



Judging South Dakota Rangeland for Livestock and Wildlife Values



SOUTH DAKOTA STATE
UNIVERSITY EXTENSION

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Table of Contents

Foreword and History	1	Part IV. Beef Cattle Habitat.	20
What is Rangeland?	1	<i>Section A: Forage Factors.</i>	20
Why Judge Rangeland?	2	<i>Section B: Distribution Factors</i>	20
Judging Contest Details	2	<i>Section C: Rangeland Health Factors</i>	20
Contest Components	2	Part V. Prairie Grouse Habitat.	20
Contest Setup	2	<i>Section A: Winter Components</i>	20
Contest Materials and Conduct	3	<i>Section B: Nesting Cover</i>	20
<i>Other Contest Information.</i>	3	<i>Section C: Brood Food</i>	20
Scoring	3	<i>Section D: Brood Habitat.</i>	21
Plants and their Characteristics	4	<i>Section E: Invasive Plants</i>	21
Ecological Sites	4	Part VI. Needed Management Practices	21
1. Subirrigated	7	PART III. BEEF CATTLE CARRYING CAPACITY	
2. Overflow	7	APPRAISAL FORM	22
3. Sands	7	PART IV. BEEF CATTLE HABITAT	
4. Sandy	7	APPRAISAL FORM	23
5. Loamy	7	PART V. PRAIRIE GROUSE HABITAT APPRAISAL	
6. Clayey	8	FORM	26
7. Dense Clay	8	PLANT CHARACTERISTICS AND RESOURCE	
8. Thin Upland	8	RATING GUIDE.	29
Ecological Sites Key	8	GLOSSARY OF TERMS	32
9. Shallow	8	Contest and Scorecards	34
10. Claypan	8	Appendix	39
Similarity Index	9	MLRA and SI Tables	53
Beef Cattle Carrying Capacity Evaluation	9		
Beef Cattle and Prairie Grouse Habitat Ratings	10		
Beef Cattle Habitat Evaluation	10		
Prairie Grouse Habitat Evaluation	11		
Guide to Needed Management Practices	13		
Beef Cattle	13		
Prairie Grouse	14		
A Detailed Contest Example	15		
Part I. Ecological site	15		
Part II. Similarity index	15		
Part III. Beef Cattle Carrying Capacity	17		
Section A: Animal Units	17		
Section B: Animal Unit Months (AUMs)	17		
Section C: Ecological Site	17		
Section D: Similarity Index (SI)	18		
Section E: Carrying Capacity Calculation	18		
Section F: Forage Balance	19		

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Foreword and History

Judging South Dakota Rangelands for Livestock and Wildlife Values is a major advance in the approach to contest judging of South Dakota rangelands. For 25 years beginning in the mid 1970s, range judges identified plants and determined range site, range condition, and management practices for a given set of goals (Johnson et al., EC 731, 1979). In the mid 1990s, the need for a more contemporary judging contest was clear. Oklahoma led the way by changing the National Range Judging Contest in 1994. A year later, South Dakota followed. Several years of field tests and multiple revisions resulted in the current manual.

The current contest requires judges to identify plants, to determine ecological sites, and to calculate similarity indices. Contestants also assess rangeland habitat suitability for livestock and wildlife by evaluating sets of factors that influence habitat suitability. In addition, contestants use basic math skills to determine whether a judging site scenario provides adequate livestock carrying capacity for the stated objective.

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What is Rangeland?

Rangeland in South Dakota is one of the richest and most important biological resources in the state. Native vegetation of rangeland is the economic backbone of ranching. Rangeland provides essential wildlife habitat. Rangeland is treasured for recreation, scenic beauty, and it is the lifeline of streams, ponds, and lakes.

Although grasses are the most common plants in our rangeland ecosystems, forbs, shrubs, and trees are integral components. Rangeland occurs as open rolling uplands, as lowland meadows, along river drainages, in association with glacial till of the northeastern counties, and as meadows in the Black Hills. South Dakota once was more than 90% rangeland, and today across the state rangeland occupies approximately half of the

state. It still occupies more than 75% of the land area in western counties. In central and north-eastern counties, 40 to 60% rangeland is common. In the southeast, rangeland occupies from less than 10% of flatter terrain up to 25% where hills have prevented conversion to cropland or towns.

Rangeland is a kind of land, not a land use, and its management profoundly impacts the similarity index of rangeland and its value for livestock, wildlife, and humans.

Why Judge Rangeland?

The purpose of rangeland judging is to provide an understanding of rangeland resources and a sense of stewardship in natural resource management. This manual describes a contest with components that have a strong biological basis for habitat management of both beef cattle and prairie grouse. Beef cattle have been chosen because they are the most common livestock grazed on South Dakota rangelands. Prairie grouse represent wildlife because they are affected by management and have the potential to occur throughout the state. Prairie grouse is a collective term that encompasses the three species of grouse that occur in South Dakota: sharp-tailed grouse, prairie chicken, and sage grouse.

Management can achieve many desired rangeland uses. Vegetation, livestock, and wildlife respond in a predictable manner to management practices. Rangeland judging is built on rangeland changes that are known to be possible for stated management goals. South Dakota rangeland judging uses beef cattle production (habitat evaluation and carrying capacity), and prairie grouse habitat evaluation to demonstrate important range management concepts.

Judging:

- Integrates basic plant and soil management and the ecological principles necessary to evaluate habitat suitability.
- Demonstrates that management by humans can influence the rangeland resource.
- Provides a basic understanding of how management affects rangeland and its resources.
- Shows that a management practice which favors one use may not equally favor another.
- Provides an opportunity to develop a basic understanding of rangeland ecosystems
- Instills a sense of rangeland stewardship.
- Is fun and instructive!

Judging Contest Details

Judging contests are held after participants have had the opportunity to study and learn principles and practices that apply to beef cattle habitat suitability, beef cattle carrying capacity, and prairie grouse habitat suitability. Generally, three judging stations are set up. Two will be for ecological site evaluation and one will be range plant identification. The estimated time to judge each station is 30 minutes.

The two ecological site evaluation stations should represent a single ecological site in a specific similarity index, both of which will be determined by the participant. Stations are square or rectangular, with border flags marking the area to judge (Figure 1). In the judged area, a path is marked so the site can be viewed more easily. Just outside the judged area a single plant is chosen to determine beef cattle forage utilization. The same plant or a different plant is marked for grouse nesting height. Also outside the judged area, a soil pit is dug to assist in determining the ecological site.

At the plant identification station, 20 plants are numbered. These plants are to be identified by the participants.

Contest Components

Stations 1 and 2

- Determine the ecological site.
- Determine similarity index.
- Determine beef cattle carrying capacity.
- Determine resource value rating for beef cattle.
- Determine resource value rating for prairie grouse.
- Make management recommendations based on stated objectives.

Station 3

Identify 20 plants and their key characteristics.

Contest Setup

- The contest committee must carefully evaluate each ecological site location before deciding on the management scenario and numerical habitat ratings.
- Ecological site evaluation stations should be about 50 x 50 feet but may be smaller if necessary.
- The statewide plant list consists of 105 entries. It is acceptable to create a more localized list eliminating species that do not occur in the contest area. If this is the case, the required species list might have 70-80 entries and should be widely circulated among contestants prior to the contest.

For Stations 1 and 2:

- Mark the boundary with wire flags or ribbon.
- Mark a path through the middle of the site to assure participants can fully evaluate vegetative components.
- For degree of use and nesting cover, mark a selected plant with a flag close to the site boundary. The same plant or separate plants can be marked for cattle and grouse.
- To assist in ecological site determination, dig a soil pit outside the site boundary to a depth greater than 20 inches or to the restrictive layer.
- Set 3-foot stakes at 50 or 100 feet to determine slope. Make sure stakes being used are the same height.
- Develop management scenario and manager's goal for each station.
- Use a grazing stick to determine annual forage production for the site. Grazing sticks can be obtained from NRCS or SDSU Extension.
- Mark an area with a ruler or determine litter amount.

For Station 3 plant identification, use wire flags numbered 1 through 20.

Contest Materials and Conduct

Each contestant should bring a clipboard and pencil. A gallon-size plastic bag should be included if rainy weather is expected. No other student-provided aids are permitted. No calculators or cellphone use is allowed.

Contestants will be given:

- A scorecard.
- A management scenario and objective for stations 1 and 2. (Example Management Scenario Sheet found on page 34).
- Local guides for calculating similarity index (found at the back of this guide on pages 53-111)
- A livestock carrying capacity table.
- A beef cattle carrying capacity appraisal form.
- A beef cattle habitat appraisal form.
- A prairie grouse habitat appraisal form.
- These worksheets and scorecard will be the same as those in this judging manual.

A minimum of 30 minutes will be allowed for judging each station.

Scorecards will be turned in at each station. Contest appraisal forms are not to be turned in for scoring.

Contestants normally divide into three equal groups, start at different stations, and rotate clockwise (See Figure 1).

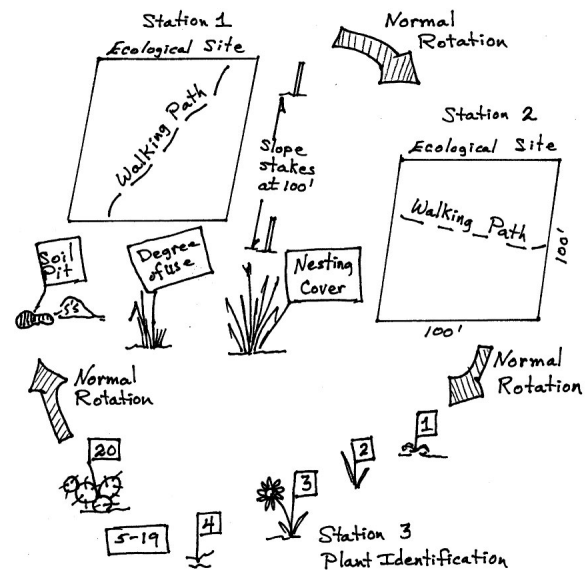


Figure 1. Normal contest setup.

Other Contest Information

Contests are designed to evaluate habitat suitability factors for beef cattle and prairie grouse on the same ecological site, thus facilitating the learning of integrated management.

The contest committee should carefully evaluate each ecological site before the contest to decide on the management scenario and numerical management goals for both beef cattle and prairie grouse. Habitat rating values range from 0 to 40. The goals for the habitat are arbitrary and must fit the site and management scenario.

If more than one limiting factor occurs on an appraisal form (two or more limiting factors with the same value), then make sure that all factors with the lowest value are marked.

Identify "Needed Management Practices" based on the stated objective(s) and numerical resource value rating. For contest purposes, beef cattle carrying capacity determination does not affect either the beef cattle habitat appraisal or the prairie grouse habitat appraisal.

Contests can be conducted without using all seven contest components. For example, a contest can be set up that does not include "beef cattle carrying capacity."

Scoring

A sample judging scorecard is at the back of this manual. The total possible score for each ecological site (stations 1 and 2) is 118 points (236 combined). For plant identification, 400 points are possible (20 points for each plant). Contest maximum is 636.

If judging as a team: 4-H teams will consist of three or four members, and the top 3 scores will count towards the team score. FFA teams can consist of as many as 10 members; the scores of the top four (occasionally three) will be counted in the team score. The team score will be the total score of those whose scores are counted.

Tie breaks for individuals will be based on the plant identification score.

Tie breaks for teams will be based on the plant identification scores of the top three team members.

Plants and their Characteristics

Proper identification and knowledge of local plants' characteristics is important for rangeland managers. Being able to identify plants and their characteristics helps land managers determine timing and use of certain plant communities. Characteristics such as growth form, life cycle, seasonality, origin, and desirability help land managers determine health of the land as well as determine best times to use and avoid certain rangeland plant communities. Proper identification of plants is used in the contest to help with similarity index, answering questions on the evaluations for beef and grouse, as well as in the plant identification portion of the contest. For the purposes of this contest, common names used are those plant names as found in Grassland Plants of South Dakota and the Northern Great Plains by James R. Johnson and Gary E. Larson. For a total list of plants, see Plant Characteristics and Resource Rating Guide later in this document. See also the Glossary of Terms for more information.

Ecological Sites

It is not difficult to recognize that some parts of any landscape are different from other parts in kinds and amounts of vegetation.

As nature would have it, there is a relationship. In fact, in most cases, there is a close link between the specific soils on the landscape and the specific plants that grow there. To understand this variation across the landscape, we classify these different parts into units called ecological sites.

An ecological site is defined as a distinctive kind of land with specific physical characteristics. It differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. Landscapes are divided into ecological sites for the purpose of inventory, evaluation, and management. Some of the criteria used to separate ecological sites are position on the

landscape, soils, and differences in kind or proportion of plant species (Figure 2).

An ecological site is the product of all the environmental factors responsible for its development. Differences in kind, proportion, and production of plants are, in large measure, the result of differences in environmental factors. In South Dakota the most important of these factors are climate and soil. The United States has been divided into broad geographic areas characterized largely by patterns of climate, soils, and vegetation. They are called Major Land Resource Areas (MLRAs, see Figure 3).

Within MLRAs, soils that have similar combinations of plant species are grouped together. These groups are called ecological sites and are given names such as Loamy or Clayey. In South Dakota there are over 40 different names given to ecological sites. These ecological sites vary in extent and distribution.

Only 10 broad ecological site names are described in this manual. These 10 make up over 90% of the rangeland in South Dakota. Their relative positions on the landscape are shown in figure 2. Examples of these ecological sites can be found in most MLRAs.

The MLRA is necessary to identify the ecological site and correctly calculate similarity index of the site (Figure 3). An example of a specific ecological site name would be Loamy, MLRA 60A (or MLRA 60A Loamy). An example Similarity Index worksheet can be found later in this manual.

The 10 broad ecological sites that will be used in range judging in South Dakota are briefly described:

1. Subirrigated
2. Overflow
3. Sands
4. Sandy
5. Loamy
6. Clayey
7. Dense clay
8. Thin upland
9. Shallow
10. Clay pan

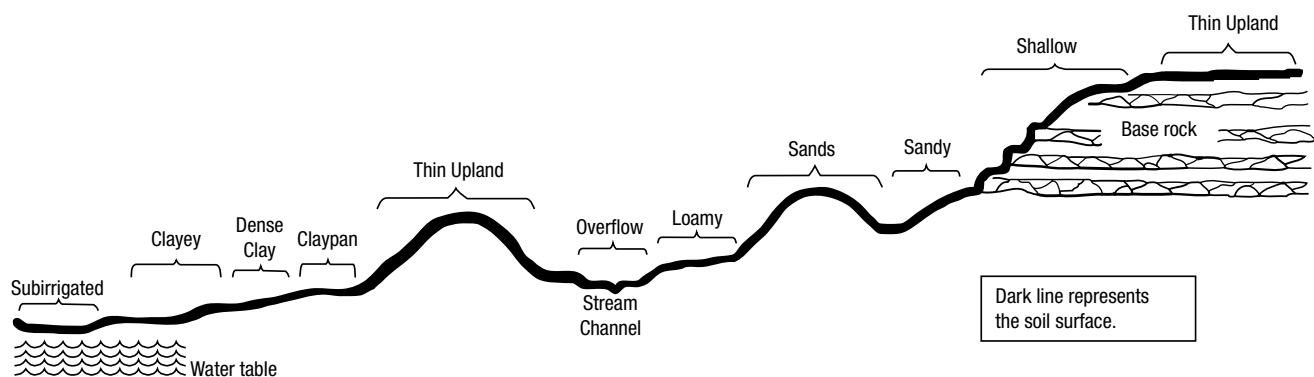


Figure 2. Ecological sites as they typically occur on the landscape.

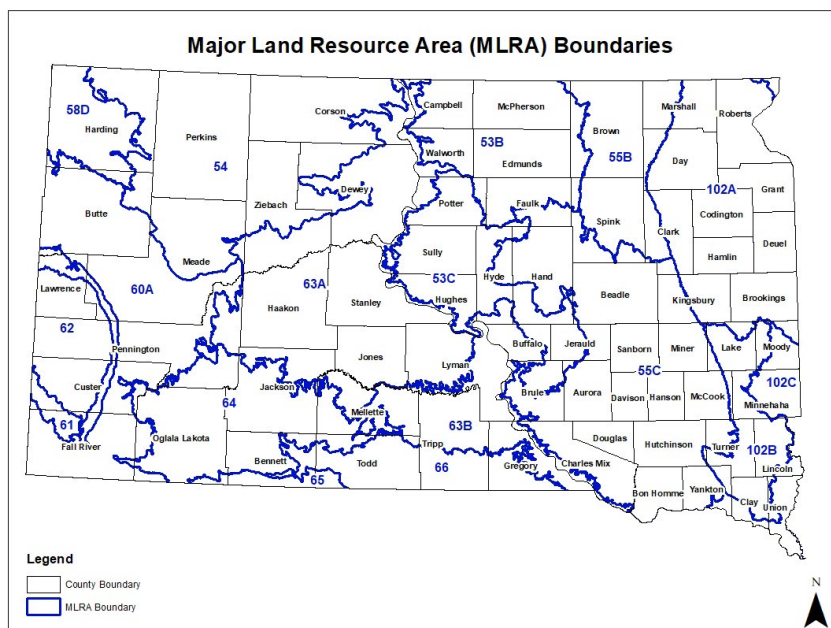


Figure 3. Major Land Use Area map for South Dakota

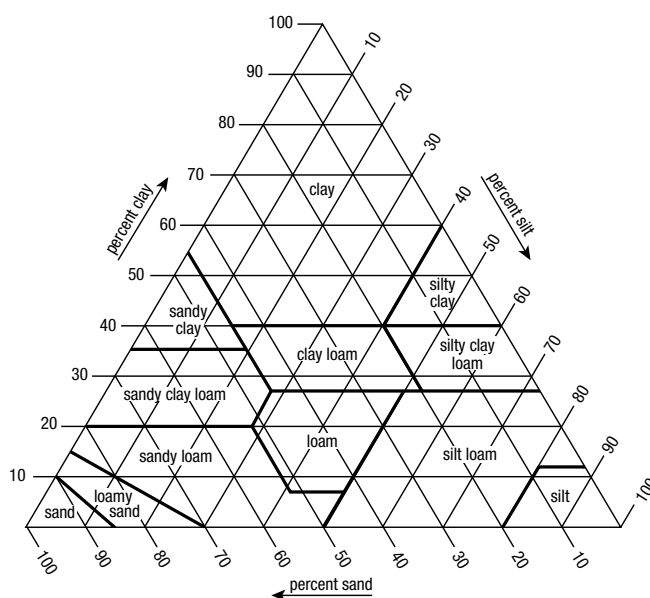


Chart showing the percentages of clay, silt, and sand in the basic textural classes.

Figure 4. Chart showing the percent ages of clay, silt, and sand in the basic textural classes.

Ecological Sites Key

By Kent Cooley, Area Resource Soil Scientist, NRCS

Determine Your Landscape Position (Run-Off, Run-In, or Normal)

Run-Off Landscape Positions (Upland)

Dig hole to a depth of 20 inches minimum or to the restrictive layer.

Is there a root restricting layer
(bedrock, shale, gravel) within 20
inches of the soil surface?

Yes

Shallow

No

Is there soil weakly developed, have a
thin topsoil, and effervesce "fizz" at or
near (within 6 inches) of the surface?
Slopes tend to be greater than 6%.

Yes

Thin Upland

No

See "Normal Landscape Positions"

Run-In Landscape Positions (Bottomlands, Drainways, etc.)

**Determine the soil characteristics to a depth
of 60 inches.**

Is there an apparent water table within
3 to 5 feet of the surface during most
of the growing season? (If present, will
be given)

Yes

Subirrigated

No

Does water flow into and through the
site?

Yes

Overflow

No

**Re-think your position and start
again!**

Normal Landscape Positions (Upland)

**Dig hole to a depth of 20 inches minimum or to
the restrictive layer.**

Is there a claypan within 8 inches of
the surface with columnar structure?

Yes

Claypan

No

What is the surface texture?

Clay, Silty Clay (40 to 60% clay)
(ribbons 2-3 inches long).

Yes

Clayey

No

Clay, Silty Clay surface with a dense
clay (>60% clay) subsoil (ribbon >3
inches long, usually wraps around
hand).

Yes

Dense Clay

No

Loam, Silt loam, Silty clay loam, Clay
loam, Sandy clay loam, Very fine
sandy loam (ribbons 0.5 to 1.5 inches
long).

Yes

Loamy

No

Sandy loam, Fine sandy loam, loamy
very fine sand (forms a ball and
ribbons up to 0.5 inch).

Yes

Sandy

No

Sand, Loamy fine sand, Loamy sand
(does not form ball).

Yes

Sands

1. Subirrigated

This site occurs on level or nearly level bottomland. Soils are characterized by a beneficial water table that is within 3 to 5 feet of the surface during most of the growing season. The water table may reach the surface during the spring but only for a very short period. Soils have textures that vary from loamy sand to silty clay. These soils are not saline. They are well-enough aerated to grow big bluestem or corn and alfalfa.

Potential natural plant cover consists chiefly of big bluestem, prairie cordgrass, and other tall grasses such as Indiangrass and switchgrass. Because of the beneficial water table, tall grasses are predominant on this site even in the drier climatic areas. Other grasses that occur are little bluestem, Canada wildrye, and green muhly. Prairie cordgrass may occur on inclusions that have a higher water table. Sedges occur in the understory. Forbs that often occur are Missouri goldenrod, Maximilian sunflower, American licorice, and showy milkweed.

The subirrigated site is often used as native hayland. It is noted for its high production of excellent quality bluestem hay.

2. Overflow

This site occurs on nearly level to gently sloping lands which receive stream water overflow or run-in from higher lands. Soils are deep and well aerated, and the texture in topsoil and subsoil varies from sandy loam to clay. Available water capacity is high. General fertility level and organic content are high. The water table is generally 5 feet or more below the surface.

Potential plant cover is an excellent stand of tall grasses. Big bluestem is the major dominant grass except in the driest climate areas. Western wheatgrass is more common in western and west central areas, especially on heavy clay soils. Other grasses that occur are prairie cordgrass, green needlegrass, switchgrass, slender wheatgrass, and sideoats grama, with an understory of sedges in the wetter areas and blue grama and buffalograss in the drier areas. Wild rose and western snowberry may occur throughout the site. Scattered stands of shrubs (such as chokecherry and buffaloberry) and trees (such as green ash and cottonwood) may occur adjacent to streams. These natural stands of trees and shrubs provide valuable but very limited cover and food for both wildlife and livestock.

3. Sands

This site occurs on nearly level to hummocky or hilly

uplands. Soils are deep, loose, excessively drained loamy fine sands or sand. Precipitation does not run off except in extreme cases; this causes this site to have more tall grasses than other upland sites in the drier climatic areas. In eastern South Dakota this site and finer textured upland soils produce about equal amounts of vegetation.

The potential natural plant cover consists of sand bluestem, little bluestem, prairie sandreed, and switchgrass. Grasses such as needle and thread, sand dropseed, and blue or hairy grama occur in lesser amounts. Shrubs such as leadplant, wild rose, and sandcherry may occur throughout. Yucca is more common on the steeper, less stable inclusions.

Proper grazing use and management are essential to maintain a suitable soil cover that will prevent wind erosion and the formation of blowouts.

4. Sandy

This site occurs on nearly level to rolling upland. Soils are deep and well drained with a sandy loam or fine sandy loam surface texture that grades into sandy loam to sand in the subsoil. Water intake rate is moderate to rapid, and available water capacity is moderately high.

The potential natural plant cover consists chiefly of prairie sandreed, little bluestem, sand or big bluestem, and the cool-season grass needleandthread. Other plants are sideoats grama, blue grama, and threadleaf sedge. Common forbs are the sageworts, heath aster, and legumes such as prairieclover. Shrubs such as leadplant and wild rose may occur throughout, but sand sagebrush occurs only in the southwestern part of the state.

With continued season-long overuse the bluestems and prairie sandreed are replaced by needleandthread, sideoats grama, blue grama, Kentucky bluegrass, and sedges.

5. Loamy

This site occurs on nearly level to rolling upland. Soils are deep or moderately well drained with a moderate or high available water capacity and favorable soil-water plant relationships.

The potential natural plant cover consists of tall and mid grasses characteristic of the true prairie in the eastern climatic area. This grades to fewer tall grasses and more mid and short grasses characteristic of the mixed prairie in the western climatic area. Big and little bluestem predominate in the eastern area. Western wheatgrass and green needlegrass are the predominant

species in the western area; needleandthread is characteristic although not always abundant. Understory species are principally sedges in the eastern area and blue grama, buffalograss, and sedges in the western area. Forbs occur in small amounts but on overused ranges weedy species such as curlycup gumweed may be abundant. On rangeland in high ecological status, shrubs like leadplant and wild rose occur on this site in all climatic areas.

6. Clayey

This site occurs on nearly level to rolling upland. Soils are deep and have silt loam to clay surfaces and silty clay to clay subsoils. If dense restrictive clay horizons occur, they are at depths of more than 14 inches. Runoff is medium or slow, and permeability is moderately slow or slow.

Potential natural plant cover is a mixture of tall and mid grasses characteristic of the northern true prairie in the east and mixed prairie in the west. In the eastern area, about equal amounts of the warm season grasses (big and little bluestem) and the cool season grasses (porcupinegrass, green needlegrass, and western wheatgrass) occur. In the western area the principal grasses are western wheatgrass and green needlegrass. Understory plants consist of the gramas, and sedges in the east and blue grama, buffalograss, and sedges in the west. Forbs and shrubs are found in the understory.

7. Dense Clay

This site occurs on nearly level to gently rolling uplands. It occurs principally in the western and west-central climatic areas. Soils are moderately deep to deep and have a nearly structureless clay surface underlain at 14 inches or less by a dense clay. Runoff is rapid. Permeability is very slow.

The potential natural plant cover is chiefly a mixture of western wheatgrass (thickspike wheatgrass may occur in the western area) and green needlegrass. This site does not have an understory of short grasses. Forbs such as American vetch, wild parsley, and wild onion are common. Woody plants are not common, but some saltbush, sagebrush, and pricklypear may occur in the western area. This site, when it is overgrazed, is nearly bare during very dry years. The erosion hazard from wind and water is high.

8. Thin Upland

This site occurs mostly on steep uplands. Soils are weakly (thinly) developed with a calcareous surface layer. Surface textures range from fine sandy loam

to clay loam. The unweathered parent material is calcareous and lacks a root restrictive layer. If bedrock exists, it is deeper than 20 inches. Surface runoff is medium or rapid, and permeability is moderate or moderately rapid. This results in less vegetative production, less organic matter in the surface, and eventually a thinly developed soil.

The potential natural plant cover consists of the tall and mid grasses characteristic of the true prairie in the eastern area. This grades to a mixture of mid and short grasses in the western area. In the east, the bluestems, prairie dropseed, and porcupinegrass are the principal species. In the west, needleandthread, bluestems, and blue grama are major grasses. Sedges occur in the understory; and in the west, threadleaf sedge becomes abundant with overuse. Forbs and shrubs are found in the understory.

9. Shallow

This site occurs on gently sloping to steeply sloping uplands. The soils are shallow, less than 20 inches to bedrock. Bedrock may be solid and rock-like or it may be unconsolidated as in the case of strongly compacted shale. If solid, moisture penetration is inhibited; if unconsolidated, the bedrock material greatly reduces the available water capacity. Both greatly restrict root penetration to less than 20 inches. Runoff is moderate or rapid and permeability is moderate to slow.

The potential natural plant cover is chiefly a mixture of bluestems, sideoats grama, and needleandthread with some western wheatgrass and green needlegrass. Understory plants are blue and hairy gramas, and sedges. Forbs such as purple coneflower and dotted gayfeather are quite typical. Shrubs such as leadplant and wild rose are common.

10. Claypan

This site occurs on nearly level to gently sloping uplands and occasionally on nearly level bottomlands. Soils may have a fine sandy loam to clay loam surface. The identifying site characteristic is that the texture changes abruptly, between depths of 4 to 8 inches, to an extremely hard clayey horizon. This hard clay has a round topped columnar commonly referred to as "biscuit tops". Salt accumulations can usually be seen in the lower part of the clay layer. Runoff is slow or medium and permeability is very slow or slow.

The potential natural plant cover is chiefly a mixture of mid and short grasses. Western wheatgrass is the major dominant. Farther east, some tall decreaser grasses may occur. Blue grama is the principal understory

plant in the east while blue grama and buffalograss fill this niche in the west. Common shrubs may include sagebrush (in the west) and cactus.

Similarity Index

Similarity Index (SI) is an expression of the kinds and proportions of vegetation present in relation to the native vegetation the site is capable of producing (see Figure 7). This plant community is known as the reference plant community and will have an SI of 100. Similarity Index is a yardstick for measuring the departure of the present plant community from the reference plant community. In South Dakota the greatest species diversity and productivity generally occur at the upper (SI closer to 100) versus the lower (SI closer to 0) levels of plant succession. The soil, water, plant, animal, and air resources on an ecological site with an SI approaching 100 will be well protected, and the ecological processes which sustain the site will be functioning at high levels (excellent rangeland health).

The desired plant community is the SI that meets the land manager's objectives or goals. It may not necessarily be an SI at or near 100. For example, the land manager may want parts of the management unit to have an SI of 30% to 40% (lower successional level) to provide winter food and cover (increased shrub component) for prairie grouse. Other parts of the management unit may need to be managed to obtain an SI of 80 to 90 (higher successional level) for prairie grouse nesting cover and forage for cattle.

Changes in SI are influenced primarily by grazing intensity and season of grazing use. Overuse by livestock or wildlife for extended periods of time results in many desirable plants losing vigor. Eventually overuse will substantially reduce or remove desirable plants from the plant community. Plants that are less productive and less desirable for the intended use may replace desirable species. Other factors that may influence SI are climatic cycles, fire, insects, exotic plants, non-use by grazing animals, and kind of grazing animal.

SI is calculated by estimating the percent species composition by weight of individual species and comparing these estimates to the reference plant community guides for the site. SI is generally best calculated at the end of the growing season to best reflect the species composition of all species present.

As judging is often done at times prior to or after the end of the growing season, contestants must be able to visualize what the plants would look like when they have reached their peak growth. The observed plant

composition is the estimate of how much weight each species contributes to the total composition.

The exception to this is with woody plants. For contest purposes, the contribution of woody plants (shrubs and trees) will be evaluated as percent canopy cover and expressed as percent composition (see Figure 5). For woody species, only consider current year's growth. A sample calculation of SI is given in the detailed contest example (see Figure 6).

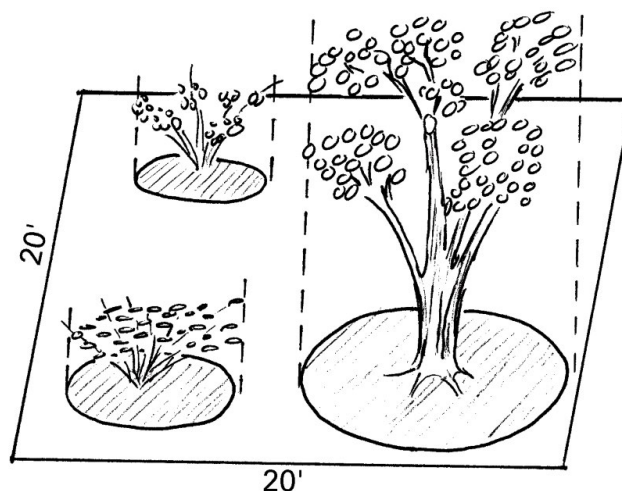


Figure 5. Visual example of tree and shrub composition estimated from canopy cover. Combined composition is estimated at 20%. **NOTE:** An area 10'X10'= 4% of a Station measuring 50'X50'.

Beef Cattle Carrying Capacity Evaluation

Beef cattle graze or browse on many different kinds of plants (herbaceous and woody). Plant selection is dependent on animal preference, availability, and palatability of the plant. Allowing beef cattle to graze in native plant communities, rangeland, or grazeable forest is compatible with natural resource stewardship provided the grazing is done in a proper manner.

Proper grazing management includes maintaining the appropriate number of cattle at or below the carrying capacity of the pasture. The carrying capacity of a pasture is the maximum stocking rate possible without causing permanent or long-term damage to the vegetation or related range resources. Stocking rate is the number of beef cattle utilizing a unit of land for a specific period of time.

The amount of forage available for grazing that is produced on an acre of land is expressed as animal unit months (AUMs) per acre. To determine AUMs per acre, first determine the ecological site and the Similarity Index of the ecological site. The carrying capacity, expressed as AUMs per acre, can be selected

from the appropriate livestock carrying capacity table. An animal unit (AU) is one mature cow of approximately 1000 pounds with a calf up to weaning, usually at 6 months of age.

Many introduced plants (those that did not evolve with the native ecosystems) that are desirable cattle forage will count toward the beef cattle carrying capacity evaluation but not toward Similarity Index. Example species are smooth brome grass and crested wheatgrass. These are primary species for cultivated pastures. However, in rangeland these and other introduced plant species threaten the integrity of native plant ecosystems and are not counted toward the SI.

Beef Cattle and Prairie Grouse Habitat Ratings

All resource value components have been arbitrarily set using a scale of 0 to 40 to facilitate judging.

Success of a species such as prairie grouse within a given area (often referred to as its home range) depends on the nature of the habitat provided in that area. Habitat desirability is dependent on a number of factors, often physical, and controlled by the vegetation and how the vegetation is managed. Success of a species is primarily dependent on the most limiting factor. This principle is illustrated by Liebig's law of the minimum which states:

Total yield or biomass of an organism will be determined by the nutrient present in the lowest (minimum) concentration in relation to the requirements of that organism. In other words, organisms and organism growth will be limited by nutrition, particularly those nutrients in short supply.

Just as a barrel can only hold as much water as allowed by the shortest stave, so any organism is only as successful as the most limiting habitat factor allows.

Beef Cattle Habitat Evaluation

This evaluation systematically judges quality of the habitat for its value to beef cattle. The evaluation guide is designed to assist in inventorying and analyzing the existing habitat conditions. It is used to determine an overall habitat value and identify the limiting factor of the habitat for beef cattle. The limiting factor is the habitat factor(s) with the lowest rating and should be checked under "Beef Cattle Limiting Factors" on the scorecard. If there is a tie for limiting factors, check both on the scorecard. Limiting factors are independent of the stated goal.

Select management practices to improve all habitat factors that have a rating below the stated goal for

the management scenario given. If the overall habitat rating for the site is at or above the stated goal, no management practices are needed (but will need to select "continue present management" on the scorecard). See "Guide to Needed Management Practices" for additional information.

Beef cattle habitat is influenced by forage, distribution, and rangeland health factors. Beef cattle restrict their home range to an area that provides their needs for food, water, and shelter. The actual size and shape is generally controlled by fencing. If not fenced, the home range would be controlled by how far the animal can travel and the quality of the various habitat elements within the home range. Actual home ranges are not marked by permanent boundaries (except for fencing), nor are they the same from season to season. Beef cattle prefer open areas that provide good air flow and thermal cover. Thermal cover can be either shade in warm weather or windbreaks during cold weather.

In range judging, the most limiting habitat factors are eliminated through selection of management practices, until the beef management goal is met.

The forage factors to evaluate are similarity index, annual production, diversity, and utilization:

Similarity index: Beef cattle prefer grazing certain grasses, forbs, and woody plants. These preferred plants decline in vigor and abundance over time if they are not properly grazed.

Annual production: The amount of forage available determines how long cattle can be present in a pasture. As similarity index declines, annual production tends to decline as well. Average annual production is found in Part IV of the Similarity Index Guide Sheets for each MLRA*. Refer to page 41 of the appendix for more information on annual plant production.

Forage diversity: Beef cattle will graze many different plants during the year. Grazing preferences change with seasons of the year and stages of plant growth. Having a variety of grasses, forbs, and woody plants available makes a properly balanced diet more likely.

Forage utilization: Diet quality is generally higher at the beginning of the growing season and declines later in the season. Forage quality is also related to forage utilization. As beef cattle graze a plant, they initially remove the higher quality leaves. The remaining leaves and stems are of declining quality. Thus, overutilization of forage causes a decline in quality. When plants are grazed lightly to moderately and then rested to allow

regrowth, the regrowth will be of higher quality. Unless otherwise stated, consider only the current year's growth on the flagged plant when evaluating forage utilization for beef cattle.

In order to determine forage utilization on the marked plant, find a similar plant elsewhere near the judging site (but not in the site). Balance the plant on your finger to determine its balancing point. This would be considered 50% utilization by weight. Use this as a guide to compare to the marked plant to determine what percentage of the plant has been removed.

The distribution factors to evaluate are forage accessibility, grazing restraint, and water:

Forage accessibility: Beef cattle prefer to graze on level ground. As the slope increases and/or the surface of the ground becomes rough from surface rocks, grazing use declines.

Grazing restraint: Beef cattle prefer to graze in open areas that allow easy movement and comfortable environmental conditions (e.g., moderate air temperature, air movement, relatively low fly numbers). Increasing brush canopy cover tends to restrict animal movement, reduce air movement, and increases fly populations.

Water: Beef cattle prefer to graze a short distance from water. Cattle will increase their distance from water in search of forage or for thermal protection (summer shade or winter windbreak). They will seldom travel more than two miles to meet their forage requirements.

The rangeland health factors to evaluate are invasive plants, bare ground, litter depth, and erosion:

Invasive Plants: Invasive Plant evaluation involves assessing the presence of invading plants and evaluating their impact on the ecological site and habitat. When invasive species occurs as a single species or a combination of invasive species that make up more than 10% of the site, the site integrity is considered to be affected. When greater than 50% of the species composition is invasive plants (species dominate), the rating is 10. When 10 to 50% of the species composition is invasive species (scattered), the rating is 20. If there are no invasive species present (rare), or they comprise less than 10% of the site, the rating is 40.*

Bare Ground: The percentage of Bare Ground or ground cover is important to protect the soil surface from water or wind erosion. This indicator is evaluated

by assessing the percentage of live plants, plant litter, gravel or rock, or biological crusts covering the surface of the site. Bare ground amounts are related to soil and hydrologic attributes, and are naturally lower on some sites such as shallow soils or clay hardpans. If bare ground is what is expected for the site (within 5% of the reference state), the rating is 40. If bare ground is moderately higher than expected for the site (6-10% greater than the reference state), the rating is 25. If bare ground is much higher than expected for the site (11% or greater than the reference state), the rating is 15. Refer to page 42 of the appendix for more information on ground cover.

Litter Depth: Litter depth or litter amount is the amount of dead plant material that is on the soil surface. Litter is important to moderate the climate at the soil surface and protect the soil surface from erosion. Litter amounts can vary with different sites - sometimes being too much (e.g., Kentucky bluegrass invaded site) and sometimes being too little (e.g., clay hardpan site). Each site will require different amounts of litter to function. If litter depth is what is expected for the site, the rating is 40. If litter depth is more or less than what is expected for the site, the rating is 10. Refer to page 44 of the appendix for more information on litter amount.*

Erosion: Erosion is a natural process that occurs when soil is transported from one location to another. Accelerated erosion occurs when the soil is left uncovered, unvegetated, and/or lacks a healthy microorganism community. In order to reduce erosion, a grazing system should promote adequate plant cover from living plants and allow for enough plant matter to remain after a grazing event to provide soil coverage. If the site shows no signs of erosion, the rating is 40. If the site shows water flow patterns or litter movement, the rating is 30. If rills are present on the site, the rating is 20. If plants are pedestalled or terracettes are present, the rating is 10. If active gullies are on the site, the rating is 0. Refer to page 45 of the appendix for more information on soil surface resistance to erosion.*

Prairie Grouse Habitat Evaluation

This evaluation systematically judges habitat quality for its value to prairie grouse in South Dakota. Sage grouse, sharp-tailed grouse, and prairie chickens are collectively considered prairie grouse. Historically they occupied every rangeland habitat in the state, which exceeded 90% of the total land area, but they have been displaced in much of their home range as a result of farmland and urban areas being carved out of rangeland. However, in areas where there is a

mix of rangeland with alfalfa fields or cropland and shelter belts, prairie grouse can fare well. In existing rangelands, management of livestock grazing can have the greatest impact on prairie grouse habitat and numbers. Grazing can often be beneficial at light and moderate levels of use. At higher levels of use, grouse habitat eventually declines as cover decreases and food becomes scarce.

The prairie grouse appraisal evaluation component of range judging is designed to systematically inventory and evaluate habitat components that are known to be important in sustaining grouse. The contestant uses the ecological site to be judged as the conceptual home range and evaluates habitat elements required by grouse in the home range. The habitat elements to evaluate are winter components, nesting cover, brood food, brood habitat, and site integrity.

Overall habitat value and limiting factors are identified by using the prairie grouse habitat appraisal form. The limiting factor is the habitat factor(s) with the lowest rating and should be checked under "Prairie Grouse Limiting Factors" on the scorecard. If there is a tie for limiting factors, check both on the scorecard. Limiting factors are independent of the stated goal.

Select management practices to improve all habitat factors that have a rating below the stated goal for the management scenario given. If the overall habitat rating for the site is at or above the stated goal, no management practices are needed (but will need to select "Continue present management" on the scorecard). See "Guide to Needed Management Practices" for additional information.

NOTE: Similarity Index is used only for beef cattle carrying capacity calculations and not for prairie grouse habitat evaluation.

The winter component factors to judge are winter escape cover, winter roosting cover, and winter food:

Winter escape cover: Shrubby vegetation in winter provides a dual purpose. It is important as predator protection and thermal protection. In winter, grouse hide in shrubby areas to make themselves less visible to predators. Shrub thickets also create effective wind barriers by reducing wind chill during windy conditions and blizzards, thus decreasing the energy needed by the birds during winter storms.

Winter roosting cover: Grouse have the ability to burrow in snow trapped by vegetation that is at least 8 inches tall. Coveys will fly to a leeward, grassy hillside,

burrow into the snow, and become essentially covered and insulated with a blanket of snow, also remaining visually protected from predators.

Winter food: Grouse will fly several miles to find suitable winter food. Persistent fruits and dormant leaf buds of essentially all shrubs and trees are valuable. Cropland of nearly any type provides good winter food. Included are green winter wheat, alfalfa seed and leaves, and unharvested seeds of wheat, oats, corn, and milo.

The nesting cover factors to judge are nesting cover quality and nesting cover height:

Nesting cover quality: Mid and tall grasses on upland ecological sites are favored nesting areas for grouse. Bunch grasses often seem preferred, but sod grasses also provide satisfactory nest sites. Sites dominated by short grasses, shrubby thickets, or cropland do not provide the environment necessary for nesting.

Nesting cover height: Up to a point, taller is better for nesting cover. As a rule, grass less than 8 inches in height does not provide adequate nesting cover. As grasses reach heights above 16 inches, the quality of the site increases for nesting. Unless otherwise stated, consider only the current year's growth on the flagged plant when evaluating utilization for grouse nesting cover.

Brood food is judged as a composite of three vegetation attributes involving broadleaf plants, canopy shading, and bare ground:

Grouse chicks rely heavily on insects and spiders, which are associated with forbs and shrubs. To some extent, they also feed on these broadleaf plants. The protein dietary requirement for a grouse chick is high. Insect and spider populations are higher when vegetation forms a canopy several inches above the ground. The canopy shades the ground, creating a variety of microhabitats for thermal regulation of body heat, nesting, feeding, and preying. Destructive grasshopper populations are often associated with short vegetation and bare ground for grasshopper nesting sites. Such sites are not good for brood rearing because they lack protective cover for chicks, insect/spider diversity, and forbs.

Brood habitat addresses brood safety by evaluating brood protective cover quality and mobility/accessibility:

Brood protective cover quality: Shrubby cover is the best protection from birds of prey. When shrubby

patches occur in conjunction with interspersed cover types, the best opportunity exists for having adequate brood food and protection from predators.

Mobility/accessibility: Brood chicks are small and must be able to (1) be mobile enough to escape predators, and (2) gain access to food and cover. Some bare ground is important for mobility/accessibility, as long as there is not so much bare ground that other desirable habitat components are lacking.

Invasive Plants: Invasive Plant evaluation involves assessing the presence of invading plants and evaluating their impact on the ecological site and habitat. When invasive species occurs as a single species or a combination of invasive species that make up more than 10% of the site, the site integrity is considered to be affected. When greater than 50% of the species composition is invasive plants (species dominate), the rating is 10. When 10 to 50% of the species composition is invasive species (scattered), the rating is 20. If there are no invasive species present (rare), or they comprise less than 10% of the site, the rating is 40.*

Guide to Needed Management Practices

Assume that if a management practice is checked to correct a factor that is below the stated goal, then the value for the component is raised to 40.

Beef Cattle

1. Apply invader plant control. Use only when site integrity (invading herbaceous or woody plants on the site) is below the stated goal. Invader plants are listed in the plant list. Invading plants may be locally exotic natives (e.g., juniper or cedar) or introduced plants (e.g., smooth brome grass or Canada thistle). Control may be in the form of grazing, fire, herbicides, or mechanical or biological control. Some invading plants are difficult to control with existing practices.
2. Continue present management for beef cattle. Use if current grazing management program is meeting the stated goals for beef cattle. **NOTE FOR CONTEST OFFICIALS:** Do not check if Option 5a, 5b, 5c, 5d, 5e, 5f, or 6 is checked.
3. Apply woody plant control for beef cattle. Use when grazing restraint is below the stated goal or woody plants exceed 20% (canopy cover) of the site composition. Consider only woody plant cover that restricts forage production. Woody plant control may be prescribed fire, herbicide, mechanical,

biological, and/or grazing/browsing. Note: Option 7 (Change kind of grazing/browsing animal) may also apply.

4. Develop water for beef cattle. Use when Water is below the stated goal. Properly located, clean, and dependable water sources are essential for good grazing management and livestock performance.
5. Begin a planned grazing system. Use if current grazing management or nesting cover is inadequate for the goal. Would be used when any of the following apply:
 - (a) an improvement in SI would adequately improve cattle carrying capacity to handle desired AUMs of grazing.
 - (b) use of a grazing system will improve Similarity index or forage diversity.
 - (c) use of a grazing system will provide adequate rest needed to improve annual production.*
 - (d) use of a grazing system will provide enough plant residue to help reduce erosion on the site.*
 - (e) use of a grazing system will provide rest to encourage adequate ground cover (reduce bare ground).*
 - (f) use of a grazing system can restore the litter depth to the acceptable amount by use of appropriate stocking rates, stock density, and suitable amounts of rest.*
 - (g) nesting cover quality for prairie grouse is a factor preventing attainment of the goal for prairie grouse. See option 10 (Improve Nesting Cover Quality). See Note on Option 2 (Continue Present Management for Beef).
 - (h) nesting cover height (flagged plant) is a factor preventing attainment of the goal for prairie grouse. See option 11 (Improve Nesting Cover Height). See Note on Option 2 (Continue Present Management for Beef).
6. Change livestock numbers or duration of grazing period.
 - (k) Use if utilization is below the stated goal for beef cattle. Use also if beef cattle carrying capacity is too small. Do not check if capacity is too large. See Note on Option 2 (Continue Present Management for Beef).

- (l) Use if Erosion is below the stated goal for beef cattle (also select 5. Begin a planned grazing system).*
 - (m) Use if Bare ground is below the stated goal for beef cattle (also select 5. Begin a planned grazing system).*
 - (n) Use if Litter depth is below the stated goal for beef cattle (also select 5. Begin a planned grazing system).*
7. Change kind of grazing/browsing animal. Use when grazing accessibility or grazing restraint is below the stated goal because of terrain (slope) or woody cover. Option 3 (Apply Woody Invader Plant Control) may also apply.

Prairie Grouse

1. Apply invader plant control. Use only when site integrity (invading herbaceous or woody plants on the site) is below the stated goal. Invader plants are listed in the plant list. Invading plants may be locally exotic natives (e.g., juniper or cedar) or introduced plants (e.g., smooth brome grass or Canada thistle). Control may be in the form of grazing, fire, herbicides, or mechanical or biological methods. Some invading plants are difficult to control with existing practices.
2. Begin a planned grazing system. Use if current grazing management or nesting cover is inadequate for the objectives stated below. Would be used when any of the following apply:
 - (a) an improvement in SI would adequately improve cattle carrying capacity to handle desired AUMs of grazing.
 - (b) use of a grazing system will improve Similarity index or forage diversity.
 - (c) use of a grazing system will provide adequate rest needed to improve annual production.
 - (d) use of a grazing system will provide enough plant residue to help reduce erosion on the site.
 - (e) nesting cover quality for prairie grouse is a factor preventing attainment of the goal for prairie grouse. See option 10 (Improve Nesting Cover Quality). See Note on Option 2 (Continue Present Management for Beef).
 - (f) nesting cover height (flagged plant) is a factor preventing attainment of the goal for prairie grouse. See option 11 (Improve Nesting Cover

Height). See Note on Option 2 (Continue Present Management for Beef).

3. Continue present management practices for prairie grouse. Use if current management program is meeting the stated goals.
4. Improve winter components for prairie grouse. Use if important winter escape cover, winter roosting cover, or winter food below the stated goal for grouse.
5. Improve nesting cover quality for prairie grouse. Use if mid and tall grass quantities are so small that they are preventing attainment of the stated goal. This may require a change in cattle stocking rates or a change in grazing management to encourage taller-growing species. Also check option 5 (Begin a Planned Grazing System).
6. Improve nesting cover height for prairie grouse. Use if nesting cover height is below the stated goal for grouse. Taller grasses are necessary to screen nests and nesting birds from predators and unfavorable weather. Nesting cover height is usually influenced by grazing management. Also check option 5 (Begin a Planned Grazing System).
7. Improve brood food for prairie grouse chicks. Use if brood food is below the stated goal for grouse. Young grouse require high protein diets, obtained mostly from insects and to some extent from forbs. The most favorable sites have broadleaf plants and taller vegetation.
8. Improve brood habitat. Use if brood protective cover quality or mobility/accessibility is below the stated goal.

Asterisks denote additions for the 2022 update.

A Detailed Contest Example

Management scenario and goals. NOTE: At the beginning of the contest, a management scenario will be given by the station monitor or will be posted.

A rancher in Lyman County has 100 cow/calf pairs and 4 bulls that he wants to graze in this 1440 acre pasture for 8 months. Water is 3/4 mile away. Cropland is 1/2 mile away. Annual Production was measured at 2,350 lbs/acre. The primary objective of the ranch is to raise cattle, with prairie grouse as a secondary objective. The manager's goal is to have a beef cattle habitat rating value of 30, and a prairie grouse habitat rating value of 25.

Part I. Ecological site

The contestant notices that the site is in an upland location, not subject to flooding. The slope is less than 5%, and the soil pit has loamy soil greater than 20 inches. The contestant determines the site is Loamy and makes the appropriate mark on the Scorecard, Station 1, Part I.

Part II. Similarity index

The MLRA 63A SI worksheets have been pre-selected from the South Dakota Major Land Resource Area Map for calculating Similarity Index (SI). Lyman County is in this Resource Area (see Figure 5 example calculation for a loamy ecological site where the SI is determined to be 83% and is entered on the judging scorecard in Part II in the "76%-100% of Potential" category as well as on the Beef Cattle Carrying Capacity Appraisal Form (Part III.D).

The SI that occurs on an ecological site is determined by comparing the kinds and proportions of vegetation presently on the site with the native vegetation that the site is capable of producing in a relatively undisturbed condition. See example calculation: Similarity Index (Figure 6).

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	50	18	18
needlegrasses	35	36	35
sideoats grama	15	5	5
big bluestem	5	8	5
other native tall grasses	5	-	-
invader tall grasses	0	4	-
Short Height			
blue grama	10	5	5
buffalograss	5	-	-
sedges	5	-	-
other native short grasses	5	-	-
invader short grasses	0	3	-
Forbs:			
native forbs	10	10	10
invader forbs	0	-	-
Shrubs:			
native shrubs	5	11	5
invader shrubs	0	-	-
Trees:			
native trees	0	-	-
invader trees	0	-	-
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			83

Figure 6. Similarity Index worksheet example

For range judging, it is necessary to select the SI worksheets from the back of the manual for the Major Land Resource Area where the contest is held. Use the Major Land Resource Area map (Figure 3) to determine which SI worksheets to use. In this example, use the MLRA 63A Similarity Index worksheets. The contestant will have already determined that the ecological site for Station 1 is Loamy and uses the loamy ecological site worksheet for calculating SI.

The SI is determined by calculating the composition of the species at the judging station. It is entered in the "Percent Observed" column. Composition is by weight of species when they reach their peak growths. Contestants must visualize what plants will look like when they are fully grown and not grazed. For contest purposes, the composition contribution of shrubs and trees will be evaluated as percent canopy cover and expressed as percent composition. "Total Observed Composition" must total 100%. The "Percent Allowed" is determined by comparing "Percent Observed" to "Composition Maximums." For each species, the smaller value is entered in the "Percent Allowed" column, as in this example:

Dominant Plants	Comp. maximums	Percent observed	Percent allowed toward SI
Needlegrass	30	33	30
Sideoats Grama	10	5	5

SOUTH DAKOTA RANGELAND JUDGING SCORECARD

Resource Inventory, Present Conditions

Part I	Ecological Sites	Station No. 1
15 pts.	Subirrigated	
	Overflow	
	Sands	
	Sandy	
	Loamy	X
	Clayey	
	Dense Clay	
	Thin Upland	
	Shallow	
	Claypan	

Part II	Similarity Index	Station No. 1
10 pts	76-100% Potential	X
	51-75% potential	
	26-50% potential	
	0-25% potential	

Part III	Beef Cattle Carrying Capacity	Station No. 1
10 pts	Capacity is Too Small	
	Capacity is Exactly Right	
	Capacity is Larger Than Needed	X

Part IV	Beef Cattle Habitat Inventory	Station No. 1
10 pts	Excellent Value (31-40)	X
	Good Value (21-30)	
	Fair Value (11-20)	
	Poor value (<11)	
3 pts each	Beef Cattle Limiting Factors	
	Forage Factor is Limiting	
	Distribution Factor is Limiting	X
	Rangeland Health Factor is Limiting	

Part V	Prairie Grouse Habitat Inventory	Station No. 1
10 pts	Excellent Value (31-40)	
	Good Value (21-30)	
	Fair Value (11-20)	
	Poor value (<11)	X
3 pts each	Prairie Grouse Limiting Factors	
	Winter Components Are Limiting	
	Nesting Cover is Limiting	X
	Brood Food is Limiting	
	Brood Habitat is Limiting	
	Invasive Species	

Contestant Name _____

Contestant Number _____

County or School _____

Team Number or Name _____

Score: Station 1 _____/118

Total: _____/118

Part VI	Needed Management Practices	Station No. 1
3 pts each	1. Apply Invader Plant Control for Integrity of the Site	
	2. Continue Present Management for Beef	
	3. Apply Woody Plant Control for Beef Cattle	
	4. Develop Water for Beef Cattle	
	5. Begin a Planned Grazing System	X
	6. Change Livestock Numbers or Duration of Grazing Period	
	7. Change the Kind of Grazing/Browsing Animal	
	8. Continue Present Management for Prairie Grouse	
	9. Improve Winter Food or Cover for Prairie Grouse	
	10. Improve Nesting Cover Quality for Prairie Grouse	X
	11. Improve Nesting Cover Height for Prairie Grouse	
	12. Improve Brood Food for Prairie Grouse Chicks	
	13. Improve Brood Habitat	

_____/79

_____/39

Part III. Beef Cattle Carrying Capacity

Use the Beef Cattle Carrying Capacity Appraisal Form for your calculations.

Section A: Animal Units

Step 1. The information for number and type (cow/calf, yearling, or bull) of livestock will be given to you at the judging station. The example site is in MLRA 63A, and the producer wants to graze 100 cow/calf pairs and 4 bulls. Enter the number of beef cattle for each type on the beef cattle carrying capacity appraisal form in the appropriate space (in this example Station 1).

Step 2. Multiply the number of cattle in column one by the Animal Unit Conversion Factor in the second column. Enter the answer in column three, Animal Units (AU) to Graze. You will note that a 1000-pound cow with a calf is one animal unit; therefore, the conversion factor is 1.0. Yearling beef cattle weigh less than 1000 pounds and consume less forage; therefore, the conversion factor is 0.6. A bull weighs more than the 1000-pound cow and consumes more forage, thus has a conversion factor of 1.2.

Step 3. Add the Animal Units to Graze and enter your answer (104.8) on the bottom line, labeled Total Animal Units.

A. Animal Units • What is the daily forage requirement of animals adjusted to the same base?

Animal Units	Number of Cattle		X	Animal Unit Conversion Factor	=	Animal Units (AU) to Graze	
	STA 1	STA 2				STA 1	STA 2
Cow/calf pairs	100		X	1.0	=	100	
Yearlings			X	0.6	=		
Bulls	4		X	1.2	=	4.8	
Total Animal Units (AU)						104.8	

Section B: Animal Unit Months (AUMs)

Step 1. Enter your answer for Total Animal Units from Section A.

Step 2. The producer wants to graze 8 months. This information will be given for the station. Enter the 8 under the Months to Graze.

Step 3. Multiply column one, Total Animal Units, by the second column, Months to Graze, and enter the answer in the third column, Total Required Animal Unit Months (AUM) Capacity. In this example the total required capacity is 838.4 AUMs.

B. Animal Unit Months • How much forage is required for a specified amount of time?

Station Number	Total Animal Units	X	Months to Graze	=	Total Required Animal Unit Months (AUM Capacity)
STA 1	104.8	X	8	=	838.4
STA 2		X		=	

Section C: Ecological Site

Enter the Ecological Site name.

C. Ecological Site • What is the ecological site? Use the ecological site determined earlier for this station or determine now.

STA 1 • Ecological Site Name Loamy **STA 2** • Ecological Site Name _____

Section D: Similarity Index (SI)

Check "76-100%" Similarity Index. You previously calculated the SI at 83%.

- D. Similarity Index (SI) • What is the SI for this site? Use SI calculated for the site, or it may be given. Enter below.

Station Number	76-100%	51-75%	26-50%	0-25%
STA 1	83%			
STA 2				

Section E: Carrying Capacity Calculation

This section is used to calculate the carrying capacity for the range judging station.

Step 1. Select the correct available AUMs/acre value for the Ecological Site from the Livestock Carrying Capacity table. The carrying capacity tables are specific for each Major Land Resource Area in South Dakota. For contests, the correct Livestock Carrying Capacity table will be provided with the SI worksheets for each MLRA.

Step 2. To use the Carrying Capacity table below, select the Loamy Ecological Site in the left hand column. Select the correct Similarity Index. In this example select 76-100%. Read the figure in the box below 76-100% and to the right of the Loamy Ecological Site. The Available Animal Unit Months Per Acre (AUMs/Acre) would be 0.65 AUMs/Acre.

Part III LIVESTOCK CARRYING CAPACITY TABLE FOR NORTHERN ROLLING PIERRE SHALE PLAINS, MLRA 63A, SOUTH DAKOTA				
SIMILARITY INDEX (%)				
	76-100	51-75	26-50	0-25
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):			
Subirrigated	1.3	1.0	0.8	0.6
Overflow	0.9	0.7	0.6	0.45
Loamy, Clayey, Sandy, Sands	0.65	0.5	0.4	0.3
Dense Clay, Thin Upland, Shallow, Claypan	0.47	0.4	0.3	0.2

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NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of Listed Plants	AUM/Ac Change
21% - 40%	next higher rate
41% - 60%	2nd higher rate
61% or greater	3rd higher rate

NOTE: Use a higher AUM/Acre value when the site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, alfalfa, and/or sweetclover.

Composition of Listed Plants	AUM/Acre Change
21% – 40%	next higher rate
41% – 60%	2nd higher rate
61% or greater	3rd higher rate

Step 3. In this example, invader plants exist on the site, but they are less than 21%, so enter the 0.6 AUM/Acre and the acres given for the pasture size, 1440 acres. Multiply the AUMs/Acre times the Acres and enter your answer (936 AUMs) under Total Available AUMs Capacity. This is the total forage available for livestock grazing in the example.

- E. Carrying Capacity Calculation • What is the specific beef cattle carrying capacity for this Ecological Site with its Similarity Index?

From the Carrying Capacity Table, Part III, select the correct Available AUM/Acre for Ecological Site and its SI.

Station Number	Available AUM/Ac	X	Acres (given)	=	Total Available AUM's Capacity
STA 1	0.65	X	1440	=	936
STA 2		X		=	

Section F: Forage Balance

In this section you will calculate whether there is enough forage in the pasture.

Step 1. Enter the Total Required AUM Capacity from Section B. Enter 838.4 AUMs required in the space provided.

Step 2. Enter the Total Available AUM Capacity, 936 AUMs available, from Section E in the space provided.

Step 3. The AUMs available is greater than the AUMs required. Check on the Appraisal form that the capacity is larger than needed.

Step 4. Also enter this response on your Rangeland Judging Scorecard, Part III, by checking the box following The Capacity is Larger Than Needed.

REMEMBER: You are only scored on the responses you record on the Rangeland Judging Scorecard. The Beef Cattle Carrying Capacity Appraisal Form is only used to arrive at the correct answer and is not turned in for scoring.

- F. Forage Balance • Does the unit have enough forage to meet the livestock demand?

Animal Unit Months	STA 1	STA 2
Enter Total Required AUM Capacity (B)	838.4	
Enter Total Available AUM Capacity (E)	936	

	Check one	Check one
If (B) is larger, the capacity is too small		
If (B) = (E) the capacity is exactly right		
If (E) is larger, the capacity is larger than needed	X	

Part IV. Beef Cattle Habitat

The contestant uses the beef cattle habitat appraisal form (found on pages 22-25) to evaluate the scenario and objectives in this contest example.

Section A: Forage Factors

Forage Factors	Habitat Value
1. Earlier in this example, a Similarity Index of 83% was determined. Enter "40" from the Appraisal Form.	40
2. Annual production. The Given annual production was 2,350. The annual production found on the Part III chart on the back page of the Similarity Index worksheets for Loamy is 2400. $2350 \div 2400 = 0.98 \times 100 = 98\%$. Enter 40 from the appraisal form.	40
2. Forage Diversity. All desirable forage groups are present.	40
3. Forage utilization of the flagged plant at the judging station is 30%.	40

NOTE: There are no limiting forage factors; all are 40.

Section B: Distribution Factors

Distribution Factors	Habitat Value
1. Forage accessibility. Slope at the station is determined to be less than 5%.	40
2. Grazing restraint. Shrubby canopy cover was less than 20% (This is from the percent shrubs observed on the SI worksheet).	40
3. Water. Water is known (given) to be 3/4 mile away.	35

Section C: Rangeland Health Factors

Rangeland Health Factors	Habitat Value
1. Invasive plants. Rarely present in the site.	40
2. Bare ground. Amount and size of bare areas match that expected for the site.	40
3. Litter depth. Litter depth is what is expected for the site.	40
4. Erosion Factors. The site is well-vegetated, with no erosion factors present.	40

Identify limiting factor(s), if any:

The overall beef cattle habitat rating for existing conditions is 35 (an excellent value), which is higher than the manager's goal of 30. One factor, B.3, water, is the most limiting. Check "Distribution Factor is limiting" on the scorecard. But since there are no factors below the stated goal, no management practices need to be selected at this time.

Part V. Prairie Grouse Habitat

The contestant determines the value described in the scenario for prairie grouse by using the prairie grouse habitat appraisal form (found on pages 26-28), making these determinations:

Section A: Winter Components

Winter Components	Habitat Value
1. Winter Escape Cover: Shrubby cover at the judging station is about 11% (found on the SI worksheet).	30
2. Winter Roosting Cover: Grasses 8 inches or taller cover more than 51% of the area.	40
3. Winter Food: Woody vegetation occupies 11% of the area; cropland is within 1 mile (given).	40

Section B: Nesting Cover

Nest Cover	Habitat Value
1. Quality mid and tall grasses predominate on greater than 60% of the site.	40
2. Height: The flagged use plant at the station is 6" tall.	5

Section C: Brood Food

Brood Food	Habitat Value
1. 10% of the vegetation is broadleaf plants (forbs); and bare ground is 15%.	30

Section D: Brood Habitat

Brood Habitat	Habitat Value
1. Protective Cover: More than 11% of site is shrub covered.	30
2. Mobility/Accessibility: Exposed ground is determined to be 15%.	40

Section E: Invasive Plants

Invasive Plants	Habitat Value
1. Invasive plants constitute less than 10%.	40

The overall prairie grouse habitat rating for existing conditions is 5 (a poor value), which is less than the manager's goal of 25. One factor, B.2, nesting cover height, is the most limiting. For limiting factors, check only nesting cover as the limiting factor. If two are tied and both are below the stated goal, then both would be checked as limiting factors. Check "Improve Nesting Cover Height for Prairie Grouse" on the score card. Increase its value to the maximum (40) and identify if any other factors are below the stated goal. If other factors are below the stated goal, continue to apply management practices until no more factors are less than the stated goal.

Part VI. Needed Management Practices

To determine the needed management practice(s), increase all factors that are less than the stated goal and check the corresponding management practice(s). Application of a management practice assumes that the score is raised to the maximum of 40.

Practices to check in this example:

5. Begin a Planned Grazing System ... because utilization at the site is too severe for prairie grouse nesting cover and does not meet the stated goal.

10. Improve Nesting Cover Height for Prairie Grouse ... because this is below the stated goal.

NOTE: Although invader grasses are present, they are less than 10% of total estimated production, so "1. Apply Invader Plant Control." will not be marked.

PART III. BEEF CATTLE CARRYING CAPACITY APPRAISAL FORM

Carrying capacity is the amount of forage which can be removed without damage to the resource. Capacity changes with the ecological sites and with plant composition, expressed as Similarity Index.

- A. Animal Units • What is the daily forage requirement of animals adjusted to the same base?

Animal Units	Number of Cattle		X	Animal Unit Conversion Factor	=	Animal Units (AU) to Graze	
	STA 1	STA 2				STA 1	STA 2
Cow/calf pairs			X	1.0	=		
Yearlings			X	0.6	=		
Bulls			X	1.2	=		
Total Animal Units (AU)							

- B. Animal Unit Months • How much forage is required for a specified amount of time?

Station Number	Total Animal Units	X	Months to Graze	=	Total Required Animal Unit Months (AUM Capacity)
STA 1		X		=	
STA 2		X		=	

- C. Ecological Site • What is the ecological site? Use the ecological site determined earlier for this station or determine now.

STA 1 • Ecological Site Name _____ **STA 2** • Ecological Site Name _____

- D. Similarity Index (SI) • What is the SI for this site? Use SI calculated for the site, or it may be given. Enter below.

Station Number	76-100%	51-75%	26-50%	0-25%
STA 1				
STA 2				

- E. Carrying Capacity Calculation • What is the specific beef cattle carrying capacity for this Ecological Site with its Similarity Index?

From the Carrying Capacity Table, Part III, select the correct Available AUM/Acre for Ecological Site and its SI.

Station Number	Available AUM/Ac	X	Acres (given)	=	Total Available AUM's Capacity
STA 1		X		=	
STA 2		X		=	

- F. Forage Balance • Does the unit have enough forage to meet the livestock demand?

Animal Unit Months	STA 1	STA 2
Enter Total Required AUM Capacity (B)		
Enter Total Available AUM Capacity (E)		

	Check one	Check one
If (B) is larger, the capacity is too small		
If (B) = (E) the capacity is exactly right		
If (E) is larger, the capacity is larger than needed		

Enter the correct responses from above on the scorecard.

PART IV. BEEF CATTLE HABITAT APPRAISAL FORM

(Refer to SI Worksheet and flagged plant)

A. Forage Factors • Characteristics of forage that influence quality

1. Forage Conditions • How abundant are the preferred food producing plants based on similarity index?

The Similarity Index (SI) for the site reflects its value for cattle grazing.

Forage Condition %	Circle Correct Value	
	STA 1	STA 2
76-100%	40	40
51-75%	30	30
26-50%	5	5
0-25%	0	0

NOTE: Use your calculated Similarity Index to enter correct value.

2. Annual Production Factors • What is the annual production compared to normal average production?

Annual Production Factors %	STA 1	STA 2
81% or greater of normal	40	40
60-80% of normal	30	30
40-60% of normal	20	20
20-40% of normal	10	10
0-20% of normal	0	0

NOTE: Annual production should be given. Compare to the Average Production for the ecological site as found in Part IV of Similarity Index worksheets.

3. Forage Diversity • How diverse is the desirable food producing plant community (growth forms=grasses/grasslikes, forbs, shrubs)? Desirable growth forms represented on the site include:

Forage Diversity	STA 1	STA 2
all 3	40	40
2 of 3	30	30
1 of 3	20	20

4. Forage Utilization • How much weight has been removed from key (marked) plant?

Forage Utilization %	STA 1	STA 2
Slight – 1-20%	40	40
Moderate – 21-40%	40	40
Full – 41-60%	30	30
Close – 61-80%	20	20
Severe – 81% or greater	10	10

Enter lowest value of Forage Factors, 1, 2, 3, and 4 above _____

- B. Distribution Factors • Physical resource factors that limit the grazing animal
1. Forage Accessibility • What factors are present that limit the grazing animal?

Forage Accessibility %	Circle Correct Value	
	STA 1	STA 2
Slope less than 5%	40	40
Slope 5-10% and smooth	35	35
Slope 5-10% and rough with exposed rock*	25	25
Slope 11-15% and smooth	30	30
Slope 11-15% and rough with exposed rock*	15	15
Sloper greater than 15% and smooth	15	15
Slope greater than 15% and rough with exposed rock *	10	10
* Exposed surface rock = Rocks greater than 4" across occupy more than 5% of judging area.		

2. Grazing Restraint • How much shrubby canopy cover is there?

Grazing Restraint	Circle Correct Value	
	STA 1	STA 2
Shrubby canopy cover less than 20%	40	40
Shrubby canopy cover 21-40%	35	35
Shrubby canopy cover 41-60%	30	30
Shrubby canopy cover greater than 60%	25	25

3. Water • How far is water from the grazing site? (Given)

Water Distance	STA 1	STA 2
Distance less than 1/2 mile	40	40
Distance from 1/2 - 1 mile	35	35
Distance from 1 - 1 1/4 miles	30	30
Distance from 1 1/4 - 1 1/2 miles	20	20
Distance from 1 1/2 - 1 3/4 miles	15	15
Distance from 1 3/4 - 2 miles	10	10
Distance greater than 2 miles	0	0

Enter lowest value of Distribution Factors, 1, 2, and 3 above _____

- C. Rangeland Health Factors • Ecological characteristics that affect plant and soil health

1. Are Invasive Plants Present? (Use values from Similarity Index worksheet.)

Rangeland Health Factors	STA 1	STA 2
Rarely present in site (less than 10% of total plant composition)	40	40
Scattered throughout the site (10-50% of species composition)	20	20
Dominate the site (greater than 50% of species composition)	10	10

2. How much bare ground is present? (Compare present bare ground amounts to the reference value found in Part IV on Similarity Index worksheet).

Bare Ground %	STA 1	STA 2
Bare ground is what is expected for the site (within 5% of the reference).	40	40
Bare ground is moderately higher than expected (6-10% greater than reference).	25	25
Bare ground is much higher than expected (11% or greater than the reference).	15	15

3. How does the litter depth compare to the range of reference values? Litter depth should be clearly marked by flag. (See Part IV on Similarity Index worksheet for reference values).

Litter Depth	STA 1	STA 2
Litter Depth is what is expected for the ecological site.	40	40
Litter Depth is more than what is expected for the ecological site	10	10
Litter Depth is less than what is expected for the ecological site.	10	10

4. Erosion • Does the site show signs of erosion?

Signs of Erosion	STA 1	STA 2
No signs of erosion	40	40
Water flow patterns or litter movement	30	30
Rills are present on site	10	10
Plants are pedestalled or terracettes present	10	10
Active gullies are present on site	0	0

Enter lowest value of Rangeland Health Factors, 1, 2, 3, and 4 above _____

Overall Beef Cattle Habitat Evaluation • Enter values from factors as determined above in the boxes below. The factor(s) with the lowest value is your limiting factor.

STA 1

(A) Forage Factors	(B) Distribution Factors	(C) Rangeland Health Factors
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Overall Habitat Rating Value for Existing Conditions (Enter on Scorecard for STA 1) _____

STA 2

(A) Forage Factors	(B) Distribution Factors	(C) Rangeland Health Factors
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Overall Habitat Rating Value for Existing Conditions (Enter on Scorecard for STA 2) _____

PART V. PRAIRIE GROUSE HABITAT APPRAISAL FORM

(Refer to SI Worksheet and flagged plant)

A. Winter Components • Characteristics that influence winter survival.

1. Winter Escape Cover • How much of the area is occupied by shrubby cover (woody vegetation no taller than 15 feet)?

Winter Escape Cover %	Circle Correct Value	
	STA 1	STA 2
Patches of shrubby cover are greater than 51%	30	30
Patches of shrubby cover are 26-50%	40	40
Patches of shrubby cover are 6-25%	30	30
Patches of shrubby cover are 0-5%	20	20

2. Winter Roosting Cover • How much of the area is occupied by grass 8 inches or taller? Taller grasses are important for winter roosting. Judge live or standing dead grasses as though this is the end of the growing season.

Winter Roosting Cover %	Circle Correct Value	
	STA 1	STA 2
Grasses 8 inches or taller cover more than 51%	40	40
Grasses 8 inches or taller cover 26-50%	30	30
Grasses 8 inches or taller cover 0-25%	20	20

3. Winter Food • How much of area has desirable winter food potential? Many shrubs and trees, and all cropland have winter food potential. Use plant composition to estimate quantities of woody vegetation.

Winter Food	Circle Correct Value	
	STA 1	STA 2
Woody vegetation occupies 10% or more of the area, and with cropland within 1 mile	40	40
Woody vegetation occupies 10% or more of the area, but no cropland within 1 mile	30	30
Woody vegetation occupies 4-9% or more of the area, and with cropland within 1 mile	20	20
Woody vegetation occupies 4-9% or more of the area, but no cropland within 1 mile	15	15
Woody vegetation occupies 1-3% or more of the area, and with cropland within 1 mile	10	10
Woody vegetation occupies 1-3% or more of the area, but no cropland within 1 mile	5	5
No woody vegetation in area, and with cropland within 1 mile	5	5
No woody vegetation in area, and no cropland within 1 miles	0	0

Enter lowest value of Winter Components from 1, 2, and 3 above _____

B. Nesting Cover • Judge the vegetation as though this is the beginning of the nesting season.

1. Nesting Quality • How much nesting cover is there?

Tall- and mid-grass composition	Circle Correct Value	
	STA 1	STA 2
more than 60% of area	40	40
41-60% of area	30	30
21-40% of area	20	20
0-20% of area	10	10

2. Nesting Cover Height • How tall is the grouse nesting cover? Use flagged utilization plant.

Nesting Cover Height	Circle Correct Value	
	STA 1	STA 2
Grass is taller than 16 inches	40	40
Grass is 12 - 16 inches tall	30	30
Grass is 8 - 12 inches tall	20	20
Grass is 4 - 8 inches tall	5	5
Grass is less than 4 inches tall	0	0

Enter lowest value for Nesting Cover, 1 and 2 above _____

- C. Brood Food • Vegetation and soil characteristics which influence insect and spider abundance necessary for brood food. Grouse chicks rely heavily on insects and spiders, and to some extent on broadleaf plants, during this critical phase of their life cycle. Insect and spider abundance are influenced directly by vegetation, canopy, shading, and bare ground.

Brood Food	STA 1	STA 2
Vegetation is 10% or more broadleaf plants, and with >30% bare ground	40	40
Vegetation is <10% broadleaf plants, and with >20% bare ground	35	35
Vegetation is 10% or more broadleaf plants, and with 11-20% bare ground	30	30
Vegetation is <10% broadleaf plants, and with 11-20% bare ground	25	25
Vegetation is 10% or more broadleaf plants, and with 0-10% bare ground	20	20
Vegetation is <10% broadleaf plants, and with 0-10% bare ground	15	15

Enter value for Brood Food factor from above _____

- D. Brood Habitat • Vegetative Characteristics which influence protective cover and the ability of grouse to use the site.

1. Brood Protective Cover Quality • How much shrub (woody cover) is present?

Shrub canopy occupies	STA 1	STA 2
More than 10% of the area	30	30
From 6-10% of the area	40	40
From 1-5% of the area	25	25
No shrubs are present in area	15	15

2. Mobility/Accessibility • Exposed ground (not covered by live or dead plant material).

Mobility/Accessibility %	STA 1	STA 2
Exposed ground greater than 50%	5	5
Exposed ground 31-50%	20	20
Exposed ground 11-30%	40	40
Exposed ground 10% or less	20	20

Enter value for Brood Habitat factor from Above _____

E. Invasive Plants • Presence of invasive plants

1. Are invasive Plants Present?

Invasive Plants	Circle Correct Value	
	STA 1	STA 2
Rarely present in site (less than 10% of total plant composition)	40	40
Scattered across the site (10-50% of total plant composition)	20	20
Dominate or common throughout the site (greater than 50%)	10	10

Enter Invasive Plant Value _____

Overall Grouse Habitat Evaluation • Enter values from factors as determined above in the boxes below. The factor(s) with the lowest score is your limiting factor and Overall Habitat Rating.

STA 1

(A) Winter Components	(B) Nesting Cover	(C) Brood Food	(D) Brood Habitat	(E) Invasive Plants
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Overall Habitat Rating Value for Existing Conditions (Enter on Scorecard for STA 1) _____

STA 2

(A) Winter Components	(B) Nesting Cover	(C) Brood Food	(D) Brood Habitat	(E) Invasive Plants
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Overall Habitat Rating Value for Existing Conditions (Enter on Scorecard for STA 2) _____

PLANT CHARACTERISTICS AND RESOURCE RATING GUIDE

No.	Common Name	Scientific Name	ID Notes	Lifespan	Seasonality	Origin/Traits	Grouse Food	Grouse Cover	Cattle Food
GRASSES and GRASSLIKES (TALL)									
1	big or sand bluestem	<i>Andropogon spp.</i>		P	W	N	U	D	D
2	Canada wildrye	<i>Elymus canadensis</i>		P	C	N	U	D	D
3	crested wheatgrass	<i>Agropyron cristatum</i>		P	C	IN/IV	U	D	D
4	green needlegrass	<i>Nassella viridula</i>		P	C	N	D	D	D
5	green or yellow foxtail	<i>Setaria spp.</i>		A	W	IN/IV	D	D	U
6	Indiangrass	<i>Sorghastrum nutans</i>		P	W	N	U	D	D
7	little bluestem	<i>Schizachyrium scoparium</i>		P	W	N	U	D	D
8	needleandthread	<i>Hesperostipa comata</i>		P	C	N	D	D	D
9	plains muhly	<i>Muhlenbergia cuspidata</i>		P	W	N	U	D	D
10	porcupinegrass	<i>Hesperostipa spartea</i>		P	C	N	D	D	D
11	prairie cordgrass	<i>Spartina pectinata</i>		P	W	N	U	D	D
12	prairie dropseed	<i>Sporobolus heterolepis</i>		P	W	N	D	D	D
13	prairie junegrass	<i>Koeleria macrantha</i>		P	C	N	U	D	D
14	prairie sandreed	<i>Calamovilfa longifolia</i>		P	W	N	U	D	D
15	reed canarygrass	<i>Phalaris arundinacea</i>		P	C	N	U	D	D
16	sand or tall dropseed	<i>Sporobolus spp.</i>		P	W	N	U	D	U
17	sideoats grama	<i>Bouteloua curtipendula</i>		P	W	N	D	D	D
18	smooth brome	<i>Bromus inermis</i>		P	C	IN/IV	U	D	D
19	switchgrass	<i>Panicum virgatum</i>		P	W	N	D	D	D
20	threeawn	<i>Aristida spp.</i>		P	W	N	U	D	U
21	western wheatgrass	<i>Pascopyrum smithii</i>		P	C	N	U	D	D
GRASSES and GRASSLIKES (SHORT)									
22	annual brome	<i>Bromus spp.</i>		A	C	IN/IV	U	U	U
23	blue or hairy grama	<i>Bouteloua spp</i>		P	W	N	D	U	D
24	bluegrass	<i>Poa</i>		P	C	IN/IV	U	U	D
25	buffalograss	<i>Bouteloua dactyloides</i>		P	W	N	U	U	D
26	foxtail barley	<i>Hordeum jubatum</i>		P	C	N	U	U	U
27	inland saltgrass	<i>Distichlis spicata</i>		P	W	N	U	U	U
28	Scribner's panicgrass	<i>Dichanthelium spp.</i>		P	W	N	U	U	D
29	sedge	<i>Carex spp.</i>		P	C	N	D	D/U	D
30	witchgrass	<i>Panicum capillare</i>		A	W	N	D	U	U
FORBS									
31	absinth wormwood	<i>Artemisia absinthium</i>		P	W	IN/IV	U	D	U
32	alfalfa	<i>Medicago sativa</i>		P	C	IN/IV	D	D	D
33	American licorice	<i>Glycyrrhiza lepidota</i>	Legume	P	W	N	D	D	D
34	American vetch	<i>Vicia americana</i>	Legume	P	C	N	D	U	D
35	annual sunflower	<i>Helianthus annuus</i>		A	W	N	D	D	D
36	breadroot scurfpea	<i>Psoralea esculenta</i>	Legume	P	C	N	D	U	U
37	Canada thistle	<i>Cirsium arvense</i>		P	W	IN/IV	U	D	U
P = Perennial; A = Annual; B = Biennial C= Cool Season; W = Warm Season N = Native; IN = Introduced; IV= Invader D = Desirable; U = Undesirable									

No.	Common Name	Scientific Name	ID Notes	Lifespan	Seasonality	Origin/Traits	Grouse Food	Grouse Cover	Cattle Food
38	clover	<i>Trifolium spp.</i>		P	C	IN/IV	D	U	D
39	cocklebur	<i>Xanthium strumarium</i>		A	W	N	U	D	U
40	common mullein	<i>Verbascum thapsus</i>		B	W	IN/IV	U	D	U
41	common yarrow	<i>Achillea millefolium</i>		P	C	N	D	U	U
42	crazyweed	<i>Oxytropis spp.</i>		P	C	N	D	U	U
43	curlycup gumweed	<i>Grindelia squarrosa</i>		B	W	N	U	D	U
44	daisy fleabane	<i>Erigeron strigosus</i>		B	C	N	D	D	U
45	deathcamus	<i>Zigadenus spp.</i>		P	C	N	U	U	U
46	deervetch	<i>Lotus unifoliolatus</i>		A	W	N	D	D	U
47	false boneset	<i>Brickellia eupatorioides</i>		P	W	N	D	D	D
48	false gromwell	<i>Onosmodium bejariense</i>		P	W	N	D	D	U
49	field bindweed	<i>Convolvulus arvensis</i>		P	W	IN/IV	D	U	D
50	gayfeather	<i>Liatris spp.</i>		P	W	N	D	D	D
51	goldenrod	<i>Solidago spp.</i>		P	W	N	D	D	U
52	hairy goldaster	<i>Heterotheca villosa</i>		P	W	N	D	U	U
53	heath aster	<i>Symphyotrichum ericoides</i>		P	W	N	D	D	U
54	horseweed	<i>Conyza canadensis</i>		A	W	N	U	U	U
55	leafy spurge	<i>Euphorbia esula</i>		P	W	IN/IV	D	D	U
56	Maximilian sunflower	<i>Helianthus maximiliani</i>		P	W	N	D	D	D
57	milkvetch	<i>Astragalus spp.</i>		P	C	N	D	U	D
58	milkweed	<i>Asclepias spp.</i>		P	W	N	U	U	U
59	penstemon	<i>Penstemon spp.</i>		P	W	N	D	U	D
60	phlox	<i>Phlox spp.</i>		P	C	N	U	U	U
61	poison hemlock	<i>Conium maculatum</i>		P	W	IN/IV	U	D	U
62	prairie clover	<i>Dalea spp.</i>	Legume	P	W	N	D	D	D
63	prairie coneflower	<i>Ratibida columnifera</i>		P	W	N	D	D	D
64	prickly pear	<i>Opuntia spp.</i>		P	W	N	U	U	U
65	purple coneflower	<i>Echinacea purpurea</i>		P	W	N	D	D	D
66	ragwort	<i>Senecio spp.</i>		P	C	N	U	U	U
67	rush skeletonplant	<i>Chondrilla juncea</i>		P	W	N	U	U	U
68	sagewort	<i>Artemisia spp.</i>		P	W	N	D	D	U
69	salsify	<i>Tragopogon dubius</i>		B	W	IN/IV	U	U	D
70	scarlet gaura	<i>Gaura coccinea</i>		P	W	N	U	U	U
71	scarlet globemallow	<i>Sphaeralcea coccinea</i>		P	W	N	D	U	U
72	scurfpea	<i>Psoralegium spp.</i>	Legume	P	W	N	D	D	U
73	sensitive briar	<i>Mimosa nuttallii</i>		P	W	N	D	D	D
74	spiderwort	<i>Tradescantia spp.</i>		P	W	N	D	U	D
75	stiff sunflower	<i>Helianthus pauciflorus</i>		B	W	N	D	U	D
76	sweetclover	<i>Melilotus officinalis</i>		B	C	IN/IV	D	D	D
77	wavyleaf thistle	<i>Cirsium undulatum</i>		P	W	N	U	U	U

P = Perennial; A = Annual; B = Biennial
 C= Cool Season; W = Warm Season
 N = Native; IN = Introduced; IV= Invader
 D = Desirable; U = Undesirable

No.	Common Name	Scientific Name	ID Notes	Lifespan	Seasonality	Origin/Traits	Grouse Food	Grouse Cover	Cattle Food
78	western ragweed	<i>Ambrosia psilostachya</i>		P	W	N	D	D	U
79	western wallflower	<i>Erysimum asperum</i>		B	W	N	U	U	U
80	wild onion	<i>Allium ascalonicum</i>		P	W	N	D	U	D
81	woolly verbena	<i>Verbena stricta</i>		P	W	N	D	D	U
SHRUBS									
82	broom snakeweed	<i>Gutierrezia sarothrae</i>		P	W	N	U	D	U
83	chokecherry	<i>Prunus virginiana</i>		P	W	N	D	D	U
84	leadplant	<i>Amorpha canescens</i>		P	W	N	D	D	D
85	poison ivy	<i>Toxicodendron radicans</i>		P	W	N	U	D	D
86	rubber rabbitbrush	<i>Ericameria nauseosa</i>		P	W	N	U	D	U
87	sagebrush	<i>Artemisia spp.</i>		P	W	N	D	D	U
88	saltbush	<i>Atriplex spp.</i>		P	W	N	D	D	D
89	sandcherry	<i>Prunus pumila</i>		P	W	N	D	D	U
90	silver buffaloberry	<i>Shepherdia argentea</i>		P	W	N	D	D	U
91	skunkbrush	<i>Rhus aromatica</i>		P	W	N	D	D	U
92	smooth sumac	<i>Rhus glabra</i>		P	W	N	D	D	U
93	western snowberry	<i>Symphor. occidentalis</i>		P	W	N	D	D	U
94	wild plum	<i>Prunus americana</i>		P	W	N	D	D	U
95	wild rose	<i>Rosa spp.</i>		P	W	N	D	D	D
96	willow	<i>Salix spp.</i>		P	W	N	D	D	D
97	yucca	<i>Yucca glauca</i>		P	C	N	U	D	D
TREES									
98	American elm	<i>Ulmus americana</i>		P	W	N	D	D	D
99	bur oak	<i>Quercus macrocarpa</i>		P	W	N	D	D	D
100	green ash	<i>Fraxinus pennsylvanica</i>		P	W	N	D	D	U
101	juniper or cedar	<i>Juniperus spp.</i>		P	W	N/IV	D	D	U
102	plains cottonwood	<i>Populus deltoides</i>		P	W	N	D	D	U
103	ponderosa pine	<i>Pinus ponderosa</i>		P	W	N/IV	D	D	U
104	Russian olive	<i>Elaeagnus angustifolia</i>		P	W	IN/IV	D	D	U
105	saltcedar	<i>Tamarix spp.</i>		P	W	IN/IV	U	U	U
P = Perennial; A = Annual; B = Biennial C = Cool Season; W = Warm Season N = Native; IN = Introduced; IV = Invader D = Desirable; U = Undesirable									

GLOSSARY OF TERMS

Animal Unit (AU) — one mature cow of approximately 1000 pounds with a calf up to weaning, usually at 6 months of age.

Animal Unit Month (AUM) — The amount of forage required by one animal unit for one month (forage demand)

Abiotic component — Basic inorganic and organic compounds of the environment.

Annual plant — A plant that completes its life cycle in one year.

Annual production — the amount of aboveground plant material (forage) produced in one growing season

Bare ground — exposed soil not covered by vegetation (live or dead material), gravel, rock, visible biological crusts, or litter; also known as bare soil

Biennial Plant — Life cycle completed in two years.

Biotic component — Living organisms.

Biological diversity — The richness, abundance, and variability of the native plant and animal species and communities and the ecological processes that link them with one another and with soil, air and water. Human quality of life and survival depend on the conservation of biological diversity.

Broadleaf plant — a plant with wide leaves, and net venation (as opposed to parallel venation like a grass leaf). These are also known as forbs.

Bunchgrass — grass with a characteristic growth habit, forming a bunch or tuft, as in crested wheatgrass

Carrying capacity — the maximum stocking rate possible without causing long-term damage to the vegetation or related range resources

Common name — The locally accepted terminology for a specific plant of a certain region

Cool season plant — plant that makes most of its growth and flowers during spring and early summer and then slows growth or becomes dormant during the hot part of summer, and may resume growth in the fall with the advent of cool temperatures

Desirable — Provides positive functions and values throughout most of its life cycle.

Ecological principle — Recognitions of the mutual relationships among organisms and between the organisms and their environment.

Ecological site — a distinctive kind of land with specific physical characteristics. It differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.

Ecosystem — The basic functional unit in ecology, it includes both organisms (biotic community) and abiotic environment, each influencing the properties of the other. Both are necessary for maintenance of life as we have it on the earth.

Energy flow — Movement of energy from one trophic level (e.g. green plants) to another (e.g. white-tailed deer).

Erosion — involves the breakdown, detachment, transport, and redistribution of soil particles by forces of water, wind, or gravity

Fauna — animal life of a specified area

Flora — plant life of a specified area

Forb — A herbaceous plant that has broad leaves. Flowers are usually large, colored, and showy.

Graminoid — A grasslike herbaceous plant that resembles grass but generally has solid stems without elongated internodes. Leaf veins are parallel, but the leaves are three-ranked. Stems are often triangular, and the flowers are small and inconspicuous.

Grass — A herbaceous plant that has both hollow and solid stems with nodes. Leaves are two-ranked and have parallel veins, which are typical of monocots. Flowers are small and inconspicuous.

Ground cover — percentage of bare ground versus ground covered with litter

Gully — a large, deep watercourse in the soil that would be difficult to drive across in a vehicle.

Habitat appraisal forms — A systematic approach to evaluating habitat.

Introduced plant — not a part of the original fauna or flora of the area in question, generally from a different continent. Some introduced plants are grown for pasture or hayland.

Invasive plant — a plant species that was absent in undisturbed portions of the original vegetation of a specific range site but which will invade and increase following disturbance or continued heavy grazing. Some invader plants can enter a site that has not been disturbed. Synonym: invader

Landscape — An expanse of land that can be viewed from one vantage point.

Land stewardship — Taking care of the land including all of its components; soil, plants, animals, water and air.

Limiting factor — The habitat component that limits the population from becoming larger.

Litter — the top layer of plant residue on the soil surface, typically detached from the plant

Litter depth – the amount of litter on the soil surface

Mid-grass – Generally plants one to three feet tall at maturity.

Native plant – plant that is part of the original fauna or flora of an area, generally meaning from the same continent

Nutrient cycling – The movement of nutrients through biotic and abiotic components of the ecosystem.

Pedestalled plants – plants that appear elevated as a result of soil loss by wind or water erosion

Perennial plant – A plant that lives for more than one year.

Planned grazing system – Any grazing routine that includes a detailed plan for moving cattle from one pasture to another that includes proper stocking rate, rest periods, and recovery for plants.

Plant community – An assemblage of plants.

Prescribed grazing – Animals grazing under a prescribed stocking rate, density (for rotational grazing) and time interval.

Recovery period – time frame where no grazing animals are present in the grazing unit (e.g., time between grazing events) to allow for adequate plant regrowth

Rest – when a grazing unit is not utilized for an extended period of time (generally a year or longer) to allow for improvement in rangeland health

Rhizome – creeping underground stem, which can produce shoots and roots at the nodes, giving rise to new plants

Rill – very small watercourse with steep sides, usually only a few centimeters or inches deep. They are typically linear erosional features that run parallel with the slope

Ruminant – A mammal with a compartmentalized stomach (more than one compartment) such as bison or cattle.

Similarity Index (SI) – expression of the kinds and proportions of vegetation present in relation to the native vegetation the site is capable of producing (or reference state).

Shrub – A woody plant with secondary growth originating from aerial stems which live throughout the year, although they may be dormant part of the time. Leaves are often broad and net veined. Flowers are sometimes showy.

Scientific name – A name used by scientists, especially the taxonomic name of an organism that consists of a genus name and a specific epithet

Stocking rate – the number of livestock utilizing a unit of land for a specific period of time

Stock density – the total pounds of animals per a given area (e.g. 10,000 lbs./ac)

Tall-grass – Generally, plants more than three feet tall at maturity.

Terracettes – “benches” of soil deposition (may include litter or gravel) that form behind or between obstacles (including plant bases or rocks) caused by water movement.

Warm season plant – plant which makes most or all its growth during the late spring and summer, flowering in the summer or autumn.

Water flow patterns – paths that water take to move across the soil surface during periods of high precipitation events. Sometimes referred to sheet flow or overland flow. In SD grasslands, water flow patterns are typically not easily found, unless the site is extremely degraded or the site is on a very steep hillside.

Undesirable – May provide short-term functions and values, but overall, not a plant suited for the intended purpose.



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Management Scenario

Station # _____

_____ cow/calf pairs

_____ yearlings

_____ bulls

_____ months of grazing

_____ acres of pasture

_____ lbs/ac Annual Production

_____ miles to nearest water

_____ miles to nearest cropland

BEEF GOAL _____

GROUSE GOAL _____

Slope stakes are _____ feet apart

SOUTH DAKOTA RANGELAND JUDGING SCORECARD

Resource Inventory, Present Conditions

Part I	Ecological Sites	Station No.	
		1	2
15 pts.	Subirrigated		
	Overflow		
	Sands		
	Sandy		
	Loamy		
	Clayey		
	Dense Clay		
	Thin Upland		
	Shallow		
	Claypan		

Part II	Similarity Index	Station No.	
		1	2
10 pts	76-100% Potential		
	51-75% potential		
	26-50% potential		
	0-25% potential		

Part III	Beef Cattle Carrying Capacity	Station No.	
		1	2
10 pts	Capacity is Too Small		
	Capacity is Exactly Right		
	Capacity is Larger Than Needed		

Part IV	Beef Cattle Habitat Inventory	Station No.	
		1	2
10 pts	Excellent Value (31-40)		
	Good Value (21-30)		
	Fair Value (11-20)		
	Poor value (<11)		
3 pts each	Beef Cattle Limiting Factors		
	Forage Factor is Limiting		
	Distribution Factor is Limiting		
	Rangeland Health Factor is Limiting		

Part V	Prairie Grouse Habitat Inventory	Station No.	
		1	2
10 pts	Excellent Value (31-40)		
	Good Value (21-30)		
	Fair Value (11-20)		
	Poor value (<11)		
3 pts each	Prairie Grouse Limiting Factors		
	Winter Components Are Limiting		
	Nesting Cover is Limiting		
	Brood Food is Limiting		
	Brood Habitat is Limiting		
	Invasive Species		

Contestant Name _____

Contestant Number _____

County or School _____

Team Number or Name _____

Score: Station 1 _____/118

Station 2 _____/118

Total: _____/236

Part VI	Needed Management Practices	Station No.	
		1	2
3 pts each	1. Apply Invader Plant Control for Integrity of the Site		
	2. Continue Present Management for Beef		
	3. Apply Woody Plant Control for Beef Cattle		
	4. Develop Water for Beef Cattle		
	5. Begin a Planned Grazing System		
	6. Change Livestock Numbers or Duration of Grazing Period		
	7. Change the Kind of Grazing/ Browsing Animal		
	8. Continue Present Management for Prairie Grouse		
	9. Improve Winter Food or Cover for Prairie Grouse		
	10. Improve Nesting Cover Quality for Prairie Grouse		
	11. Improve Nesting Cover Height for Prairie Grouse		
	12. Improve Brood Food for Prairie Grouse Chicks		
	13. Improve Brood Habitat		

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SOUTH DAKOTA RANGELAND JUDGING SCORECARD

Resource Inventory, Present Conditions

Part I	Ecological Sites	Station No. 1
15 pts.	Subirrigated	
	Overflow	
	Sands	
	Sandy	
	Loamy	
	Clayey	
	Dense Clay	
	Thin Upland	
	Shallow	
	Claypan	

Part II	Similarity Index	Station No. 1
10 pts	76-100% Potential	
	51-75% potential	
	26-50% potential	
	0-25% potential	

Part III	Beef Cattle Carrying Capacity	Station No. 1
10 pts	Capacity is Too Small	
	Capacity is Exactly Right	
	Capacity is Larger Than Needed	

Part IV	Beef Cattle Habitat Inventory	Station No. 1
10 pts	Excellent Value (31-40)	
	Good Value (21-30)	
	Fair Value (11-20)	
	Poor value (<11)	
3 pts each	Beef Cattle Limiting Factors	
	Forage Factor is Limiting	
	Distribution Factor is Limiting	
	Rangeland Health Factor is Limiting	

Part V	Prairie Grouse Habitat Inventory	Station No. 1
10 pts	Excellent Value (31-40)	
	Good Value (21-30)	
	Fair Value (11-20)	
	Poor value (<11)	
3 pts each	Prairie Grouse Limiting Factors	
	Winter Components Are Limiting	
	Nesting Cover is Limiting	
	Brood Food is Limiting	
	Brood Habitat is Limiting	
	Invasive Species	

Contestant Name _____

Contestant Number _____

County or School _____

Team Number or Name _____

Score: Station 1 _____/118

Total: _____/118

Part VI	Needed Management Practices	Station No. 1
3 pts each	1. Apply Invader Plant Control for Integrity of the Site	
	2. Continue Present Management for Beef	
	3. Apply Woody Plant Control for Beef Cattle	
	4. Develop Water for Beef Cattle	
	5. Begin a Planned Grazing System	
	6. Change Livestock Numbers or Duration of Grazing Period	
	7. Change the Kind of Grazing/Browsing Animal	
	8. Continue Present Management for Prairie Grouse	
	9. Improve Winter Food or Cover for Prairie Grouse	
	10. Improve Nesting Cover Quality for Prairie Grouse	
	11. Improve Nesting Cover Height for Prairie Grouse	
	12. Improve Brood Food for Prairie Grouse Chicks	
	13. Improve Brood Habitat	

_____/79

_____/39

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SOUTH DAKOTA RANGELAND JUDGING SCORECARD

Resource Inventory, Present Conditions

Part I	Ecological Sites	Station No. 2
15 pts.	Subirrigated	
	Overflow	
	Sands	
	Sandy	
	Loamy	
	Clayey	
	Dense Clay	
	Thin Upland	
	Shallow	
	Claypan	

Part II	Similarity Index	Station No. 2
10 pts	76-100% Potential	
	51-75% potential	
	26-50% potential	
	0-25% potential	

Part III	Beef Cattle Carrying Capacity	Station No. 2
10 pts	Capacity is Too Small	
	Capacity is Exactly Right	
	Capacity is Larger Than Needed	

Part IV	Beef Cattle Habitat Inventory	Station No. 2
10 pts	Excellent Value (31-40)	
	Good Value (21-30)	
	Fair Value (11-20)	
	Poor value (<11)	
3 pts each	Beef Cattle Limiting Factors	
	Forage Factor is Limiting	
	Distribution Factor is Limiting	
	Rangeland Health Factor is Limiting	

Part V	Prairie Grouse Habitat Inventory	Station No. 2
10 pts	Excellent Value (31-40)	
	Good Value (21-30)	
	Fair Value (11-20)	
	Poor value (<11)	
3 pts each	Prairie Grouse Limiting Factors	
	Winter Components Are Limiting	
	Nesting Cover is Limiting	
	Brood Food is Limiting	
	Brood Habitat is Limiting	
	Invasive Species	

Contestant Name _____

Contestant Number _____

County or School _____

Team Number or Name _____

Score: Station 2 _____/118

Total: _____/118

Part VI	Needed Management Practices	Station No. 2
3 pts each	1. Apply Invader Plant Control for Integrity of the Site	
	2. Continue Present Management for Beef	
	3. Apply Woody Plant Control for Beef Cattle	
	4. Develop Water for Beef Cattle	
	5. Begin a Planned Grazing System	
	6. Change Livestock Numbers or Duration of Grazing Period	
	7. Change the Kind of Grazing/Browsing Animal	
	8. Continue Present Management for Prairie Grouse	
	9. Improve Winter Food or Cover for Prairie Grouse	
	10. Improve Nesting Cover Quality for Prairie Grouse	
	11. Improve Nesting Cover Height for Prairie Grouse	
	12. Improve Brood Food for Prairie Grouse Chicks	
	13. Improve Brood Habitat	

_____/79

_____/39

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Contestant Name _____ Contestant Number _____ School/County _____

Score: _____/400

Grasses and Grasslike (Mid and Tall)

1. big or sand bluestem
2. Canada wildrye
3. crested wheatgrass
4. green needlegrass
5. green or yellow foxtail
6. Indiangrass
7. little bluestem
8. needleandthread
9. plains muhly
10. porcupinegrass
11. prairie cordgrass
12. prairie dropseed
13. prairie junegrass
14. prairie sandreed
15. reed canarygrass
16. sand or tall dropseed
17. sideoats grama
18. smooth brome
19. switchgrass
20. threeawn
21. western wheatgrass

Grasses and Grasslikes (short)

22. annual brome
23. blue or hairy grama
24. bluegrass
25. buffalograss
26. foxtail barley
27. inland saltgrass
28. scribner's panicgrass
29. sedge
30. witchgrass

Forbs

31. absinth wormwood
32. alfalfa
33. American licorice
34. American vetch
35. annual sunflower
36. breadroot scurfpea
37. Canada thistle
38. clover
39. cocklebur
40. common mullein
41. common yarrow
42. crazyweed
43. curlycup gumweed
44. daisy fleabane
45. deathcamus
46. deervetch
47. false boneset
48. false gromwell
49. field bindweed
50. gayfeather
51. goldenrod

52. hairy goldaster
53. heath aster
54. horseweed
55. leafy spurge
56. Maximilian sunflower
57. milkvetch
58. milkweed
59. penstemon
60. phlox
61. poison hemlock
62. prairie clover
63. prairie coneflower
64. prickly pear
65. purple coneflower
66. ragwort
67. rush skeletonplant
68. sagewort
69. salsify
70. scarlet gaura
71. scarlet globemallow
72. scurfpea
73. sensitive briar
74. spiderwort
75. stiff sunflower
76. sweetclover
77. wavyleaf thistle
78. western ragweed
79. western wallflower
80. wild onion
81. woolly verbena

Shrubs

82. broom snakeweed
83. chokecherry
84. leadplant
85. poison ivy
86. rubber rabbitbrush
87. sagebrush
88. saltbush
89. sandcherry
90. silver buffaloberry
91. skunkbrush
92. smooth sumac
93. western snowberry
94. wild plum
95. wild rose
96. willow
97. yucca

Trees

98. American elm
99. bur oak
100. green ash
101. juniper or cedar
102. plains cottonwood
103. ponderosa pine
104. Russian olive
105. saltcedar

Flag #	Plant #	PLANT CHARACTERISTICS								Prairie Grouse		Cattle	
		Life Span			Growth Season		Origin			Food		Cover	
		Peren-nial	Biennial	Annual	Cool Season	Warm Season	Native	Intro-duced	Invader	De	Un	De	Un
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
ECOLOGICAL and RESOURCE RATING: Desirable = De; Undesirable = Un													

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Appendix

Rangeland Health

Written by: Mitch Faulker, NRCS Area Rangeland Management Specialist
With assistance from: Dave Ollila, SD Soil Health Coalition Soil Health Specialist

Overview and Definition

Rangelands are a type of land where the plant cover is predominately grasses, forbs, shrubs, or dispersed trees. Rangelands are uncultivated and often still retain the attributes of the native historic plant communities (before non-native plants, animals, and other disturbances were introduced to or removed from the landscape). Rangelands are grasslands, shrublands, wetlands, sparse woodlands, and deserts. In many cases the rangelands we find today are the lands that are too dry, shallow, steep, and rocky to be farmed.

Rangeland Health is a standardized and broadly agreed-to way of assessing the “health” of rangelands. Rangeland health concepts are the basis for rangeland assessment in North America and are universally agreed to. This assessment evaluates how ecological processes such as energy capture and flow, nutrient cycling, and water cycling are functioning. It considers the kinds and amounts of plants on a site and evaluates the conditions of the soils. Assessing rangelands is not the same as monitoring. It is a point and time evaluation and does not diagnose if there is a problem or what the problem might be. Understanding rangeland health concepts is helpful for a land manager to continuously evaluate rangeland and make management decisions. Three general attributes are evaluated for rangeland health:

- Soils: Identifying if there is or there has been erosion and/or loss of soil, soil nutrients, or soil organic matter. This relates to the condition of the soil.
- Hydrology: Evaluating how well an area captures, stores and releases water that occurs from rainfall, snowmelt, etc. It is basically how water moves through a landscape.
- Biotic: Determines if the plant types in an area can support the basic ecological processes like energy flow, and nutrient cycling. It relates to the kind and amount of plants found on a rangeland ecological site.

These attributes are evaluated by comparing the existing conditions observed on the ground to what has been determined to be the “Reference State or Condition”. The Reference State is the state or condition of a rangeland area where soils, hydrology, and biotic components are functioning in a resilient way that is resistant to disturbance and is usually a state where the ecological processes are functioning at a high level with grassland plants producing at or near their potential. Resilience for rangelands means that if a rangeland site experiences a disturbance it can return to its original form in a short time (such as drought, heavy grazing, fire, flood, grasshopper outbreaks, etc., on their own or in combination).

We do not evaluate each attribute at once, but instead look at multiple very specific indicators on the land scape that relate to one or more of the attributes. Today we are going to focus on a select group of indicators that are most relatable to us in South Dakota.

Why are Rangelands Important?

Rangelands are important because about 47% of the world's land is rangeland! In the United States about 30% of the land cover is rangeland. Most of that land cover in the United States is generally considered to exist in the western U.S. and parts of Florida and Louisiana. In South Dakota about half of the state is rangeland, with most of that land concentrated in the western part of the State. About 65% of the rangeland in the United States are privately owned, with most of the rest in public ownership such as BLM, Forest Service, state lands, National Park Service, etc.

With such a large amount of land occupied by rangeland in South Dakota, these lands are an important natural resource for our state. Rangelands are enormously important to South Dakota's economy and are the life blood that support many of our communities by way of cattle, sheep, and bison ranches. In addition, our vast expanses of rangelands and ranching communities help form the foundation for our unique culture in western South Dakota. It is important that our rangelands are productive and resilient.

- A 2012 study indicates that beef industry in South Dakota provided a \$4.48 billion impact on the state's economy.
- The state supports about 4,000,000 head of beef cattle (5th nationally).

- South Dakota ranks as about the 6th largest producer of lamb and wool in the United States.
- Buffalo ranching is an important and growing part of South Dakota's rangeland livestock production economy.
- Hunting and recreation is a major part of South Dakota's economy. Valued wildlife species rely on rangeland such as deer, elk, antelope, grouse, turkey, and fur bearing animals to name a few. Numerous fish rely on habitats created in streams, rivers, and ponds that wind their way across the drainage basins of South Dakota and the western U.S.

What do Rangelands Do?

Rangelands are considered a multiple use land type. Rangelands are managed for, and in rhythm with, their natural and diverse characteristics.

- Recreation (hunting, hiking, fishing, biking, etc.)
- Livestock grazing
- Wildlife habitat
- Renewable energy
- Mineral and non-renewable energy production
- Contributes to clean water yield
- Historical, spiritual, and aesthetic values
- Biodiversity



How do we Assess Rangeland Health?

Step 1. Find a spot to assess your rangeland. This can be done in a couple of ways that will make the information you collect more useful. The first is to select a spot that is representative of the broader area you are working in. Commonly these areas are usually fairly level or rolling, not too far from livestock water, and visually appear similar to larger areas of the pasture (soil type, types of plants, productivity, etc.). The other way is to pick a specific area you have an interest in. This might be a problem area in the past where management has been or is being changed to improve the resource conditions at that spot.

Step 2. Determine the type of ecological site that you are on. There are a variety of different rangeland soil types on rangelands. Each ecological site has different soil characteristics and types of plants and amounts of plants that could grow on them, so therefore the soil, hydrologic, and biotic indicators can have different potentials. **IMPORTANT:** When we assess rangelands we need a reference to know what we should compare the site to (compare to potential). The USDA Natural Resources Conservation Service develops and maintains the documents that are used as a comparison. Soils and ecological site information is organized by your Major Land Resource Area (MLRA), which are different soil area based on the geology, climate, and land use of a broader area.

1. Dig a hole to a depth of 20 inches if possible (there might be a natural restricting layer).
2. Refer to the ecological site key provided to determine what ecological site best describes the soils where the hole you dug is located.
3. You can use the Web Soil Survey to predict what ecological sites are in the area you are interested in and where different ecological sites might be located.

Step 3. Assess the rangeland health indicators visually on the ground. For this process it is common to use an area of about 1/10th of an acre in size if possible (or about the length and width of a football field from the goal line to the 10-yard line). Try to stay on the same ecological site you determined when you dug the hole to determine your site. Nationally there are 17 rangeland indicators that are assessed for rangeland health. For our purposes we are going to learn about 5 indicators that are important and can be easily applied in western South Dakota. We need 3 things beside our ecological site key. The first is an ecological site “reference worksheet” for the ecological sites we are assessing. This tells us what conditions to expect for each indicator within the Reference State. We also need a “matrix” that helps the user to determine how far the site they are looking at has departed from the Reference State. Finally, we need an “evaluation form” to keep track of how we rated each indicator. The indicators are each rated from “none to slight” departure clear to a “high or extreme departure” using these tools. None to slight departure means that the indicator for the site is very close to the reference state (really good condition and all of the natural processes like energy flow, water cycling, nutrient cycling, etc. are plugging along at full speed). High or extreme departure means the indicator no longer resembles how it is expected to be in the reference condition in any way (usually a poor condition situation). Keep in mind every ecological site is different, and some sites might have more obvious rangeland health indicators showing up based on their natural slope, soil depth and or texture, soil chemistry, etc.

Indicator 1. Annual Plant Production

Plant production is the total amount of production that an ecological site produces during the growing season (usually April through September). Annual production is related to the biotic attribute of the ecological site. Total production is usually the highest at the early part of July in western South Dakota. Plant production on an ecological site reflects how well energy is being captured and converted on an ecological site (energy flow). There are many ways to measure plant productivity, however we are going to use a grazing stick to determine productivity.

Rangeland Production Using the Grazing Stick

Grass Heights- 20 Plants			
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

To calculate production (lbs/acre)

↓

$$\text{Average Grass Ht. (Inches)} \times \text{Stand Density}^* = \text{_____ lbs/acre}$$

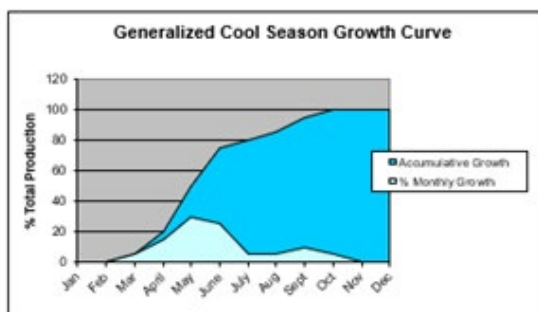
See the instructions on the South Dakota Grazing Stick for more information, especially how to measure plants and determining stand densities.

Annual Plant Production: Departure from Expected

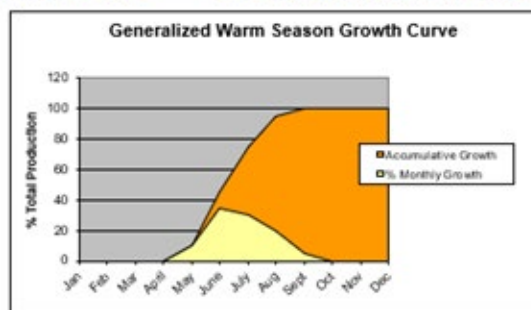
High level of departure	Moderate level of departure	None or slight level of departure
Less than 40% of potential production	40-80% of potential production	Exceeds 80% of potential production- See reference sheet.

It is best to do this in the middle of summer when we have accumulated total plant growth. A “reconstruction” can be done by dividing the pounds per acre determined from the grazing stick by the % of growth completed so far if it is earlier than early to mid-July. Likewise, if plant productivity is currently limited by drought, a percent of normal production can be calculated next by dividing the pounds per acre determined from the grazing stick by the % of normal productivity that occurred that year*. In addition, NRCS rangeland health reference worksheets include a range of production for productivity, including lows expected in dry years and highs expected during wet years.

Generalized Growth	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Growth Curve (Cool Season Grasses)	0	0	5	15	30	25	5	5	10	5	0	0
Accumulative Cool Season	0	0	5	20	50	75	80	85	95	100	100	100



Generalized Growth	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Growth Curve (Warm Season Grasses)	0	0	0	0	10	35	30	20	5	0	0	0
Accumulative Warm Season	0	0	0	0	10	45	75	95	100	100	100	100



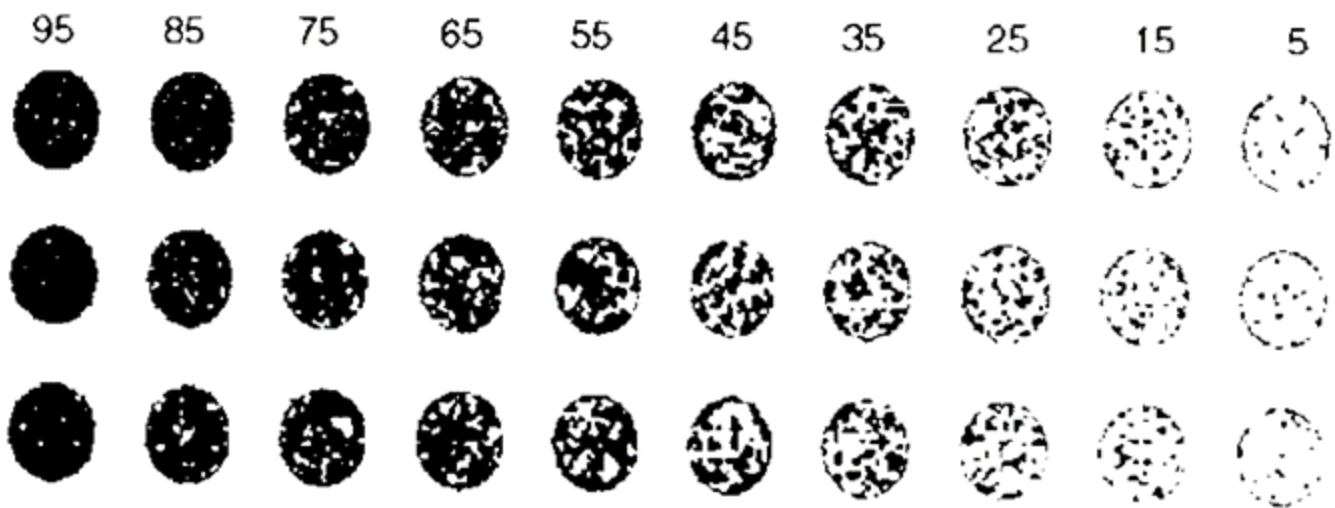
Indicator 2. Ground Cover (i.e. Bare Ground)

R, there should be less than 5% bare ground on most ecological sites in western South Dakota. Recent weather can cause bare ground to change temporarily. Bare ground is related to the soil and hydrologic attributes.

Bare Ground: Departure from Expected

High level of departure	Moderate level of departure	None or slight level of departure
Much higher than expected. Bare ground patches are large and frequently connected. There is more bare ground than ground cover.	Moderately higher than expected. Bare ground patches seem bigger than normal in size and are sporadically connected.	Bare ground as expected or only small rarely connected patches of bare ground- See reference sheet.

Ground cover can be estimated visually by walking around the site using a cover guide such as the one below, or can be done by using a "flag pin" where a line is walked and the flag pin is dropped every few feet. We then record if the pin hit ground cover, or bare ground. The number of times the pin hit ground cover is then divided by the total number of times you dropped the pin.



Guide for visually estimating cover



An example of a high percentage of bare ground.

Indicator 3. Litter Amount

The amount of litter (dead plant material that is generally lying on the soil surface) is important to moderate the climate at the soil surface (keep conditions cooler and limit evaporation) and helps dissipate the energy produced by, and aid in infiltration of water flowing along the soil surface. Plant litter also help protect the soil surface from wind erosion. The amount of litter at the soil surface can vary significantly. In some cases there can be too much litter on the soil surface, which creates an excessively cool and shady environment that can limit plant growth or encourage invasion by exotic plant species like Kentucky bluegrass. This is especially found on areas that have not been grazed for long periods of time (several years) and/or have had long term absence of fire that can consume the litter layer. Litter amount is related to both the hydrologic and biotic attributes.



Ungrazed area of a pasture with excessive litter that limits plant growth and production. The area has become dominated by Kentucky bluegrass and has lost its natural biodiversity.



Area devoid of dead plant litter. The soil surface on this site is not protected from erosion and high temperatures.

Litter Amount: Departure from Expected

High Level of Departure	Moderate Level of Departure	None or Slight Level of Departure
Litter is largely absent compared to site potential and weather. It is difficult to find litter on the soil surface anywhere. Or Litter is so excessive plants have difficulty growing through the litter layer.	Greatly reduced relative to site potential and weather. There are areas of litter on the soil surface, but it is very thin or there are large spots absent of litter. Or heavy litter is apparent in some areas that limits plant growth.	Amount is what is expected for the site potential and weather - See Reference sheet.

Indicator 4. Soil Surface Resistance to Erosion

This indicator is related to all three of the attributes (soils, hydrologic, and biotic). It relates specifically to how stable the soils are near the soil surface. This can be a good indicator of how much organic matter is in the soil and the nature of the soil structure there. Soils are bound together by organic matter to create “aggregates” of soil that stick together. This makes the soil stable when it gets wet from rain or snow melt, so the soil particles stick together. Soils with poor surface resistance to erosion tend to break into fine particles when wetted or hit by a raindrop (the soil surface explodes into tiny particles in these cases). The soil then is carried off site by overland water flow. Soils with high resistance to erosion also typically have good soil structure which helps water to be infiltrated and held, instead of flowing across the soils surface which can increase soil erosion.

Soil Surface Resistance to Erosion: Departure from Expected

High Level of Departure	Moderate Level of Departure	None or Slight Level of Departure
Highly reduced throughout the site. All or almost all samples or plant interspace areas have very little soil stability (Ms and or Ds).	Moderately reduced compared to potential. About half of plant interspace areas or samples have limited soil stability Ms and or Ds).	Soil stability as expected for the site. See Reference Sheet.



Using a large sized bottlecap filled with water, collect a small “ped” of soil from the soil surface at a random location and carefully place it in the water. Watch the soil ped for 30 seconds. Then gently swirl the water in the bottle cap for 5 seconds. The soil stability and soil surface resistance to erosion can be graded as follows:

M = Melts in 30 seconds without swirling (unstable)

D = Disintegrates when swirls (but did not melt (somewhat stable)

S = Stable (even after swirling)

Note* Use distilled water when possible

Assessing Soil Surface Resistance to Erosion and soil stability in the field

Additional Field Tests:

Soil aggregate stability (how well soils hold together when wetted) is important for minimizing soil erosion and harvesting as much water as possible from rain or snowmelt. A ring infiltration test can help us understand how well our soils are functioning from a hydrologic standpoint. Soil infiltration kits are available from various sources in South Dakota including the NRCS, the South Dakota Grassland Coalition, and the South Dakota Soil Health Coalition.



The photo above shows how to measure how fast a known amount of water infiltrates into the soil with a soil infiltration ring. Soils with good soil structure and stability commonly infiltrate water much more quickly than those with poor soil structure.

Indicator 5. Plant Functional Structural Groups

Different types and amounts of types of rangeland plants can exist on the same soil type in the same area. In some cases the kinds, amounts, and proportions of plants can be vastly different due to things like historical management and disturbances or lack of disturbances. Similar plant species can be grouped into like kinds that function similarly in the plant community (think niches), these are called Functional Structural Groups. In the reference state, some functional structural groups are expected to be dominant, while others are expected to be subdominant or minor. Under different conditions, plants that are common and dominant in the reference state can be completely replaced by other plant groups, some of which might not be found in the reference state at all. Some of these groups common to western South Dakota are: Cool-season mid grasses, cool-season bunchgrasses, warm-season short grasses, perennial forbs, annual grasses, and shrubs. Having basic knowledge of plant identification and plant growth forms is important to assess this attribute. This attribute is, however, very important as the functional composition of rangelands have a major impact on the natural processes of an ecological site. Energy capture, nutrient cycling, and hydrology can all be modified by this indicator. Utilizing a reference sheet is an especially important tool when evaluating functional structural groups. Non-native plants often invade rangelands and can become dominant. When this happens changes in functional structural groups on an ecological site can be dramatic. This indicator is related to the biotic attribute.

Plant Functional Structural Groups: Departure from Expected

High Level of Departure	Moderate Level of Departure	None or Slight Level of Departure
Very few of the functional structural group plants expected for the site can be found and the dominant functional structural group expected for the site is now minor or missing.	The functional structural group described as dominant is no longer dominant but can still be found on the site. Some functional/structural groups that were minor are increasing in composition.	Functional structural groups are as expected for the site- See reference sheet.



This is a plant community where the dominant functional structural group is tall warm-season grasses in south central Nebraska on clayey soils. This is the site's potential. Annual and perennial forbs along with short warm-season grasses are minor.



This is the same soil in south central Nebraska. The plant community is dominated by annual, biennial, and perennial forbs. The primary grass type under the forbs are short warm-season grasses. No tall warm-season grasses remain. The dominant plant functional structural groups expected for the site cannot be found.

Rangeland Soil Health and Other Selected Rangeland Health Indicators:

1. Soil structure is an important concept related to rangeland soil health. Soils have natural limitations; however, they can also be dynamic and change over a relatively short period of time. Many grassland soils have the capability to be deep, dark, and have a “granular” structure. This structure looks like chocolate cake when it crumbles. When some soils lose their natural structure, they can become more “platy” or sometimes “blocky” in appearance. This limits how the soils can move water and how roots can grow through them.
2. Heavy repeated traffic by vehicles or animals can cause compaction in the soil. This causes reduced water infiltration and limit plant growth and the types of plants that will grow on the site. The structure of the soil changes when it is compacted.
3. A dark soil color near the surface is common in soils that are dominated by grasses. This is because the soil near the ground surface is rich in organic matter. Soils are mapped and named by soil scientists working on soil surveys. Soil survey information can help describe how deep the soil surface layer might be, and the color of that soil. When soils erode, the depth of the dark surface layer can decrease. In addition, as organic matter in soils are depleted the color of the soil can change.
4. Soil erosion indicators can be found on rangelands. Some erosion is natural. Common erosion indicators are small and shallow erosion patterns on steep slopes called rills. Rills can become deep gullies in some cases. Soil erosion near bunchy grasses can cause a plant to appear pedestalled. These can also indicate a loss of hydrology (i.e. water does not infiltrate as well as it could, and instead flows along the soil surface leaving a pattern). Water flow patterns, and signs that soil surface plant litter is moving can especially indicate the hydrology attribute is not functioning as it potentially could. Litter movement is when overland water flow volume and force is powerful enough to move plant litter on the soil surface. Usually this is a function of low water infiltration and minimal resistance to water flow on the site. Wind can also contribute to litter movement. Litter movement can best be seen on areas with noticeable slope and appears as areas where the litter accumulates in small piles or create what look like litter dams.
5. Different kinds of plants and their distribution and composition on a site can influence how well moisture is infiltrated into the soil. Short “soddy” grasses can increase runoff of moisture when they are dominant, thus reducing infiltration potential of moisture. Deep-rooted herbaceous plants such as native bunchgrasses and tall or mid height native grasses and forbs help increase water infiltration into the soil. Plant rooting patterns, plant cover, and litter production can affect the amount of water that infiltrates or runs off. This indicator of rangeland health is called Plant Community Composition and Distribution Relative to Infiltration and Runoff. In an arid or semi-arid climate this concept is critical, as it is believed that with every extra inch of water that enters the soil we can expect about 150 pounds/ac of grassland production.



Rills are small linear erosion patterns on hill slopes.



Pedestalled plants appear to sit above the soil surface and are caused by erosion from water around a plant's crown.



Water flow patterns appear when soils have limited ability to infiltrate water and/or plant and litter cover is inadequate to slow water flow. They are common on slopes but often are not natural.



Gullies are deep erosional features that form on landscapes due to long-term water erosion. They generally form on slopes that receive water runoff. In South Dakota no ecological site should contain gullies.



Litter accumulation at the bottom of a slope that was moved and deposited by overland water movement.

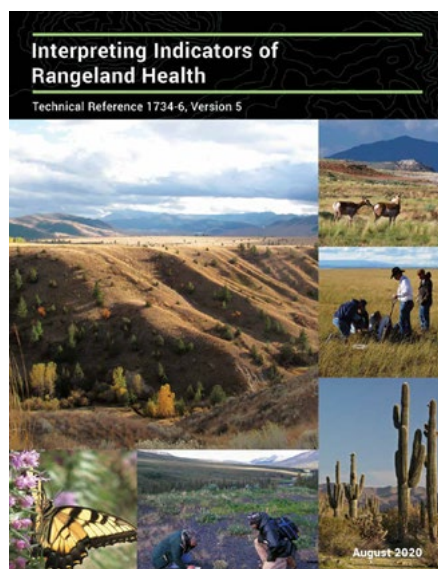


Kinds of plants and their distribution on the landscape can have an important impact on moisture infiltration and runoff.

Did You Know?

We only covered a select few Rangeland Health Indicators in the field, so you are aware of the main concepts. There are 17 indicators that are evaluated for rangeland health. There is also a 186-page manual that outlines how rangeland health assessments are completed. The indicators we looked at were also simplified somewhat for our purposes. Training to complete rangeland health assessments are detailed and usually fill four days of training. It is also important to understand the area where you are completing an assessment. The more official training and experience you can get on rangeland health the better. The manual, which is written in a technical style, is available at: www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/landuse/rangepasture/range/?cid=stelprdb1068410

(Or just do a web search for Rangeland Health Version 5)



Web Soil Survey is a handy tool to help with soil inventories and finding soil information in your area. It is available at: websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

(Or just do a web search for Web Soil Survey)

In addition, NRCS recognizes numerous ecological sites beyond what we provided on the ecological site key today. We also provided reference materials that contain fewer details and are easier to use for learning students. If you are interested in learning more, contact your NRCS office.

Part I & II MLRA 53B - CENTRAL DARK BROWN GLACIATED PLAINS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	45		
switchgrass	20		
Indiangrass	15		
little bluestem	10		
needlegrasses	10		
western/slender wheatgrass	10		
prairie cordgrass	5		
other native grasses/sedges	5		
invader tall grasses	0		
Short Height			
sedges	5		
rushes & other grass-likes	5		
other native short grasses	0		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	30		
needlegrasses	15		
western wheatgrass	10		
switchgrass	10		
sideoats grama	5		
Indiangrass	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
blue grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
prairie sandreed	20		
needlegrasses	20		
big or sand bluestem	10		
western wheatgrass	10		
little bluestem	5		
sideoats grama	5		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	7		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	30		
western/slender wheatgrass	20		
big bluestem	10		
sideoats grama	10		
little bluestem	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 53B - CENTRAL DARK BROWN GLACIATED PLAINS (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	35		
needlegrasses	25		
sideoats grama	5		
big bluestem	5		
plains muhly	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
native short grasses/sedges	5		
invader short grasses	0		
Forbs:			
native forbs	5		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	20		
sideoats grama	15		
little bluestem	15		
big bluestem	15		
prairie sandreed	10		
western wheatgrass	10		
plains muhly	8		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	8		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	30		
needlegrasses	20		
sideoats grama	10		
plains muhly	10		
western wheatgrass	5		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	8		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	30		
needlegrasses	18		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	15		
buffalograss	5		
native short grasses/sedges	15		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 53B - CENTRAL DARK BROWN GLACIATED PLAINS (Page 3)

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
prairie sandreed	30		
sand bluestem	15		
needlegrasses	15		
little bluestem	10		
western wheatgrass	5		
switchgrass	5		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	5		
native short grasses/sedge	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	8		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE					LIVESTOCK FOR CENTRAL DARK
BROWN GLACIATED PLAINS, MLRA 53B, SOUTH DAKOTA					
SIMILARITY INDEX (%)					
	76-100	51-75	26-50	0-25	
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):				
Subirrigated	1.4	1.2	0.9	0.7	
Overflow	1.0	0.8	0.6	0.45	
Loamy, Clayey, Sandy, Sands	0.65	0.5	0.4	0.3	
Thin Upland, Shallow, Claypan	0.5	0.4	0.3	0.2	

Rev. 5/30/08

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR CENTRAL DARK BROWN GLACIATED PLAINS, MLRA 53B, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	5,000	< 5%	0.5 - 1.0 inches
Overflow	3,500	< 5%	0.25 - 0.75 inches
Loamy, Clayey, Sandy, Sands	2,400	< 5%	0.25 - 0.5 inches
Thin Upland, Shallow, Claypan	1,700	< 10%	0.25 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 53C - SOUTHERN DARK BROWN GLACIATED PLAINS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	45		
switchgrass	20		
Indiangrass	20		
needlegrasses	10		
little bluestem	10		
western/slender wheatgrass	10		
prairie cordgrass	5		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
sedges	15		
rushes & other grass-likes	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	45		
green needlegrass	25		
western wheatgrass	15		
switchgrass	15		
porcupine grass	10		
little bluestem	10		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
sedges	10		
rushes and other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big or sand bluestem	25		
prairie sandreed	25		
little bluestem	20		
needlegrasses	20		
western wheatgrass	10		
sideoats grama	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	30		
western wheatgrass	30		
big bluestem	20		
little bluestem	15		
sideoats grama	15		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue grama	5		
buffalograss	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Part I & II MLRA 53C - SOUTHERN DARK BROWN GLACIATED PLAINS (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	40		
needlegrasses	30		
big bluestem	20		
sideoats grama	15		
little bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
sand or big bluestem	30		
prairie sandreed	30		
little bluestem	20		
switchgrass	20		
needlegrasses	15		
sand dropseed	5		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	35		
needlegrasses	20		
sideoats grama	20		
big bluestem	20		
western wheatgrass	10		
other native tall grasses	20		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
buffalograss	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Dense Clay Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	60		
green needlegrass	35		
sideoats grama	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
other native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Part I & II MLRA 53C - SOUTHERN DARK BROWN GLACIATED PLAINS (Page 3)

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
western wheatgrass	40		
green needlegrass	30		
needleandthread	10		
prairie sandreed	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	15		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Part III CARRYING CAPACITY TABLE				LIVESTOCK FOR SOUTHERN
DARK BROWN GLACIATED PLAINS, MLRA 53C, SOUTH DAKOTA				
SIMILARITY INDEX (%)				
	76-100	51-75	26-50	0-25
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):			
Subirrigated	1.4	1.2	0.9	0.7
Overflow	1.0	0.8	0.6	0.5
Loamy, Clayey, Sandy, Sands	0.75	0.5	0.4	0.3
Dense Clay, Thin Upland, Claypan	0.5	0.4	0.3	0.2

Rev. 12/28/21

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth bromegrass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

Part IV RANGELAND HEALTH REFERENCE VALUES TABLE FOR SOUTHERN DARK BROWN GLACIATED PLAINS, MLRA 53C, SOUTH DAKOTA			
	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	5,100	< 5%	0.5 - 1.0 inches
Overflow	3,500	< 5%	0.5 - 1.0 inches
Loamy, Clayey, Sandy, Sands	2,600	< 5%	0.25 - 0.5 inches
Dense Clay, Thin Upland, Claypan	1,900	< 15%	0.25 - 0.5 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 54 - ROLLING SOFT SHALE PLAIN (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	45		
switchgrass	15		
needlegrasses	10		
prairie cordgrass	5		
little bluestem	5		
Indiangrass	5		
western wheatgrass	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	5		
rushes & other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	10		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	30		
needlegrasses	25		
western wheatgrass	15		
switchgrass	10		
sideoats grama	5		
Canada wildrye	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
blue grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
prairie sandreed	25		
big or sand bluestem	20		
needlegrasses	10		
little bluestem	5		
western wheatgrass	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	30		
needlegrasses	30		
sideoats grama	5		
big bluestem	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
sedges	5		
other native short grasses	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 54 - ROLLING SOFT SHALE PLAIN (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	40		
needlegrasses	35		
sideoats grama	5		
big bluestem	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	5		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	20		
little bluestem	20		
western wheatgrass	15		
plains muhly	15		
sideoats grama	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	7		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	25		
sideoats grama	15		
western wheatgrass	15		
little bluestem	10		
plains muhly	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	30		
needleandthread	15		
green needlegrass	10		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	15		
buffalograss	5		
native grasses/sedges	15		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 54 - ROLLING SOFT SHALE PLAIN (Page 3)

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
big or sand bluestem	20		
prairie sandreed	20		
needlegrasses	15		
little bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	5		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE					LIVESTOCK FOR ROLLING SOFT
SHALE PLAIN, MLRA 54, SOUTH DAKOTA					
SIMILARITY INDEX (%)					
	76-100	51-75	26-50	0-25	
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):				
Subirrigated	1.1	0.9	0.7	0.5	
Overflow	0.9	0.75	0.6	0.4	
Loamy, Clayey, Sandy, Sands	0.6	0.5	0.4	0.3	
Thin Upland, Shallow, Claypan	0.4	0.37	0.27	0.19	

Rev. 12/29/21

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

Part IV RANGELAND HEALTH REFERENCE VALUES TABLE FOR ROLLING SOFT SHALE PLAIN, MLRA 54, SOUTH DAKOTA			
	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,000	< 5%	0.5 - 1.0 inches
Overflow	3,200	< 5%	0.5 - 1.0 inches
Loamy, Clayey, Sandy, Sands	2,200	< 10%	0.25 - 0.5 inches
Thin Upland, Shallow, Claypan	1,500	< 15%	0.25 - 0.5 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 55B - CENTRAL BLACK GLACIATED PLAINS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	40		
switchgrass	20		
Indiangrass	10		
western/slender wheatgrass	10		
northern reedgrass	10		
prairie cordgrass	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	10		
rushes & other grass-like	5		
other native short grasses	0		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	30		
needlegrasses	20		
switchgrass	10		
Indiangrass	10		
western/slender wheatgrass	10		
little bluestem	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
prairie sandreed	25		
needlegrasses	20		
big or sand bluestem	20		
little bluestem	10		
sideoats grama	10		
western/slender wheatgrass	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	30		
western/slender wheatgrass	20		
big bluestem	20		
sideoats grama	5		
little bluestem	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part I & II MLRA 55B - CENTRAL BLACK GLACIATED PLAINS (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
needlegrasses	40		
western wheatgrass	20		
slender wheatgrass	10		
big bluestem	10		
sideoats grama	10		
other native tall grasses	10		
invader tall grasses	0		
<i>Short Height</i>			
blue grama	5		
buffalograss	5		
native grasses/sedges	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
needlegrasses	20		
sideoats grama	15		
little bluestem	15		
big bluestem	15		
prairie sandreed	10		
western wheatgrass	10		
plains muhly	5		
other native tall grasses	5		
invader tall grasses	0		
<i>Short Height</i>			
blue or hairy grama	10		
sedges	8		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
little bluestem	25		
needlegrasses	25		
big bluestem	10		
sideoats grama	10		
western wheatgrass	5		
other native tall grasses	15		
invader tall grasses	0		
<i>Short Height</i>			
blue or hairy grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
western wheatgrass	30		
needlegrasses	30		
other native tall grasses	5		
invader tall grasses	0		
<i>Short Height</i>			
blue grama	15		
buffalograss	5		
native grasses/sedges	15		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Part I & II MLRA 55B - CENTRAL BLACK GLACIATED PLAINS (Page 3)

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
needlegrasses	30		
prairie sandreed	25		
big or sand bluestem	15		
little bluestem	5		
western wheatgrass	5		
switchgrass	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	5		
native grasses/sedge	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE					LIVESTOCK FOR CENTRAL BLACK
GLACIATED PLAINS, MLRA 55B, SOUTH DAKOTA					
SIMILARITY INDEX (%)					
	76-100	51-75	26-50	0-25	
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):				
Subirrigated	1.3	1.2	0.9	0.7	
Overflow	1.0	0.8	0.6	0.5	
Loamy, Clayey, Sandy, Sands	0.7	0.5	0.4	0.3	
Thin Upland, Shallow, Claypan	0.5	0.4	0.3	0.2	

Rev. 12/28/21

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR CENTRAL BLACK GLACIATED PLAINS, MLRA 55B, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,700	< 5%	0.5 - 1.0 inches
Overflow	3,800	< 5%	0.25 - 0.5 inches
Loamy, Clayey, Sandy, Sands	2,600	< 5%	0.25 - 0.5 inches
Thin Upland, Shallow, Claypan	2,000	< 10%	0.25 - 0.5 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 55C - SOUTHERN BLACK GLACIATED PLAINS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	45		
switchgrass	20		
Indiangrass	15		
slender wheatgrass	10		
little bluestem	10		
prairie cordgrass	5		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
sedges	10		
rushes & other grass-likes	5		
other native short grasses	0		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	40		
needlegrasses	20		
switchgrass	15		
western/slender wheatgrass	15		
Indiangrass	10		
little bluestem	10		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
prairie sandreed	20		
needlegrasses	20		
big or sand bluestem	15		
little bluestem	10		
sideoats grama	10		
western/slender wheatgrass	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	30		
big bluestem	25		
western/slender wheatgrass	20		
sideoats grama	10		
little bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Part I & II MLRA 55C - SOUTHERN BLACK GLACIATED PLAINS (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	35		
needlegrasses	30		
slender wheatgrass	10		
big bluestem	15		
sideoats grama	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue grama	5		
buffalograss	5		
other native grasses/sedges	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
sand or big bluestem	40		
prairie sandreed	30		
little bluestem	20		
needlegrasses	15		
switchgrass	15		
sand dropseed	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/21

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	30		
needlegrasses	25		
big bluestem	20		
sideoats grama	10		
western wheatgrass	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Dense Clay Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	65		
green needlegrass	35		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
buffalograss	5		
blue grama	5		
other native grasses/sedges	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Part I & II MLRA 55C - SOUTHERN BLACK GLACIATED PLAINS (Page 3)

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
western wheatgrass	30		
green needlegrass	30		
needleandthread	10		
little bluestem	10		
prairie sandreed	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	15		
buffalograss	10		
sedges	10		
native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Part III CARRYING CAPACITY TABLE					LIVESTOCK FOR SOUTHERN
BLACK GLACIATED PLAINS, MLRA 55C, SOUTH DAKOTA					
SIMILARITY INDEX (%)					
	76-100	51-75	26-50	0-25	
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):				
Subirrigated	1.4	1.2	0.9	0.7	
Overflow	1.10	0.8	0.6	0.5	
Loamy, Clayey, Sandy, Sands	0.7	0.5	0.4	0.3	
Dense Clay, Thin Upland, Claypan	0.5	0.4	0.3	0.2	

Rev. 12/28/21

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR SOUTHERN BLACK GLACIATED PLAINS, MLRA 55C, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	5,100	< 5%	0.5 - 1.0 inches
Overflow	3,900	< 5%	0.5 - 1.0 inches
Loamy, Clayey, Sandy, Sands	3,000	< 5%	0.25 - 0.5 inches
Dense Clay, Thin Upland, Claypan	2,200	< 15%	0.25 - 0.5 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 58D - NORTHERN ROLLING HIGH PLAINS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem & switchgrass	55		
prairie cordgrass	20		
western wheatgrass	10		
slender wheatgrass	10		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
sedges	10		
rushes & other grass-like	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	35		
western wheatgrass	30		
needlegrasses	25		
switchgrass	5		
prairie sandreed	5		
slender wheatgrass	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	5		
blue grama	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	12		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
prairie sandreed	30		
needlegrasses	25		
big bluestem or sand bluestem	10		
little bluestem	15		
western wheatgrass	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	5		
sedges	15		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	35		
green needlegrass	25		
needleandthread	15		
big bluestem	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
sedges	8		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part I & II MLRA 58D - NORTHERN ROLLING HIGH PLAINS (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
western wheatgrass	45		
green needlegrass	25		
sideoats grama	10		
big bluestem	10		
plains muhly	10		
other native tall grasses	10		
invader tall grasses	0		
<i>Short Height</i>			
blue grama and buffalograss	10		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
needlegrasses	25		
western wheatgrass	20		
little bluestem	15		
sideoats grama	10		
big bluestem	10		
other native tall grasses	15		
invader tall grasses	0		
<i>Short Height</i>			
blue or hairy grama	10		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
western wheatgrass	25		
needlegrasses	20		
little bluestem	15		
plains muhly	8		
big bluestem	5		
other native tall grasses	10		
invader tall grasses	0		
<i>Short Height</i>			
blue grama	10		
sedges	15		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	15		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
prairie sandreed	35		
needleandthread	25		
sand bluestem	15		
little bluestem	8		
western wheatgrass	3		
other native tall grasses	5		
invader tall grasses	0		
<i>Short Height</i>			
blue or hairy grama	5		
sedges	5		
native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 58D - NORTHERN ROLLING HIGH PLAINS (Page 3)

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
western wheatgrass	35		
needlegrasses	15		
sand dropseed	5		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue grama	15		
buffalograss	10		
sedges	10		
other native short grasses	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	15		
invader shrubs	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE					LIVESTOCK FOR NORTHERN
ROLLING HIGH PLAINS, MLRA 58D, SOUTH DAKOTA					
SIMILARITY INDEX (%)					
	76-100	51-75	26-50	0-25	
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):				
Subirrigated	1.2	0.9	0.7	0.4	
Overflow	0.8	0.5	0.4	0.3	
Loamy, Clayey, Sandy, Sands	0.5	0.4	0.3	0.2	
Thin Upland, Shallow, Claypan	0.4	0.3	0.2	0.1	

Rev. 12/28/21

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac Change
next higher rate
2nd higher rate
3rd higher rate

Part IV RANGELAND HEALTH REFERENCE VALUES TABLE FOR NORTHERN ROLLING HIGH PLAINS, MLRA 58D, SOUTH DAKOTA			
	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,500	< 5%	0.5 - 1.0 inches
Overflow	2,800	< 5%	0.25 - 0.5 inches
Loamy, Clayey, Sandy, Sands	2,000	< 10%	0.25 inches
Thin Upland, Shallow, Claypan	1,500	< 15%	0.25 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 60A - PIERRE SHALE PLAINS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
big bluestem & switchgrass	55		
prairie cordgrass	20		
western wheatgrass	10		
slender wheatgrass	10		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
sedges	10		
rushes & other grass-like	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
big bluestem	40		
western wheatgrass	30		
switchgrass	20		
green needlegrass	10		
slender wheatgrass	10		
Canada wildrye	8		
other native grasses/sedges	20		
invader tall grasses	0		
Short Height			
blue grama	5		
buffalograss	5		
sedges	8		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
prairie sandreed	35		
big or sand bluestem	15		
little bluestem	15		
needleandthread	20		
western wheatgrass	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	15		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
western wheatgrass	30		
needleandthread	20		
green needlegrass	15		
sideoats grama	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 60A - PIERRE SHALE PLAINS (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	50		
green needlegrass	40		
sideoats grama	15		
big bluestem	10		
needleandthread	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
other native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	20		
sideoats grama	20		
needlegrasses	20		
western wheatgrass	15		
big bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	15		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	35		
sideoats grama	20		
western wheatgrass	15		
needlegrasses	15		
big bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	20		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Dense Clay Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	60		
green needlegrass	30		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
buffalograss	10		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part I & II MLRA 60A - PIERRE SHALE PLAINS (Page 3)

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	40		
green needlegrass	15		
needleandthread	15		
sideoats grama	5		
prairie sandreed	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	20		
buffalograss	5		
other native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
sand bluestem	40		
prairie sandreed	30		
little bluestem	20		
needlegrasses	10		
western wheatgrass	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE				
PLAINS, MLRA 60A, SOUTH DAKOTA				
LIVESTOCK FOR PIERRE SHALE				
SIMILARITY INDEX (%)				
	76-100	51-75	26-50	0-25
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):			
Subirrigated	1.2	0.9	0.7	0.4
Overflow	0.8	0.5	0.4	0.3
Loamy, Clayey, Sandy, Sands	0.5	0.4	0.3	0.2
Dense Clay, Thin Upland, Shallow, Claypan	0.4	0.3	0.2	0.1

Rev. 12/28/21

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants

21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change

next higher rate
2nd higher rate
3rd higher rate

Part IV RANGELAND HEALTH REFERENCE VALUES TABLE FOR PIERRE SHALE PLAINS, MLRA 60A, SOUTH DAKOTA			
	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,300	< 5%	0.25 - 0.75 inches
Overflow	2,800	< 5%	0.25 - 0.5 inches
Loamy, Clayey, Sandy, Sands	2,000	< 5%	0.25 inches
Dense Clay, Thin Upland, Shallow, Claypan	1,400	< 15%	0.25 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 61 - BLACK HILLS FOOT SLOPES (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem, switchgrass, & Indiangrass	75		
prairie cordgrass	15		
sideoats grama	15		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem, switchgrass, & Indiangrass	45		
Canada wildrye	10		
green needlegrass	10		
little bluestem	15		
western wheatgrass	20		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem, switchgrass, & Indiangrass	30		
little bluestem	25		
prairie sandreed	40		
sideoats grama	25		
western wheatgrass	10		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	25		
western wheatgrass	25		
big bluestem	15		
sideoats grama	10		
little bluestem	10		
other native tall grasses	20		
invader tall grasses	0		
Short Height			
blue grama	10		
sedges	10		
other native short grasses	10		
invader short grasses	10		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 61 - BLACK HILLS FOOT SLOPES (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	25		
little bluestem	35		
needlegrasses	30		
sideoats grama	10		
western wheatgrass	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	35		
needleandthread	10		
big bluestem	50		
sideoats grama	35		
western wheatgrass	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	5		
other native short grasses	15		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	30		
needlegrasses	25		
sideoats grama	30		
western wheatgrass	10		
other native tall grasses	25		
invader tall grasses	0		
Short Height			
blue or hairy grama	15		
buffalograss	5		
sedges	20		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Dense Clay Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
green needlegrass	40		
western wheatgrass	80		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 61 - BLACK HILLS FOOT SLOPES (Page 3)

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
needlegrasses	25		
prairie sandreed	10		
western wheatgrass	50		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue or hairy grama	30		
buffalograss	15		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	5		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE					LIVESTOCK FOR FOOTHILLS OF
THE BLACK HILLS, MLRA 61, SOUTH DAKOTA					
SIMILARITY INDEX (%)					
	76-100	51-75	26-50	0-25	
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):				
Subirrigated	1.4	1.0	0.7	0.4	
Overflow	0.9	0.65	0.45	0.25	
Sandy, Loamy, Clayey	0.6	0.45	0.3	0.15	
Dense Clay, Thin Upland, Shallow, Claypan	0.45	0.3	0.2	0.1	

Rev. 5/30/08

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR FOOTHILLS OF THE BLACK HILLS, MLRA 61, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,800	< 5%	0.25 - 0.75 inches
Overflow	3,200	< 5%	0.25 - 0.5 inches
Sandy, Loamy, Clayey	2,500	< 5%	0.5 - 1.0 inches
Dense Clay, Thin Upland, Shallow, Claypan	1,800	< 10%	0.25 - 0.5 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 63A - NORTHERN ROLLING PIERRE SHALE PLAINS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	45		
switchgrass	15		
Indiangrass	15		
western wheatgrass	15		
little bluestem	10		
prairie cordgrass	8		
slender wheatgrass	8		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	10		
rushes & other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	40		
western wheatgrass	20		
needlegrasses	20		
switchgrass	10		
slender wheatgrass	10		
Canada wildrye	5		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
blue grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	8		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big or sand bluestem	30		
prairie sandreed	25		
needleandthread	20		
little bluestem	15		
switchgrass	10		
sideoats grama	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	8		
sedges	7		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	50		
needlegrasses	35		
sideoats grama	15		
big bluestem	5		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 63A - NORTHERN ROLLING PIERRE SHALE PLAINS (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	50		
needlegrasses	30		
sideoats grama	15		
big bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
sideoats grama	25		
western wheatgrass	20		
little bluestem	15		
needlegrasses	15		
big bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	15		
buffalograss	10		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	35		
sideoats grama	20		
needlegrasses	20		
big bluestem	15		
little bluestem	10		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
buffalograss	10		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Dense Clay Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	80		
green needlegrass	10		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
buffalograss	10		
blue grama	10		
native grasses/sedges	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 63A - NORTHERN ROLLING PIERRE SHALE PLAINS (Page 3)

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	35		
green needlegrass	25		
needleandthread	10		
prairie sandreed	10		
sideoats grama	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
native grasses/sedges	15		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	15		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
sand or big bluestem	35		
prairie sandreed	25		
little bluestem	15		
needleandthread	15		
sand dropseed	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	5		
native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE				LIVESTOCK FOR NORTHERN
ROLLING PIERRE SHALE PLAINS, MLRA 63A, SOUTH DAKOTA				
SIMILARITY INDEX (%)				
	76-100	51-75	26-50	0-25
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):			
Subirrigated	1.3	1.0	0.8	0.6
Overflow	0.9	0.7	0.6	0.45
Loamy, Clayey, Sandy, Sands	0.65	0.5	0.4	0.3
Dense Clay, Thin Upland, Shallow, Claypan	0.47	0.4	0.3	0.2

Rev. 5/30/08

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR NORTHERN ROLLING PIERRE SHALE PLAINS, MLRA 63A, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,800	< 5%	0.25 - 0.75 inches
Overflow	3,300	< 5%	0.25 - 0.5 inches
Sandy, Loamy, Clayey	2,400	< 10%	0.25 inches
Dense Clay, Thin Upland, Shallow, Claypan	1,600	< 15%	0.25 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 63B - SOUTHERN ROLLING PIERRE SHALE PLAINS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	40		
Indiangrass	20		
little bluestem	20		
switchgrass	15		
little bluestem	10		
prairie cordgrass	10		
sideoats grama	10		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
sedges	5		
rushes & other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	40		
western wheatgrass	20		
needlegrasses	15		
switchgrass	10		
sideoats grama	10		
Indiangrass	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	5		
rushes and other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	7		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big or sand bluestem	35		
prairie sandreed	25		
little bluestem	25		
switchgrass	20		
needlegrasses	15		
Indiangrass	15		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	35		
western wheatgrass	20		
big bluestem	15		
little bluestem	15		
sideoats grama	10		
other native tall grasses	20		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 63B - SOUTHERN ROLLING PIERRE SHALE PLAINS (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
western wheatgrass	45		
needlegrasses	25		
sideoats grama	10		
big bluestem	10		
little bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
<i>Short Height</i>			
blue grama	10		
buffalograss	5		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
big bluestem	20		
sideoats grama	20		
little bluestem	20		
western wheatgrass	15		
needlegrasses	10		
prairie sandreed	10		
plains muhly	5		
other native tall grasses	10		
invader tall grasses	0		
<i>Short Height</i>			
blue or hairy grama	10		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
little bluestem	25		
western wheatgrass	25		
sideoats grama	20		
big bluestem	20		
needlegrasses	15		
other native tall grasses	10		
invader tall grasses	0		
<i>Short Height</i>			
blue or hairy grama	15		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Dense Clay Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
<i>Tall and Mid Height</i>			
western wheatgrass	65		
green needlegrass	35		
other native tall grasses	5		
invader tall grasses	0		
<i>Short Height</i>			
buffalograss	5		
blue grama	5		
native grasses/sedges	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 63B - SOUTHERN ROLLING PIERRE SHALE PLAINS (Page 3)

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	35		
green needlegrass	25		
needleandthread	10		
prairie sandreed	10		
sideoats grama	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
native grasses/sedges	15		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	15		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
sand or big bluestem	40		
prairie sandreed	30		
little bluestem	25		
switchgrass	20		
Indiangrass	15		
needlegrasses	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	5		
native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE				LIVESTOCK FOR SOUTHERN
ROLLING PIERRE SHALE PLAINS, MLRA 63B, SOUTH DAKOTA				
SIMILARITY INDEX (%)				
	76-100	51-75	26-50	0-25
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):			
Subirrigated	1.3	1.0	0.8	0.6
Overflow	0.9	0.7	0.6	0.45
Loamy, Clayey, Sandy, Sands	0.75	0.6	0.45	0.3
Dense Clay, Thin Upland, Shallow, Claypan	0.5	0.4	0.3	0.2

Rev. 5/30/08

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth bromegrass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants

21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change

next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR SOUTHERN ROLLING PIERRE SHALE PLAINS, MLRA 63B, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,800	< 5%	0.5 - 1.0 inches
Overflow	3,300	< 5%	0.5 - 1.0 inches
Sandy, Loamy, Clayey	2,800	< 5%	0.25 - 0.5 inches
Dense Clay, Thin Upland, Shallow, Claypan	1,800	< 15%	0.25 - 0.5 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 64 - TABLELANDS, BADLANDS, AND PINE RIDGE (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	25		
prairie cordgrass	15		
Indiangrass	15		
switchgrass	15		
little bluestem	15		
western wheatgrass	10		
slender wheatgrass	10		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	10		
rushes & other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	40		
western wheatgrass	30		
switchgrass	15		
needlegrasses	10		
slender wheatgrass	5		
Canada wildrye	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
blue grama	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big or sand bluestem	30		
prairie sandreed	30		
little bluestem	10		
needleandthread	20		
switchgrass	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	15		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	30		
needlegrasses	25		
sideoats grama	10		
big bluestem	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 64 - TABLELANDS, BADLANDS, AND PINE RIDGE (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	50		
needlegrasses	35		
sideoats grama	15		
big bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
sideoats grama	20		
needlegrasses	20		
little bluestem	15		
western wheatgrass	15		
big bluestem	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	15		
buffalograss	5		
sedges	15		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	30		
sideoats grama	20		
western wheatgrass	15		
needlegrasses	15		
big bluestem	10		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue or hairy grama	20		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Dense Clay Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	60		
green needlegrass	40		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
buffalograss	10		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 64 - TABLELANDS, BADLANDS, AND PINE RIDGE (Page 3)

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	40		
green needlegrass	25		
needleandthread	15		
porcupine grass	10		
prairie sandreed	5		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	15		
buffalograss	5		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
prairie sandreed	40		
sand bluestem	25		
little bluestem	15		
needleandthread	10		
sand dropseed	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	10		
native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE				
BADLANDS, AND PINE RIDGE, MLRA 64, SOUTH DAKOTA				
LIVESTOCK FOR TABLELANDS,				
SIMILARITY INDEX (%)				
	76-100	51-75	26-50	0-25
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):			
Subirrigated	1.2	0.9	0.7	0.4
Overflow	0.8	0.6	0.4	0.3
Loamy, Clayey, Sandy, Sands	0.54	0.43	0.34	0.25
Dense Clay, Thin Upland, Shallow, Claypan	0.44	0.35	0.27	0.2

Rev. 5/30/08

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants

21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change

next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR TABLELANDS, BADLANDS, AND PINE RIDGE, MLRA 64, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,300	< 5%	0.5 - 1.0 inches
Overflow	2,800	< 5%	0.25 - 0.5 inches
Sandy, Loamy, Clayey	2,000	< 10%	0.25 - 0.5 inches
Dense Clay, Thin Upland, Shallow, Claypan	1,600	< 15%	0.25 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 65 - NEBRASKA-SOUTH DAKOTA SAND HILLS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	50		
Indiangrass	30		
little bluestem	25		
switchgrass	15		
prairie cordgrass	15		
needlegrasses	15		
western wheatgrass	10		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
sedges	10		
rushes & other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	25		
sideoats grama	25		
needlegrasses	20		
big or sand bluestem	20		
prairie sandreed	10		
western wheatgrass	10		
other native tall grasses	20		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	8		
other native short grasses	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big or sand bluestem	30		
prairie sandreed	30		
needleandthread	20		
little bluestem	20		
switchgrass	10		
sideoats grama	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	15		
sedges	5		
other native short grasses	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	30		
western wheatgrass	20		
big bluestem	15		
little bluestem	15		
other native tall grasses	20		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
<i>Tall and Mid Height</i>			
sand bluestem	40		
prairie sandreed	35		
little bluestem	25		
switchgrass	10		
Indiangrass	5		
sand lovegrass	5		
other native tall grasses	5		
invader tall grasses	0		
<i>Short Height</i>			
blue or hairy grama	10		
sedges	5		
other native short grasses	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE					LIVESTOCK FOR NEBRASKA-
SOUTH DAKOTA SAND HILLS, MLRA 65, SOUTH DAKOTA					
SIMILARITY INDEX (%)					
	76-100	51-75	26-50	0-25	
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):				
Subirrigated	1.3	1.1	0.9	0.7	
Loamy	0.7	0.6	0.5	0.35	
Sandy, Sands	0.65	0.5	0.4	0.3	
Shallow	0.47	0.35	0.27	0.18	

Rev. 5/30/08

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR NEBRASKA-SOUTH DAKOTA SAND HILLS, MLRA 65, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,600	< 5%	0.5 - 1.0 inches
Overflow	3,000	< 5%	0.25 - 0.5 inches
Sandy, Sands	2,400	< 10%	0.25 - 0.5 inches
Shallow	1,700	< 15%	0.25 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 66 - DAKOTA-NEBRASKA ERODED TABLELAND (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	40		
Indiangrass	20		
little bluestem	20		
switchgrass	15		
little bluestem	10		
prairie cordgrass	10		
sideoats grama	10		
other native grasses/sedges	15		
invader tall grasses	0		
Short Height			
sedges	5		
rushes & other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	40		
western wheatgrass	20		
needlegrasses	15		
switchgrass	10		
sideoats grama	10		
Indiangrass	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	5		
rushes and other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	7		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big or sand bluestem	33		
prairie sandreed	28		
little bluestem	23		
needlegrasses	18		
switchgrass	15		
Indiangrass	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	8		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
needlegrasses	30		
western wheatgrass	20		
big bluestem	15		
little bluestem	15		
sideoats grama	10		
other native tall grasses	20		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 66 - DAKOTA-NEBRASKA ERODED TABLELAND (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	45		
needlegrasses	25		
sideoats grama	10		
big bluestem	10		
little bluestem	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue grama	10		
buffalograss	5		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	25		
sideoats grama	25		
big or sand bluestem	20		
needlegrasses	20		
western wheatgrass	10		
prairie sandreed	10		
plains muhly	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	15		
sedges	8		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	30		
sideoats grama	20		
needlegrasses	15		
big bluestem	15		
western wheatgrass	15		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue or hairy grama	20		
buffalograss	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	35		
green needlegrass	35		
needleandthread	10		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	20		
buffalograss	10		
native grasses/sedges	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 66 - DAKOTA-NEBRASKA ERODED TABLELAND (Page 3)

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
sand bluestem	40		
prairie sandreed	33		
little bluestem	25		
switchgrass	15		
needlegrasses	15		
Indiangrass	10		
sand lovegrass	10		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	10		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE					LIVESTOCK FOR DAKOTA-
NEBRASKA ERODED TABLELAND, MLRA 66, SOUTH DAKOTA					
SIMILARITY INDEX (%)					
	76-100	51-75	26-50	0-25	
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):				
Subirrigated	1.3	1.0	0.8	0.6	
Overflow	0.9	0.7	0.6	0.45	
Loamy, Clayey, Sandy, Sands	0.75	0.6	0.45	0.3	
Thin Upland, Shallow, Claypan	0.55	0.45	0.3	0.2	

Rev. 5/30/08

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR DAKOTA-NEBRASKA ERODED TABLELAND, MLRA 66, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	4,800	< 5%	0.5 - 1.0 inches
Overflow	3,300	< 5%	0.5 - 1.0 inches
Loamy, Clayey, Sandy, Sands	2,800	< 5%	0.25 - 0.5 inches
Thin Upland, Shallow, Claypan	2,000	< 10%	0.25 - 0.5 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 102A - ROLLING TILL PRAIRIE (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem or Indiangrass	40		
switchgrass	25		
prairie cordgrass	10		
little bluestem	10		
porcupine grass	8		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges and other grass-like	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	60		
porcupine grass	10		
switchgrass	10		
Canada wildrye	10		
little bluestem	10		
sideoats grama	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big or sand bluestem	40		
little bluestem	30		
prairie sandreed	25		
needlegrasses	15		
sideoats grama	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem or Indiangrass	25		
little bluestem or sideoats grama	25		
needlegrasses	25		
slender/western wheatgrass	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 102A - ROLLING TILL PRAIRIE (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	35		
needlegrasses	30		
big bluestem	25		
slender/western wheatgrass	10		
sideoats grama	5		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	5		
native grasses/sedges	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	25		
sideoats grama	15		
little bluestem	15		
needlegrasses	15		
prairie sandreed	10		
slender/western wheatgrass	5		
plains muhly	5		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	45		
needlegrasses	30		
big bluestem	20		
prairie dropseed	10		
sideoats grama	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	45		
green needlegrass	25		
big bluestem	15		
switchgrass	10		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	15		
native grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 102A - ROLLING TILL PRAIRIE (Page 3)

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
sand bluestem	35		
prairie sandreed	30		
little bluestem	25		
needlegrasses	15		
switchgrass	10		
slender/western wheatgrass	5		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
native grasses/sedge	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Part III CARRYING CAPACITY TABLE			LIVESTOCK FOR ROLLING TILL	
PRAIRIE, MLRA 102A, SOUTH DAKOTA				
SIMILARITY INDEX (%)				
	76-100	51-75	26-50	0-25
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):			
Subirrigated	1.5	1.3	1	0.75
Overflow	1.25	0.9	0.7	0.5
Loamy, Clayey, Sandy, Sands	0.9	0.7	0.5	0.35
Thin Upland, Shallow, Claypan	0.75	0.6	0.4	0.25

Rev. 5/30/08

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

Part IV RANGELAND HEALTH REFERENCE VALUES TABLE FOR ROLLING TILL PRAIRIE, MLRA 102A, SOUTH DAKOTA			
	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	5,400	< 5%	0.5 - 1.0 inches
Overflow	4,500	< 5%	0.5 - 1.0 inches
Loamy, Clayey, Sandy, Sands	3,300	< 5%	0.25 - 0.5 inches
Thin Upland, Shallow, Claypan	2,600	< 10%	0.25 - 0.5 inches

Rev. 12/28/2021

The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.

Part I & II MLRA 102B - TILL PLAINS (Page 1)

Subirrigated Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem or Indiangrass	40		
switchgrass	25		
prairie cordgrass	10		
little bluestem	10		
porcupine grass	8		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges and other grass-likes	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Overflow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem	60		
porcupine grass	10		
switchgrass	10		
Canada wildrye	10		
little bluestem	10		
sideoats grama	5		
other native grasses/sedges	10		
invader tall grasses	0		
Short Height			
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	5		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sandy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big or sand bluestem	40		
little bluestem	30		
prairie sandreed	25		
needlegrasses	15		
sideoats grama	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Loamy Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
big bluestem or Indiangrass	25		
little bluestem or sideoats grama	25		
needlegrasses	25		
slender/western wheatgrass	10		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 102B - TILL PLAINS (Page 2)

Clayey Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	35		
needlegrasses	30		
big bluestem	25		
slender/western wheatgrass	10		
sideoats grama	5		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	5		
native short grasses/sedges	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Sands Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
sand bluestem	35		
prairie sandreed	30		
little bluestem	25		
needlegrasses	15		
switchgrass	10		
slender/western wheatgrass	5		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
native short grasses/sedge	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Thin Upland Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
little bluestem	45		
needlegrasses	30		
big bluestem	20		
prairie dropseed	10		
sideoats grama	10		
other native tall grasses	10		
invader tall grasses	0		
Short Height			
blue or hairy grama	5		
sedges	5		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Claypan Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses & Grasslike:			
Tall and Mid Height			
western wheatgrass	45		
green needlegrass	25		
big bluestem	15		
switchgrass	10		
other native tall grasses	5		
invader tall grasses	0		
Short Height			
blue grama	15		
native short grasses/sedges	10		
invader short grasses	0		
Forbs:			
native forbs	10		
invader forbs	0		
Shrubs:			
native shrubs	5		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 5/30/08

Part I & II MLRA 102B - TILL PLAINS (Page 3)

Shallow Ecological Site			
Dominant Plants	Composition Maximums	Percent Observed	Percent Allowed
Grasses and Grasslike:			
Tall and Mid Height			
needlegrasses	30		
little bluestem	20		
big bluestem	15		
sideoats grama	10		
slender/western wheatgrass	5		
plains muhly	5		
other native tall grasses	15		
invader tall grasses	0		
Short Height			
blue or hairy grama	10		
sedges	10		
other native short grasses	5		
invader short grasses	0		
Forbs:			
native forbs	15		
invader forbs	0		
Shrubs:			
native shrubs	10		
invader shrubs	0		
Trees:			
native trees	0		
invader trees	0		
TOTAL OBSERVED COMPOSITION		100%	
TOTAL ALLOWED FOR SIMILARITY INDEX			

Rev. 12/28/2021

Part III CARRYING CAPACITY TABLE					LIVESTOCK FOR TILL PLAINS,
MLRA 102B, SOUTH DAKOTA					
SIMILARITY INDEX (%)					
	76-100	51-75	26-50	0-25	
Ecological Site:	Carrying Capacity Expressed As Animal Unit Months Per Acre (AUM's/Ac):				
Subirrigated	1.5	1.3	1	0.75	
Overflow	1.25	0.9	0.7	0.5	
Loamy, Clayey, Sandy, Sands	0.9	0.7	0.5	0.35	
Thin Upland, Claypan	0.75	0.6	0.4	0.25	

Rev. 5/30/08

NOTE: Use higher AUM/Ac value when site contains large quantities of any (alone or in combination) of these invader plants that are desirable forage: crested wheatgrass, intermediate wheatgrass, quackgrass, smooth brome grass, bluegrass, alfalfa, and/or sweetclover.

Composition of
Listed Plants
21% - 40%
41% - 60%
61% or greater

AUM/Ac
Change
next higher rate
2nd higher rate
3rd higher rate

**Part IV
RANGELAND HEALTH REFERENCE VALUES TABLE
FOR TILL PLAINS, MLRA 102B, SOUTH DAKOTA**

	Average Annual Production (lbs/acre)	Bareground %	Litter Depth
Ecological Site:	Reference Values		
Subirrigated	5,600	< 5%	0.5 - 1.0 inches
Overflow	4,500	< 5%	0.5 - 1.0 inches
Loamy, Clayey, Sandy, Sands	3,300	< 5%	0.25 - 0.5 inches
Thin Upland, Shallow, Claypan	2,700	< 10%	0.25 - 0.5 inches

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The above are values for each ecological site grouping for the Reference State (when similarity index is greater than 76%). These values represent the range of variability acceptable to promote rangeland and soil health. Current site conditions should be compared to these reference values in order to determine if management is needed to improve the resource value ratings.