

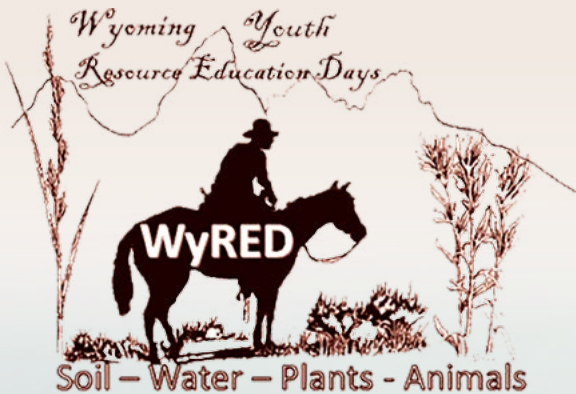


WYOMING RANGE Judging Handbook

Acknowledgments

Version 2

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Dedicated in Memory of Nolan “Tim” Bixby”



Wyoming Range Judging Handbook..... 1
What is Rangeland?.....4
Why Judge Rangeland?..... 4
Judging Contest Details4
 Contest components 5
 Contest setup5
 Contest materials and conduct6
 Other contest information 6
Ecological Sites..... 7
 Introduction 7
 Ecological Sites 7
 Determining Ecological Sites8
 Descriptions of Ecological Sites9
Similarity Index..... 21
 Determining Similarity Index 23
 SIMILARITY INDEX WORKSHEET 24
Beef Cattle Habitat Evaluation..... 25
 BEEF CATTLE HABITAT EVALUATION FORM..... 27
 GUIDE TO MANAGEMENT PRACTICES FOR BEEF CATTLE 30
Greater Sage Grouse 31
 Greater Sage Grouse Habitat Evaluation 33
 GREATER SAGE GROUSE HABITAT EVALUATION FORM..... 35
 GUIDE TO MANAGEMENT PRACTICES FOR GREATER SAGE GROUSE..... 39
Ranch Map40
Wyoming Range Plants.....51
Wyoming Range Plant List62
Plant Anatomy.....74
References..... 87

What is Rangeland?

Rangeland in Wyoming is one of the richest and most important biological resources in the state. The native vegetation of rangeland is the economic backbone of ranching. Rangeland provides essential wildlife habitat. Rangeland is treasured for recreation and 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 throughout most range areas. Rangeland occurs as open rolling uplands, as lowland meadows, along river drainages and as meadows in the mountains across the state. Rangeland is a kind of land, not a land use. Rangeland is fragile, yet durable and resilient. 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 sage grouse. Beef cattle have been chosen because they are the most common livestock species grazed on Wyoming rangelands. Sage grouse represent wildlife because they are affected by management and have the potential to occur throughout the state. 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. Wyoming rangeland judging uses beef cattle production (habitat evaluation) and sage 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 that will last for a lifetime.
- Instills a sense of rangeland stewardship.
- Is fun while 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 sage 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 20 minutes. Ten minutes will be provided at the end of each judging station for participants to finish filling out the scorecard for the station. 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 normally are square or rectangular, with border flags marking the area to judge (fig. 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. Also outside the judged area, a soil pit is dug to assist in determining the ecological site. At the plant identification station, 24 plants are numbered. These plants are to be identified by the participants.

Contest components

- Stations 1 2, & 3
- Determine the ecological site.
- Determine similarity index of plant succession.
- Determine beef cattle carrying capacity.
- Determine resource value rating for beef cattle.
- Determine resource value rating for sage grouse.
- Make management recommendations based on stated objectives.
- Station 4 Identify 20 plants and their key characteristics.
- Station 5 Make management recommendations for Ranch Map.
- Station 6 Identify plant anatomy of 20 mounted or flagged plants.

Contest setup

The contest committee must carefully evaluate each ecological site location before deciding on the management scenario and numerical habitat ratings.

For Stations 1 2, and 3-Ecological Sites:

Ecological site evaluation stations normally are 100 by 100 feet but may be smaller if necessary. Mark the boundary with wire flags.

Mark a path through the middle of the site to assure that 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.

Set 3-foot stakes at 50 or 100 feet to determine slope. Develop management scenario and manager’s goal for each station.

For Station 4- Plant identification:

Use wire flags numbered 1 through 24.

The statewide plant list consists of 237 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 Station 5-Ranch Map:

Have copies of Ranch Map available for evaluation.

For Station 6-Plant Anatomy:

Use 20 dried, mounted plants or flagged live plants.



Bottlebrush Squirreltail



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. A simple calculator is permitted for the Ranch Map exercise. No other student-provided aids are permitted.

Contestants will be given:

- Ecological Site and Plant ID scorecards.
- A management scenario and objective for stations 1, 2 and 3.
- Local guides for calculating similarity index.
- A beef cattle habitat appraisal form.
- A sage grouse habitat appraisal form.
- These worksheets and scorecard will be the same as those in this judging manual.
- A Ranch map
- A plant anatomy question sheet.
- A minimum of 20 minutes will be allowed for judging each station.
- An additional 10 minutes will be allowed at each station for completing the scorecard.
- 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.



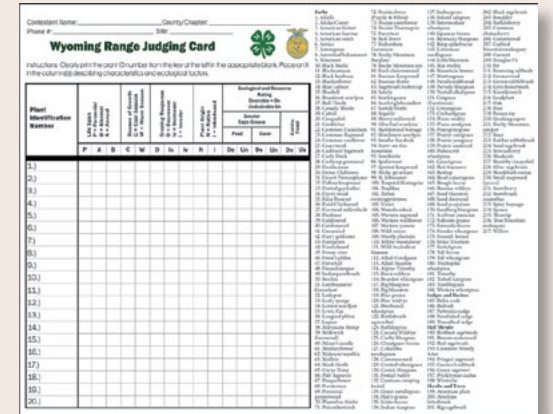
Other contest information

Contests are designed to evaluate habitat suitability factors for beef cattle and sage 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 sage grouse. Habitat rating values, ranging from 0 to 40, 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 in order to meet the objective. Assume that if a factor is limiting (checked), then its value is automatically raised to 40. 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 sage 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, 2 and 3) is 115 points (345 combined). For plant identification, 200 points are possible (10 points for each plant), for the Ranch Map, 300 points are possible, and for plant anatomy 100 points are possible (5 points for each plant). Contest maximum is 945. If judging as a team: 4-H teams will consist of three or four members, and the score from the lowest member will not be counted in 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.



Ecological Sites

Introduction

Land areas of the world can be classified in many ways such as forest land, cultivated land or non-cultivated land (range land). Rangeland is a specific kind of land that produces grass, forbs, and shrubs that can be harvested by grazing animals. It provides water (hydrology), wildlife habitat, areas of natural recycling of wastes and purification of air, and biodiversity. In addition, rangeland has aesthetic value and provides open space and urban buffer areas.

Most rangeland is not suited for farming because of the rough terrain, soil factors and sometimes climatic conditions that make it unsuitable for cultivation. Therefore, most rangelands remain as native vegetation providing many products of value on a sustained self-renewing basis.

Rangeland in Wyoming may appear as a monotonous expanse of shrub land (or grassland) that is very similar throughout. However, it actually consists of many different groups of plants (called plant communities) which are different enough to be classified separately into ecological sites.

Rangeland landscapes are divided into ecological sites for the purpose of management, evaluation, and inventory. Ecological site inventories vary among federal agencies, state agencies, and universities. However, most inventories use the same basic approach in comparing the reference plant communities on any specific soil. This section uses some of the site criteria used by the Natural Resources Conservation Service.

Ecological Sites

An ecological site is a distinctive kind of land with specific physical characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. Ecological sites have characteristic soils that have developed over time throughout the soil development process. The factors of soil development are parent material, climate, living organisms, topography or landscape position, and time. Because an ecological site is the cumulative response to all environmental factors that give it a set of key characteristics, the relationship between the soil, plant community and the environment must be understood. Sites (see Figures 1 and 2) are grouped based on landscape positions, Land Resource Units (LRU's), and Major Land Resource Areas (MLRA's) that are developed based on geology, climate and locations. (see Figures 3 and 4).

The kinds and amount of vegetation growing within plant communities are determined by topography, climate, exposure, level of water table, and the depth, texture and chemical properties of the soil. Although all parts of the environment have the potential to influence the vegetation on a site, precipitation (amount and timing) probably is the single, most important factor, with length of growing season running a close second. Wyoming is divided into 17 MLRA's (Figure 4), which are then further divided by 17 different zones, or LRU's, which are based on environmental factors, primarily precipitation.

Most ecological sites have evolved with some kind of herbivory regime (kinds, numbers, season and intensity of use) that directly influence the specific plant community and the soil, both of which then influence the hydrology of the site (potential for water infiltration and runoff). Each site also evolved with a disturbance regime (i.e. fire and/or drought frequency and intensity) that contributed to the characteristic plant communities of the site. Good range management can use these influences to improve forage production, forage variability, seasonal distribution and water intake.

Water intake is correlated with the amount of old and new vegetation that is left to protect the soil from erosion and crusting. Different kinds of rangeland often are classified according to availability of soil



moisture. By studying the position of an ecological site within the landscape you can group ecological sites within three ranges – Normal, Run-in or Run-off (Figure 2&5). Are you standing in a drainage or are you on the top of a hill? Topography influences the moisture conditions of an ecological site. “Normal” ecological sites allow vegetation to normally respond to climate and are not affected by topography, soil or moisture limiting factors. However, areas which receive additional water are designated as “run-in” sites because they receive water from adjacent sites due to their lower landscape position, giving them superior soil moisture availability and more productivity potential. In contrast, “run-off” sites have topographic features or characteristics that limit soil moisture availability such

as steeper slopes and have lower productivity potential than “normal” sites. A beginner’s Key has been developed to assist in determining which of these locations you are in. (Table 1).

Determine Ecological Sites

Plants often can be used as a clue to classify certain ecological sites. However, management practices or natural occurrences such as heavy grazing, drought, fire, or tillage may change or destroy the vegetation. The more a site has been disturbed, the greater the change in the current vegetation compared to the site potential. A site cannot be identified solely upon vegetation. Ecological sites must be identified on the basis of soils, climate, and topography with indications from vegetation as a minor guide.

The first step in identifying ecological sites is to select a representative location within each area. Then, excavate a small hole and examine the soil characteristics. Determine soil texture.

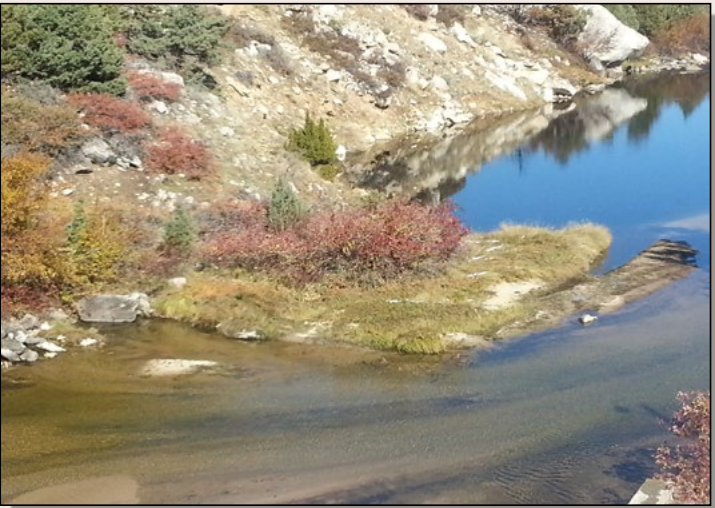
Then use the Ecological Site Key (Table 1) to assist with the identification of ecological sites.

Descriptions of Ecological Sites

Currently, there are twenty four or more ecological sites recognized within the seventeen LRU’s currently established in Wyoming. Twelve of the most important ecological sites are listed below. The key plants that can be found on these sites in most of the LRU breaks are also listed with each ecological site.

SUB IRRIGATED (Fig. 2, Line 1):

This site usually occurs adjacent to live streams, lakes, ponds or springs. The soils of this site are deep (greater than 40 inches to bedrock), moderately well drained, with water tables below the surface for all of the growing season. Te water table is non-saline and non-alkaline. These areas may have water over the surface from run-in but only for short periods of time.



The reference plant community is dominated by plants that can tolerate a high water table throughout most of the growing season. The potential vegetation is about 80%grasses or grass-like plants, 10% forbs and 10%woody plants. Some of the important species on this site are Nebraska sedge, basin wild rye, slender wheat grass, tufted hairgrass, and several forbs and willows. Most invaders on this site are annual forbs or introduced perennials such as Kentucky bluegrass or Canada thistle.

SALINE SUBIRRIGATED (Fig. 2, Line 1):

The saline subirrigated ecological site occurs on nearly level bottom lands and adjacent to streams, springs and ponds. The soils have strong saline and/or alkaline water table within the root zone during most of the growing season. A salt crust is commonly found on ridges and mounds during the dry periods. Moisture is not usually the factor limiting plant production.

The reference plant community is dominated by plants that can withstand a high water table throughout most of the growing season along with saline condition. The potential vegetation is about 85% grasses, 5% forbs and 10%shrubs. Some of the important species include alkali sacaton, nuttall alkaligrass, and inland saltgrass. As ecological condition deteriorates, greasewood and inland saltgrass dominate the community. Species most likely to invade the site as cover is reduced are annuals.

LOWLAND (Fig. 2, Line 1 or 2):

This site usually occurs adjacent to streams that run water at least during the major part of the growing season. Soils are generally greater than 40 inches deep and well-drained. A fluctuating water table occurs in these soils, but will be deeper than three feet during most of the year.

The reference plant community is dominated by herbaceous plants that derive no benefit from the water table. Trees and shrubs that can benefit from the water table are an important part of this site. The potential vegetation is about 70 percent grasses and grass-like plants, 10 percent forbs, and 20 percent woody plants. Some of the important species are needleandthread, rhizomatous wheatgrass, basin wildrye, and cottonwoods. Green needlegrass is important in the eastern part of the state. As conditions deteriorate, woody plants such as snowberry, rubber rabbitbrush, and roses tend to increase. Most invaders are annuals.

OVERFLOW (Fig. 2, Line 2 or 5):

This site occurs on lands which receive additional water form overflow of intermittent streams or runoff form adjacent slopes. The soils of this site are deep (greater than 40 inches to bedrock), well drained, and moderately to rapidly permeable. Topsoil may vary from sandy loam through light silty clay loams. Coarser or finer textured surface soils may also be present provided they are less than 2 to 4 inches thick.

The reference plant community is dominated by tall and mid-grasses. The potential vegetation is about 75%grasses and sedges, 15%forbs, and 10% woody plants. Some of the important species are basin wildrye, western wheatgrass, green needlegrass (in the eastern part of the state), canby bluegrass, several forbs, winterfat, silver sagebrush (or basin big sagebrush), and snowberry. Silver sagebrush and rabbitbrush often increase as condition deteriorates. Annual plants are primary invaders on this site.



SALINE LOWLAND (Fig. 2, Line 1 or 2):

The saline lowland ecological site normally occurs on lands which receive additional water from overflow of intermittent streams or run-in from adjacent slopes. The soils of this site are deep (greater than 40 inches to bedrock), well drained, moderately to slowly permeable and are moderately to strongly saline and/or alkaline. Higher soluble salt concentrations may be found in the subsoil.

The reference plant community is dominated by plants that can withstand moderately saline soils. The potential vegetation is about 75 percent grasses, 5 percent forbs, and 20 percent woody plants. Some of the important

species found on this site are alkali sacaton, western wheatgrass, inland saltgrass, bottlebrush squirreltail, greasewood, winterfat, and fourwing saltbush. As ecological condition deteriorates, greasewood and inland saltgrass become more dominant. Annuals and cactus are the dominant invaders on this ecological site.

SANDS (Fig. 2, Line 3):

Gently to moderately rolling lands characterize this ecological site. The soils are deep to moderately deep (more than 20 inches to bedrock), well-drained and rapidly to very rapidly permeable. Soil textures will vary from loamy sand to sand in the surface and subsoil. With deterioration of cover, the soil will develop into active sand dunes.

The reference plant community is dominated by mid-grasses. The potential vegetation is about 85 percent grasses and grass-like plants, 10 percent forbs, and 5 percent woody species. Some of the species found on this site are silver sagebrush , sand bluestem, prairie sandreed (all in the eastern part of the state), Indian ricegrass, needleandthread, several forbs, basin big sagebrush and spiny hopsage (western part of the state) . A decrease in similarity index results in an increase in undesirable or invasive plant species. Invaders species include annuals and broom snakeweed.

SANDY (Fig. 2, Line 3):

Gently to moderately rolling lands characterize this ecological site. The soils are deep to moderately deep (more than 20 inches to bedrock), well drained and rapidly permeable. The surface soils is at least 3 to 6 inches in thickness, depending on texture and permeability of the top soil, and will include the fine sandy loam, sandy loam, or loamy very fine sand textures.

The potential plant community is dominated by mid-grasses. Grasses and grass-like plants contribute about 80 percent, forbs 10 percent and woody plants 10 percent to the total forage production of the site. Some of the important plants found on this site are needleandthread, Indian ricegrass, western wheatgrass, several perennial forbs, winterfat, silver sagebrush, big sagebrush, green rabbitbrush, and snow berry. Prairie sandreed, little bluestem and blue grama are also important in the eastern part of Wyoming. When ecological condition deteriorates, fringed sagewort and cudweed sagewort increase (in the eastern part of the state) while mat-forming forbs such as Hoods phlox and buckwheat increase in the western part of the state.

LOAMY (Fig. 2, Line 3):

The loamy ecological site occurs on lands with slope from nearly level to 50 percent. The soils of this site are deep to moderately deep (greater than 20 inches to bedrock), well drained, and moderately to slowly permeable. The surface soil will vary from 3 to 6 inches in thickness depending on the texture and permeability of the subsoil. The surface soil will be on or more of the following textures: very fine sandy loam, loam, silt loam, and the friable portions of sandy clay loam, silty clay loam and clay loam. Loess material with little or no development is excluded from this site.

The reference plant community is dominated by mid-grasses. The potential vegetation is about 75 percent grasses, 15 percent forbs, and 10 percent woody plants. Some of the important plants are needleandthread, blue grama, green needlegrass, cussick bluegrass, sedges, and forbs and big sagebrush. When similarity index decreases, big sagebrush and short grass, such as blue grama in the east and north, increase. Invader species include prickly pear, broom snakeweed, and several annuals.

CLAYEY (Fig. 2, Line 3):

The clayey ecological site occurs on nearly level land and up to 50 percent slope. The soils of this site are deep to moderately deep (greater than 20 inches to bedrock), well drained, and moderately to slowly permeability. The topsoil is at least 2 to 5 inches deep and one of the following textures: silty clay or the finer portions of sandy clay loam, silty clay loam and clays which do not develop severe cracks or become extremely hard when dry or very sticky when wet.



The reference plant community is dominated by mid-grasses. The potential vegetation is about 80% grasses and sedges, 10% forbs, and 10% woody plants. Some of the plants found are western wheatgrass, blue grama, green needlegrass, in the east, several forbs, winterfat, rabbitbrush and big sagebrush. Big sagebrush increases as similarity index decreases. Prickly pear and broom snakeweed are the primary invaders on the site.

SHALLOW (Fig. 2, Line 4):

Shallow ecological sites usually occurs on steep slopes and ridge tops, but may occur on all slopes. The soils of these site are shallow (between 10 and 20 inches to bedrock), well drained, moderately permeable and may occur on all slopes. The bedrock may be of any kind which is virtually impenetrable to plant roots. The soil textures range from dense clays to coarse sands, resulting in a range of ecological sites such as Shallow Sandy, Shallow Loamy, and Shallow Clayey. Thin ineffectual layers of other textures are disregarded.

The reference plant communities vary by site, but mostly resemble their deep sited counterparts (i.e. Loamy vs. Shallow Loamy) with the main difference in their comparative low productivity. Site is dominated by mid-grasses. The potential vegetation is about 80%grasses and sedges, 10%forbs and 10%shrubs. The overriding factor influencing the vegetation on the site is the 10 to 20 inch soil depth. Bluebunch wheatgrass, needleandthread, rhizomatous wheatgrass, and various sagebrushes are important plants. Cactus, broom snakeweed and annuals are often invaders on this site.

SALINE UPLAND (Fig. 2, Line 3, 4, or 5):

The saline upland ecological site occurs on nearly level to moderately sloping lands. The soils are deep to moderately deep (more than 20 inches to bedrock), well drained, moderate to slowly permeable and are moderately to strongly saline or alkaline. Some soils may contain more soluble salts in the subsoil. Production is less on this site because the site receives no additional moisture from run-in. The reference plant community is dominated by salt tolerant plants. The potential vegetation is about 45% grasses, 5 percent forbs and 50 percent woody plants. Some of the important species are Gardner’s/ Nuttall’s saltbush, winterfat, western wheatgrass, Indian ricegrass, alkali sacaton and bottlebrush squirreltail. Unpalatable forbs and shrubs increase as the similarity index decreases. Most invaders on this site are annuals

VERY SHALLOW (Fig. 2, Line 6):

The soils of this site are very shallow (less than 10 inches to bedrock, well drained, rapidly to slowly permeable and can be of any texture. This site usually occurs on steep slopes, but may be on any slope. The bedrock will include all kinds except soft clay shale, igneous and some volcanic parent materials.



The reference plant community is dominated by mid-grasses. The potential vegetation is about 70 percent grasses and sedges, 10 percent forbs and 20 percent woody species. Ponderosa pine (in the eastern part of the state), limber pine (western) and Rocky Mountain and Utah juniper should be added to the list of important plants found on the shallow site. Big Sagebrush, juniper and skunkbrush sumac increase as condition deteriorates. Annuals such as cheatgrass are most likely to invade this site. Plant communities and the corresponding ecological sites will shift with soil depth on a characteristic pattern that is closely related to precipitation. If precipitation is 10 inches or more, these changes usually occur at 10 inches and 20 inches soil depths. If precipitation is less than 10 inches, however changes occur at 8 inches and 15 inches of soil depth.

For example, loamy textured soils in a 10 to 14 inch precipitation zone would be:

Less than 10 inch soil depth -	Very shallow
10 to 20 inch soil depth -	Shallow
Greater than 20 inch soil depth -	Loamy

In a 5 to 9 inch precipitation zone, loamy textured soils would be:

Less than 8 inch soil depth -	Very Shallow
8 to 15 inch soil depth -	Shallow
Greater than 15 inch soil depth -	Loamy



TABLE 1
BEGINNERS KEY TO ECOLOGICAL SITES

This simple key gives a place to start when learning to identify ecological sites. It focuses on the 3 major landscape classifications or positions and the relation to water availability within a location in Rangelands. Once you are able to move through this key without guidance, then it is time to move up to the Wyoming ecological site key.

TO IDENTIFY AN ECOLOGICAL SITE, DETERMINE WHICH ONE OF THESE THREE QUESTIONS CAN BE ANSWERED “YES”.

Does the site receive additional moisture from overflow? Or does it have groundwater close to the surface (within 3 ft.) at least part of the growing season?

If yes, the ecological site class is-----RUN – IN

If no, go to the next question.

Is the soil depth at least 20 inches (15 inches in 5-9 inch and 7-9 inch precipitation zones) from the surface with no sign of significant additional moisture? Does the slope of the site range from 0-15%?

If yes, the ecological site class is-----NORMAL

If no, go to the next question.

Is the site located on slopes greater than 15%? Or is the soil depth less than 20 inches (or less than 15 inches in 5-9 inch and 7-9 inch precipitation zones) to un-weathered parent material?

If yes, the ecological site class is-----RUN – OFF

If no, go back and try again.



TABLE 2
KEY TO COMMON WYOMING ECOLOGICAL SITES USED IN RANE JUDGING AND EDUCATION ACTIVITES.

To identify an ecological site, first determine which one of these two questions can be answered “yes”.
Is the soil moderately to strongly saline and/or alkaline?

If yes, go to GROUP 1.

If no, go to the next question.

Is the soil non-saline and non-alkaline?

If yes, go to GROUP 2.

GROUP 1 – ECOLOGICAL SITES THAT ARE SALINE AND/OR ALKALINE

Is there a water table within rooting depth of herbaceous forage species (2-3 ft. to a water table) during most of the growing season?

If yes, the range site is-----SALINE SUBIRRIGATED

If no, go to the next question.

Is there significant additional moisture from runoff of adjacent slopes from intermittent streams or is there a water table within rooting depth of woody plants but not within rooting depth of herbaceous plants (greater than 3 ft. to a water table)?

If yes, the range site is-----SALINE LOWLAND

If no, go to the next question.

Does the site occur on nearly level to steep uplands and/or terraces, without additional moisture?

If yes, the range site is-----SALINE UPLAND

If no, go back and see if you are in the right group and try again.

GROUP 2 – ECOLOGICAL SITES THAT ARE NON-SALINE AND NON-ALKALINE

Is there significant additional moisture from runoff of adjacent slopes or from intermittent streams or water table?

If yes, go to -----SUBGROUP A

If no, go to the next question.

Is the soil at least 20 inches deep to a restrictive layer or bedrock (at least 15 inches deep in 5-9 inch or 7-9 inch precipitation zones)?

If yes, go to -----SUBGROUP B

If no, go to the next question.

Is the soil less than 20 inches deep to a restrictive layer or bedrock (less than 15 inches deep in 5-9 inch or 7-9 inch precipitation zones)?

If yes, go to -----SUBGROUP C

If no, go back and see if you are in the right group and try again.

SUBGROUP A – ECOLOGICAL SITES THAT RECEIVE SIGNIFICANT ADDITONAL MOISTURE

Is there a water table within rooting depth of the herbaceous forage species (2-3 ft. to a water table) during most of the growing season?

If yes, go to -----SUBIRRIGATED

If no, go to the next question.

Doe this site occur adjacent to streams that run water at least during the major part of the growing season, with a water table within rooting depth of woody plants, but not within rooting depth of herbaceous plants (greater than 3 ft. to a water table)?

If yes, go to -----LOWLAND

If no, go to the next question.

Does the site occur on land which receives additional moisture from overflow of intermittent streams or runoff from adjacent slopes, but without a water table within the rooting depth of woody plants?

If yes, go to -----OVERFLOW

If no, go back and see if you are in the right group and try again.

SUBGROUP B – SITES WITHOUT SIGNIFICANT ADDITIONAL MOISTURE WITH SOILS AT LEAST 20 INCHES DEEP TO A RESTRICTIVE LAYER OR BEDROCK (or at least 15 inches deep in 5-9 inch or 7-9 inch precipitation zones).

Is the surface layer (4-6 inches)a sand to loamy coarse sand texture?

If yes, go to -----SANDS

If no, go to the next question.

Is the surface layer a loamy sand or a sandy loam to a fine sandy loam texture?

If yes, go to -----SANDY

If no, go to the next question.

Is the surface layer a very fine sandy loam, loam, silt loam or silt texture?

If yes, go to -----LOAMY

If no, go to the next question.

Is the surface layer a clay, sandy clay, clay loam, silty clay, silty clay loam or a sandy clay loam texture?

If yes, go to -----CLAYEY

If no, go back and see if you are in the right group and try again.

SUBGROUP C – SITES WITHOUT SIGNIFICANT ADDITIONAL MOISTURE WITH SOILS LESS THAN 20 INCHES DEEP TO A RESTRICTIVE LAYER OR BEDROCK (less than 15 inches deep in 5-9 inch or 7-9 inch precipitation zones.)

Is the soil depth between 10 and 20 inches deep to a restrictive layer or bedrock (or between 8 and 15 inches deep in 5-9 inch or 7-9 inch precipitation zones)?

If yes, go to -----SHALLOW

If no, go to the next question.

Is the soil depth less than 10 inches deep to a restrictive layer or bedrock (less than 8 inches deep in 5-9 inch or 7-9 inch precipitation zones)?

If yes, go to -----VERY SHALLOW

If no, go back and see if you are in the right group and try again.

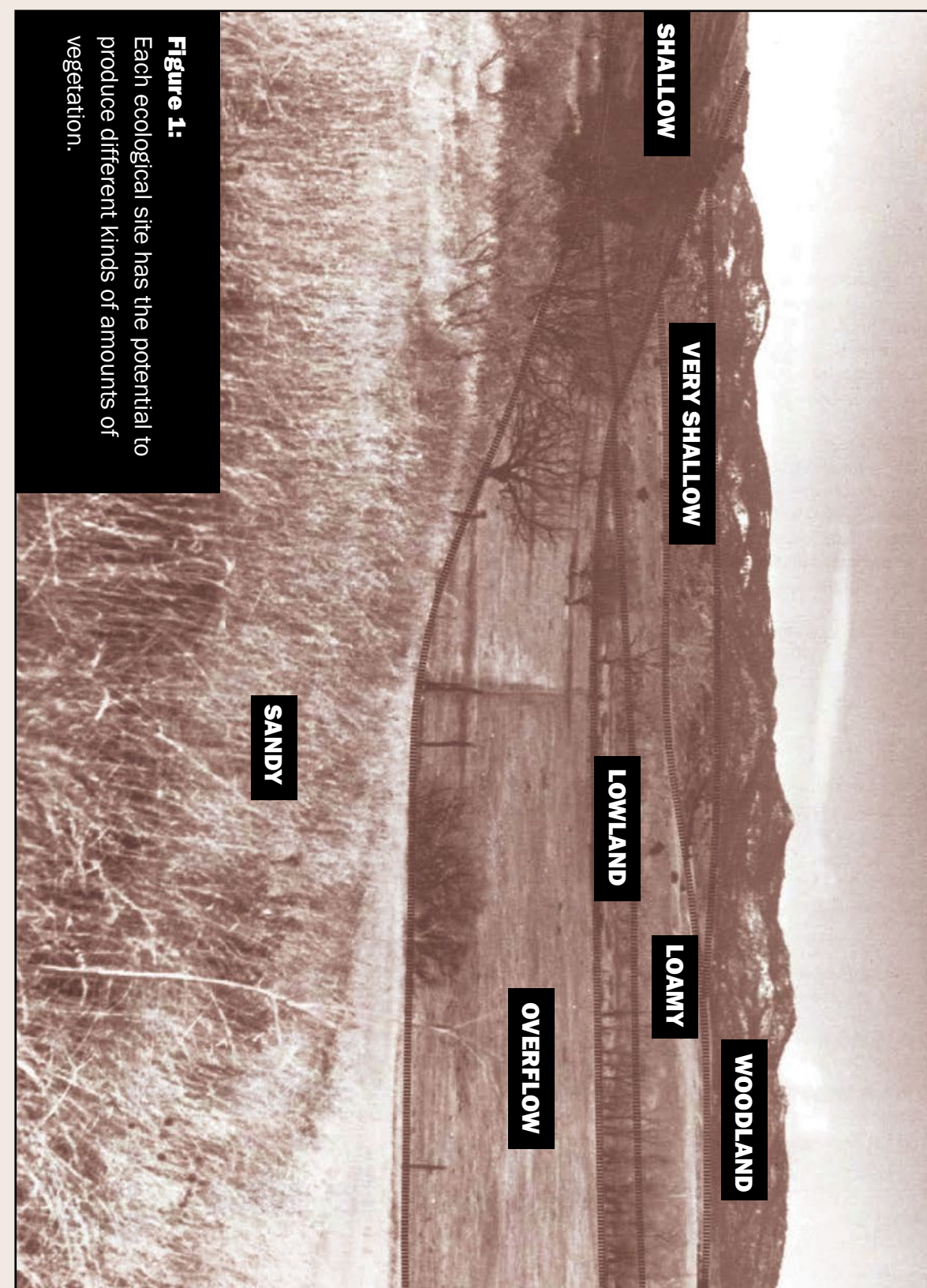
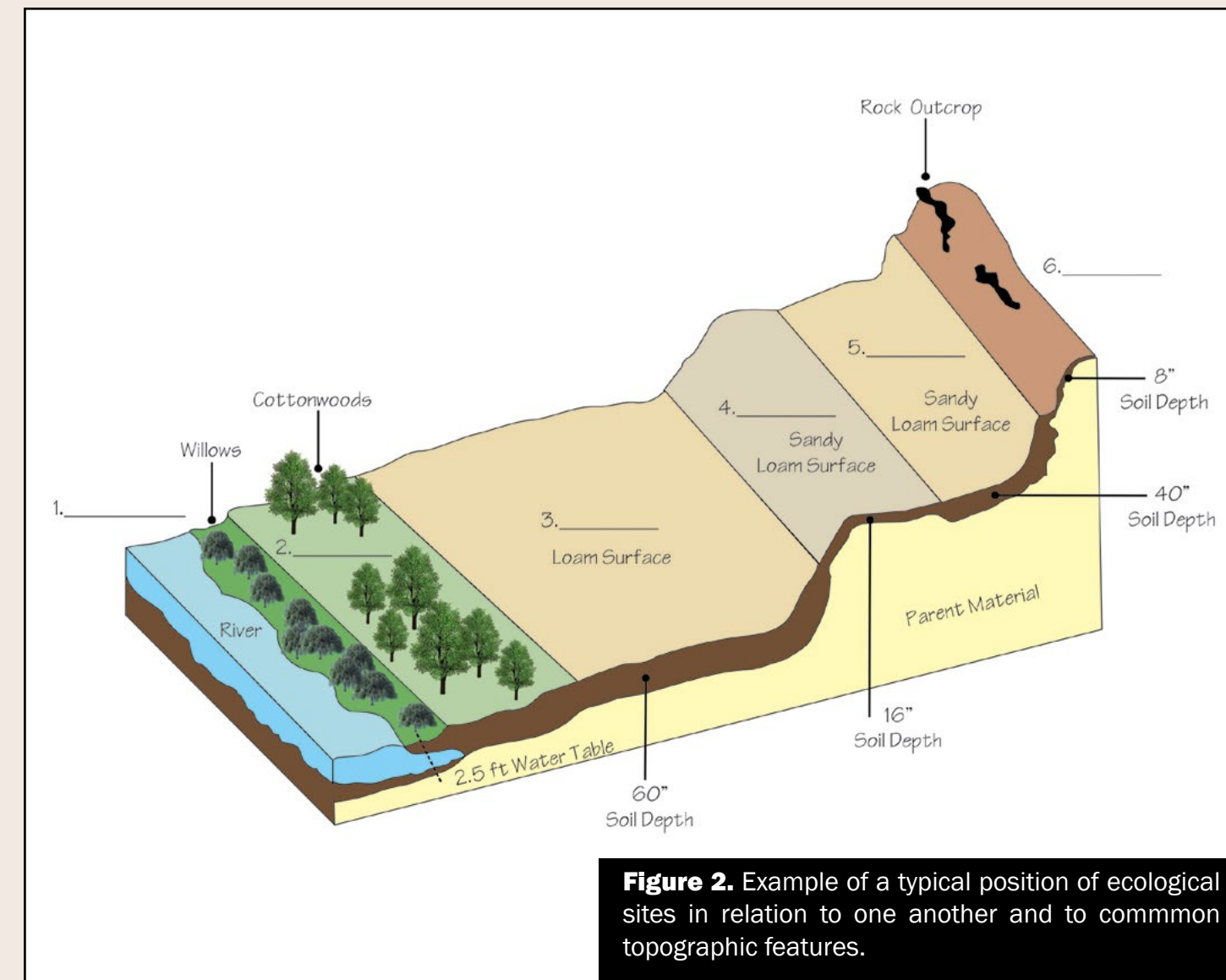


FIGURE 1 – Each ecological site produces a different kind and/or amount of vegetation within a landscape position.



States and Transitions within an Ecological Site:

Development of soil and a plant community cycles in a process known as succession and retrogression. Succession is when a plant community moves from a degraded or disturbed state towards the expected or reference plant community within an ecological site. Retrogression is the process of being disturbed or degraded where the community is moving away from the reference community. These processes occur over time and are the result of interactions of climate, soil development, plant growth and man induced and/or natural disturbances.

Succession is divided into primary and secondary processes. Primary occurs on sites or soils/stratum that never has supported vegetation previously, such as lava flows, volcanic ash deposits, etc. Where secondary succession occurs on soils previously formed and supporting vegetation that was partially or completely removed.

Natural disturbances and the climatic conditions, within a “normal” regime, creates a dynamic equilibrium that supports a “typical” set of plant communities referred to as the Reference State. The dynamic within this equilibrium includes both succession and retrogression. The pathway may not be a simple reversal of disturbances impact, and may not follow the same pathway as primary succession.

If the dynamic equilibrium of a site is upset due to changes in climate, or in a disturbance regime (i.e. increase in fire frequency or lack of fire), a plant community may develop that is not reversible without intervention by man, and even then it may be financially prohibitive. It is these transitions in the dynamics of an ecological site that create a State and Transition Model (STM). This model provides a method to organize and classify the vegetative response to disturbances and management or the lack there of.

States can be one or many plant communities that are relatively stable and resistant to change up to a threshold. The, threshold is a boundary between two stable states wherein one or more ecological processes has been altered, either by means of natural events or a change in management. Many thresholds can exist within each State and Transition Model. Once a threshold has been crossed, disequilibrium among the ecological processes exists and will cause a change in the vegetative community and possibly the soils. When the system reaches a new equilibrium a new stable state is formed.

A Transition is the pathway of change between two states. This transition can be caused by natural events, management actions or often combinations of events. Some may occur quickly while others occur over long periods of time. Transitions can be reversible or irreversible. Transitions within a state are generally reversible however; once the threshold is crossed the transition is irreversible without significant inputs of management, resources, and energy.

The first state described in an ecological site description is the Reference State. This state often includes a Reference Plant Community which has been identified and measured over time on this site. From this state, the State and Transition Model is a map to the other states by following the transitions, which are each identified separately, between the states.



Similarity Index

Rangelands are classified into Ecological sites based on soils, topography, and climate that make up their unique characteristics. Each site has a characteristic plant community that has developed on the site according to these factors. We refer to this as the Reference State and Community, previously referred to as “Historic Climax Plant Community.”

In the plant section we learned to identify our plants and determine their important characteristics, such as response to grazing. In the Soils and Geology section and in the Ecological site section we learned how to answer the very important question “What is our potential?” Potential is referring to the potential plant community s well as the potential productivity for each ecological site.

The reference or historic climax plant community is detailed by the types, amounts, and proportions of different plant species that dominate a site. It is what is used is to describe the potential plant community and potential productivity of each ecological site.

The next important question we need to answer is “What are we producing now compared to what we could produce?” The plant community is a good indicator of changes in the health of our site. Wildlife diversity, soil erosion, and livestock production will all be affected by changes in our plant community.

Overtime, our rangelands shift with different management practices, disturbances, and or climatic changes. The existing plant communities are often different from what is established as the Reference community. This comparison is called the “Similarity Index”. Similarity index is not a replacement or true equivalent to condition scores for range sites. They are both similar in that they are ratings on the transition away from the potential of a site; however different, there is a strong relationship that allows a soft correlation between the two numbers.

The purpose for determining “Similarity Index” is to describe the extent and direction of changes that have taken place on a site from its original characteristics or condition. We can then begin to predict what changes could occur from implementing a new grazing management strategy or other practices (grazing land mechanical treatment, prescribed burning, etc.)

The evaluation of the similarity index provides a baseline of information to establish goals and objectives for rangeland management. Changes in similarity index can be monitored over time to determine if you are meeting your management goals – productivity, plant diversity, habitat types.

If vigorous, productive, palatable plants are present on a particular ecological site, then that range will score with a higher similarity index or in a higher state of health. Most of these plants would be the “decreaser” group (see plant section and glossary of terms).

If weedy, poor producing, unpalatable plants dominate this same range site, then that range will score a low similarity index or a lower state of health. These plants would be primarily “invaders” and some “increasers”. The groups of plants called decreasers, increasers, and invaders change in relative abundance as the similarity indices changes and thus the percent they contribute to the yield of a particular ecological site increases or decreases.

When the site is dominated by decreasers, with some increasers present, the site is at or very close to its potential production and diversity. If the decreaser plants are overgrazed, they will decrease in abundance and the group of plants called increasers will increase in abundance to fill the gaps. But, as the increaser group begins to carry the grazing load, they too may begin to decrease if they are overgrazed.

As this process continues, an invader group of species that was not on the site when it was at, or near, climax begins to invade the site to fill the voids an protect the soil. If overgrazing continues, eventually this site will be totally dominated by invaders, with a small amount of increasers and little or no decreasers. The ecological principle “that nature does not permit a vacuum” becomes very important in this illustration. Something will be growing on most rangeland. Whether it is decreasers, increasers, or invaders depends on how it is grazed or what other environmental impacts/disturbances have occurred.

Across the top of the chart in Figure 3 are four categories that were used to describe Range condition but also correlate to the categorization of similarity index. The percent scored is used to indicate the amount of vegetation considered to be reference vegetation for this site.

- 1. Excellent: 76 - 100 percent score (condition). Most of the vegetation consists of decreaser plants.
- 2. Good: 51 – 75 percent score (condition). Fewer decreaser plants are present and increaser plants are more common.
- 3. Fair: 26-50 percent score (condition). Vegetation is mostly increaser plants with some invaders present. A few decreaser plants may be present, but are low in vigor.
- 4. Poor: 0-25 percent score (condition). Low growing plants and invaders make up most of the vegetation. Soil erosion may be evident.

The Technical Guides provided in this manual are simplified for a general overview of ecological sites within specific precipitation zones. However, the land base has been divided into Major Land Resource Areas (MLRA's) which are large geographical groupings of similar landscapes, climate etc. These MLRA's are the further subdivided into Land Resource Units (LRU's) that are similar to the precipitation zone divisions that have been used in the past. For maps and references to these new divisions and the more complex key and list of ecological sites for each of these units, please refer to the Electronic Field Office Technical Guide (E-FOTG) secion 2, posted on the USDA-Natural Resources Conservation Service (NRCS) website (www.wy.nrcs.usda.gov). In these documents the pounds per acre (lbs./ac.) are stated as well as percent composition by weight. For further information on similarity indexing, refer to the USDA-NRCS National Range and Pasture Handbook, 2003.

(<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17734.wba>)

Determining Similarity Index

To determine the similarity index, the following procedures and information must be known or be available.

- 1. Determine what geographical area (MLRA), ecological site and precipitation zone you are in. (see ecological site descriptions and the key to ecological sites in the ecological site section.)
- 2. Identify the plants that are present within the plot or transect (to classify them as to reaction to grazing - list the best perennial plants first, then other perennials and then annuals). (See plant list and characteristics in the plant section.)
- 3. Estimate the percent composition, by air dry weight, which each species contributes to the total production. There are many different ways you can use to help you make an accurate estimate of this weight. One of the most effective ways is to actually mark out a plot and clip off, by species, all this year's production, dry it and weigh it. But remember, your estimate must reflect all of the production for the year. For example, if you clipped a site in July, the sandberg bluegrass would be dried up. So you must estimate how much production it made in the early spring. For help on making accurate estimates, ask your local Natural Resources Conservation Service, Bureau of Land Management, Forest Service, Extension Service or other specialists to assist you and explain the methods they find useful.
- 4. Determine the weight of each plant which can be counted toward the similarity index score from the “Technicians guide to Ecological sites and Similarity Index”. Be sure to use the proper MLRA and precipitation zone for the ecological site you have identified.
- 5. A worksheet for determining similarity index is provided which shows the steps to arrive at a similarity index score.



SIMILARITY INDEX WORKSHEET Figure 3

Ecological Site: _____

Planted Identified	% Current Composition	% Reference Composition	Allowable %
TOTAL:	100%		

SIMILARITY INDEX (F/E):

Beef Cattle

Beef cattle is a common use of Wyoming's rangelands. The ability for rangeland to be utilized for beef cattle varies on the factors that affect management. Availability of forage, water and shelter are primary needs for cattle. Rangelands with more grass cover and less shrub and tree cover tend to provide better quality habitat for livestock production.



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. Once the most-limiting factor is identified, and if other factors are limiting (below the stated goal), the other limiting factors should be identified to ensure that needed management practices are selected to improve the habitat for beef cattle.

This evaluation guide evaluates only the condition of the natural resources. Economic goals, natural resources conditions, and family goals must be evaluated in an actual situation. Beef cattle habitat is influenced by forage and distribution factors and site integrity. 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. 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. However, the animals will use shrubs or woody or forested areas if available.

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

Forage Factors

The forage factors to evaluate are Similarity Index, 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.

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.

Distribution Factors:

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 movement and 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.

Site Integrity:

Site integrity evaluation involves assessing the presence of invading plants and evaluating their impact on the ecological site and habitat. When either a single invasive species or a combination of invasive species make up more than 5% of the site, the site integrity is considered to be affected.



BEEF CATTLE HABITAT EVALUATION FORM

Habitat Requirements: Essential habitat components needed for survival and propagation of the species. For beef cattle, evaluate (A) forage and (B) distribution factors.

Forage Components: Forage of annual and perennial grass, forbs, legumes, and woody plants.

Circle Correct Value
Site
1 2 3

Forage Production - How abundant (composition by weight) are the desirable food producing plants?

Site has 76-100% by weight of desirable forage plants for beef cattle	<u>40</u>	<u>40</u>	<u>40</u>
Site has 51-75% by weight of desirable forage plants for beef cattle	<u>30</u>	<u>30</u>	<u>30</u>
Site has 26-50% by weight of desirable forage plants for beef cattle	<u>20</u>	<u>20</u>	<u>20</u>
Site has 0-25% by weight of desirable forage plants for beef cattle	<u>10</u>	<u>10</u>	<u>10</u>

Forage Diversity - How diverse is the desirable food producing plant community? (plant types = grasses, forbs, legumes, and woodies.)

Food plants represented by 4 of the 4 major plant types	<u>40</u>	<u>40</u>	<u>40</u>
Food plants represented by 3 of the 4 major plant types	<u>30</u>	<u>30</u>	<u>30</u>
Food plants represented by 2 of the 4 major plant types	<u>20</u>	<u>20</u>	<u>20</u>
Food plants represented by 1 of the 4 major plant types	<u>10</u>	<u>10</u>	<u>10</u>

Forage Utilization - How long is the residue of key (marked) utilization plants?

	Tallgrass	Midgrass	Shortgrass			
Light Use	(>8")	(>5")	(>4")	<u>30</u>	<u>30</u>	<u>30</u>
Moderate Use	(>5-8")	(4-5")	(3-4")	<u>40</u>	<u>40</u>	<u>40</u>
Heavy Use	(4-5")	(2-3")	(1-2")	<u>20</u>	<u>20</u>	<u>20</u>
Severe Use	(<4")	(<2")	(<1")	<u>10</u>	<u>10</u>	<u>10</u>

Lowest score of 3 rated criteria = Limiting Factor for Forage Factors

Distribution Components - Physical factors that limit the grazing animal

Circle Correct Value
Site
1 2 3

Grazing Accessibility - How accessible are the forage plants to grazing animals?

Slope less than 5%	<u>40</u>	<u>40</u>	<u>40</u>
Slope 5-10% and smooth	<u>35</u>	<u>35</u>	<u>35</u>
Slope 5-10% and rough (exposed surface rock)	<u>25</u>	<u>25</u>	<u>25</u>
Slope 11-15% and smooth	<u>30</u>	<u>30</u>	<u>30</u>
Slope 11-15% and rough (exposed surface rock)	<u>20</u>	<u>20</u>	<u>20</u>
Slope greater than 15% and smooth	<u>15</u>	<u>15</u>	<u>15</u>
Slope greater than 15% and rough (exposed surface rock)	<u>10</u>	<u>10</u>	<u>10</u>

Grazing Restraint - How much woody cover is there below 6 feet?

Brush canopy cover less than 30%	<u>40</u>	<u>40</u>	<u>40</u>
Brush canopy cover 31-50%	<u>30</u>	<u>30</u>	<u>30</u>
Brush canopy cover 51-80%	<u>20</u>	<u>20</u>	<u>20</u>
Brush canopy cover greater than 80%	<u>10</u>	<u>10</u>	<u>10</u>

Water - How far is water from the grazing site? (Given)

Distance less than or equal to 1/2 mile	<u>40</u>	<u>40</u>	<u>40</u>
Distance greater than 1/2 up to 1 mile	<u>30</u>	<u>30</u>	<u>30</u>
Distance greater than 1 up to 1 1/2 miles	<u>20</u>	<u>20</u>	<u>20</u>
Distance greater than 1 1/2 up to 2 miles	<u>10</u>	<u>10</u>	<u>10</u>
Distance greater than 2 miles or not available in the grazing unit	<u>0</u>	<u>0</u>	<u>0</u>

Lowest score of 3 rated criteria for Distribution Factors

Site Integrity - Invasive plants.

1. Are invasive plants present?

No – does not exceed 5%	<u>40</u>	<u>40</u>	<u>40</u>
Yes – resource value rating desirable	<u>20</u>	<u>20</u>	<u>20</u>
Yes – resource value rating undesirable	<u>10</u>	<u>10</u>	<u>10</u>

Lowest score of 1 rated criteria = Limiting Factor for Site Integrity

Site 1. Summary

(A) Forage Components	(B) Distribution Components	(C) Site Integrity
<div></div>	<div></div>	<div></div>

Habitat Rating Based on the Limiting Factor (lowest value)

Excellent_____	Good_____	Fair _____	Poor_____
(31 to 40)	(21 to 30)	(11 to 20)	(<11)

Site 2. Summary

(A) Forage Components	(B) Distribution Components	(C) Site Integrity
<div></div>	<div></div>	<div></div>

Habitat Rating Based on the Limiting Factor (lowest value)

Excellent_____	Good_____	Fair _____	Poor_____
(31 to 40)	(21 to 30)	(11 to 20)	(<11)

Site 3. Summary

(A) Forage Components	(B) Distribution Components	(C) Site Integrity
<div></div>	<div></div>	<div></div>

Habitat Rating Based on the Limiting Factor (lowest value)

Excellent_____	Good_____	Fair _____	Poor_____
(31 to 40)	(21 to 30)	(11 to 20)	(<11)

GUIDE TO MANAGEMENT PRACTICES FOR BEEF CATTLE

CONTINUE PRESENT MANAGEMENT — Use when the current management objective is met by the present condition of the site.

DECREASE STOCKING RATE FOR BEEF CATTLE — Use when forage utilization is the limiting factor because of overuse.

INCREASE STOCKING RATE FOR BEEF CATTLE — Use when forage utilization is the limiting factor because of lack of use.

BEGIN A PLANNED GRAZING SYSTEM — Use when forage production and/or forage diversity is the limiting factor.

DEVELOP WATER FOR BEEF CATTLE — Use when water is the limiting factor because of distance to water.

CHANGE THE KIND OF GRAZING/BROWSING ANIMAL — Use when grazing accessibility or grazing restraint is the limiting factor because of terrain or woody cover.

APPLY FORB OR GRASS CONTROL — Use when forage production is the limiting factor and undesirable forbs or grasses exceed 50% (by weight) of the plant community.

APPLY WOODY PLANT CONTROL — Use when forage production or grazing restraint is the limiting factor and woody plants exceed 30% (canopy cover) of the plant community.

APPLY INVASIVE PLANT CONTROL — Use when invasive plants are the limiting factor because of their presence on the site. Use to maintain the integrity of the ecological site when any invasive herbaceous or woody plant occurs. Invasive plants include locally invasive (e.g. Rocky Mountain Juniper, prickly pear etc.) or introduced plants (e.g. cheatgrass, leafy spurge, musk thistle, etc.). Control may be in the form of prescribed fire, herbicide, biological, mechanical, or grazing/browsing. Often, combinations of the above treatments are required. Some invasive plants are difficult to control with existing technology. If more than one invasive plant occurs on the site, choose the plant with the lowest resource value rating.

PLANT ADAPTED FORAGE SPECIES — Use when forage production is the limiting factor and the Similarity Index is 10% or less. This usually occurs on land that has been farmed and not reseeded. Defer grazing until the Desired Plant Community is established. Control competitive plants and invasive species with fire, grazing, or herbicide.

Note: Distance to water will be given.

Greater Sage Grouse

Greater Sage grouse (*Centrocercus urophasianus*) (sage grouse) is the largest grouse in North America. It is a sagebrush obligate, and is entirely dependent on sagebrush ecosystems. This species is considered a “landscape species” (WGFD 2003) because it utilizes a variety of sagebrush structural stages to meet seasonal habitat requirements. Sage grouse are found throughout Wyoming, largely due to large amounts of intact habitats. Mating birds aggregate on leks (display grounds) which are generally bare or grassy patches within larger sagebrush stands. Nesting habitat for females is denser sagebrush that provides hiding cover and is often 2-3 miles from the lekking grounds. Juvenile grouse feed on forbs and insects and are often found in wetter riparian areas. In winter this species specializes on sagebrush that is available above the snow. (WGFD 2003)

In existing rangelands, management of livestock grazing can impact sage grouse habitat and numbers. Grazing can often be beneficial at light and moderate levels of use. At higher levels of use, grazing by livestock or wild herbivores that significantly reduces the herbaceous understory in breeding habitat may have negative impacts on sage grouse populations (Braun 1987).



Breeding Habitat (Lekking)

During the breeding season, in spring, male sage-grouse gather together to perform courtship displays on areas called leks. Leks are typically relatively bare areas, where males perform courtship displays to attract females, surrounded by a sagebrush-grassland, which is used for escape cover, nesting, and foraging. The proximity, configuration, and abundance of nesting habitat are key factors influencing lek locations (Connelly et al. 2011a).

Nesting Habitat

Productive nesting areas are typically characterized by sagebrush with an understory of native grasses and forbs, with horizontal and vertical structural diversity that provides an insect prey base, herbaceous forage for pre-laying and nesting hens, and cover for the hen while she is incubating (Gregg 1991; Schroeder et al. 1999; Connelly et al. 2000; Connelly et al. 2004; Connelly et al. 2011b). Shrub canopy and grass cover provide concealment for sage-grouse nests and young and are critical for reproductive success (Barnett and Crawford 1994; Gregg et al. 1994; DeLong et al.1995; Connelly et al. 2004). Because average clutch sizes is 7 eggs (Connelly et al. 2011a), and sage-grouse exhibit limited re-nesting, there is little evidence that populations of sage-grouse produce large annual surpluses (Connelly et al. 2011a).

Brood Rearing Habitat

Most sage-grouse gradually move from sagebrush uplands to more mesic areas (moist areas, such as streambeds or wet meadows) during the late brood-rearing period (three weeks posthatch) in response to summer desiccation of herbaceous vegetation in the sagebrush uplands (Connelly et al. 2000). Summer use areas can include sagebrush habitats as well as riparian areas, wet meadows and alfalfa fields (Schroeder et al. 1999). These areas provide an abundance of forbs and insects for both hens and chicks (Schroeder et al. 1999; Connelly et al. 2000). This is important because forbs and insects are essential nutritional components for chicks (Klebenow and Gray 1968; Johnson and Boyce 1991; Connelly et al. 2004; Thompson et al. 2006). Late brood-rearing habitats are often associated with sagebrush, but selection is based on the availability of forbs, correlating with a shift in the diet of chicks as they mature (Connelly et al. 1988, and references therein; Connelly et al. 2011b).



Winter Habitat

As vegetation continues to desiccate through the late summer and fall, sage-grouse shift their diet entirely to sagebrush (Schroeder et al. 1999) and depend entirely on sagebrush throughout the winter for both food and cover (Schroeder et al. 1999).

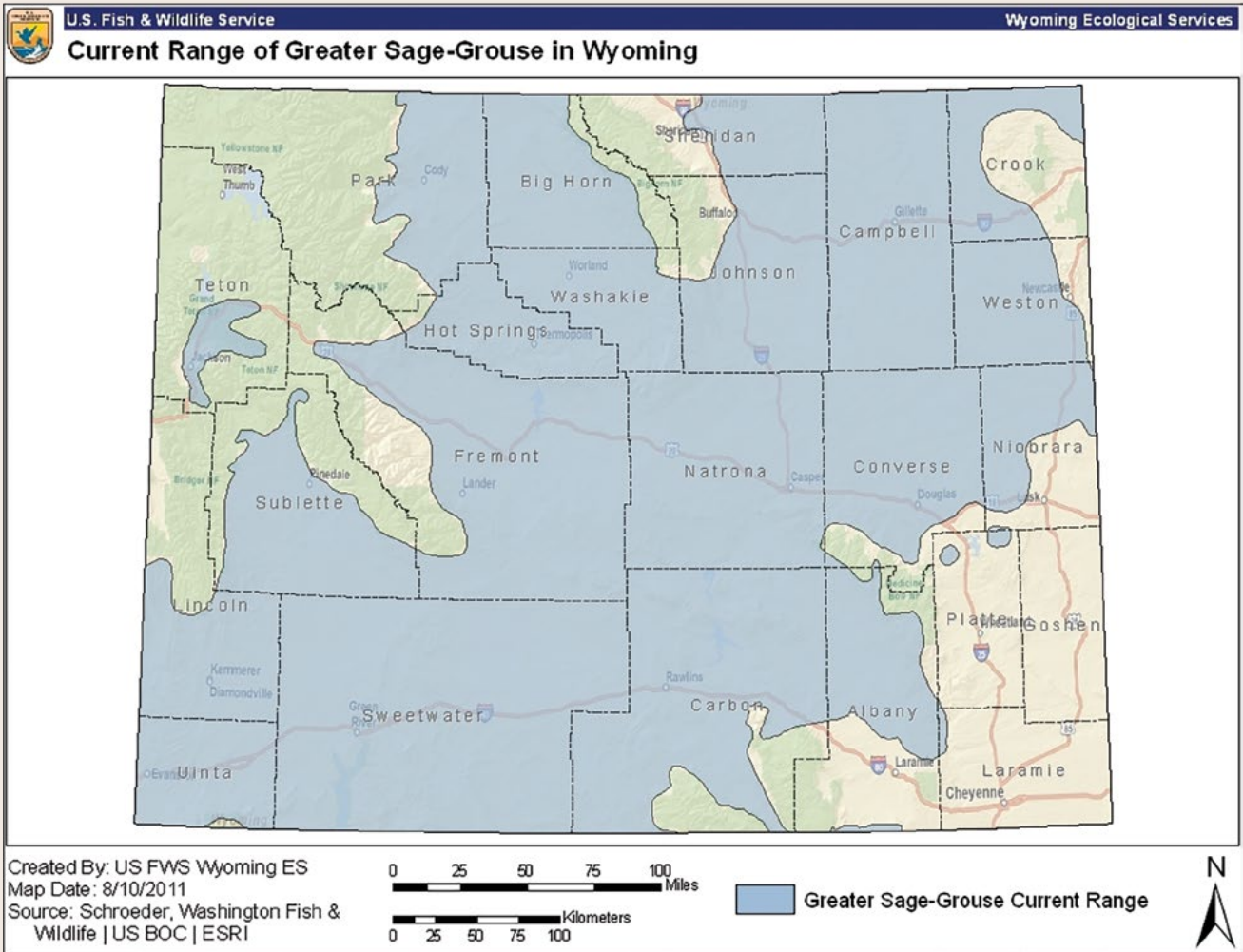


Figure 1. Current sage-grouse habitat within Wyoming (adapted from Schroeder et al. 2004)

Greater Sage Grouse Habitat Evaluation

The sage grouse 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 breeding habitat, nesting habitat, brood rearing habitat, winter habitat and site integrity.

Overall habitat value and limiting factors are identified by using the sage grouse habitat appraisal form. At the discretion of the landowner, those factors that are most limiting often can be eliminated.



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

NOTE: Similarity Index is not for sage grouse habitat evaluation.

The **breeding habitat factors** to judge are **lekking habitat** and proximity to **sagebrush cover**:
Lekking habitat: Leks are typically relatively bare areas, where males perform courtship displays to attract females, surrounded by a sagebrush-grassland.
Proximity to Sagebrush cover: Areas of sagebrush are used for escape cover, nesting, and foraging. The proximity, configuration, and abundance of nesting habitat are key factors influencing lek locations. The nesting cover factors to judge are **nesting cover quality, sagebrush nesting cover and herbaceous nesting cover height**:

Nesting cover quality: Sagebrush with an understory of Mid and tall native grasses and forbs, with horizontal and vertical structural diversity are favored nesting areas for grouse. Sites dominated by short grasses do not provide the environment necessary for nesting.

Sagebrush nesting cover: Canopy cover of sagebrush is a primary factor in nesting success. Sagebrush canopy cover less than 10% does not provide adequate cover for nesting birds. Canopy cover greater than 35%



may limit the amount of understory vegetation.
Herbaceous nesting cover height: Up to a point, taller is better for nesting cover. As a rule, understory herbaceous vegetation (grasses and forbs) less than 4 inches in height does not provide adequate nesting cover. High quality nesting habitat will have understory herbaceous vegetation greater than 7 inches.

The **brood rearing habitat** factors to judge are brood food and brood protective cover.
Brood food: 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.

Brood protective cover quality: Sagebrush cover is the best protection from birds of prey and other predators. When sagebrush patches occur in conjunction with mesic bottoms, the best opportunity exists for having adequate brood food and protection from predators.

The **winter component** factors to judge are **winter protective cover** and **winter food**:
Winter protective cover: Sagebrush vegetation in winter provides a dual purpose. It is important as predator protection and thermal protection. In winter, grouse hide in sagebrush areas to make themselves less visible to predators. Sagebrush patches 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 food: Sage grouse are almost entirely dependent upon the leaves and seeds of sagebrush for winter time food. Sagebrush height is the primary factor determining how much food is accessible to grouse for food in snow conditions.
Site integrity evaluation involves assessing the presence of invading plants and evaluating their impact on the ecological site and habitat.

GREATER SAGE GROUSE HABITAT EVALUATION FORM

Habitat Requirements: Essential habitat components needed for survival and propagation of the spe- cies. For bobwhite quail these components include (A) nesting cover, (B) brood habitat, (C) protective cover, and (D) food.

Breeding Habitat Components:

Lekking habitat – How close is the nearest lekking habitat?

	Circle Correct Value		
	Site 1	2	3
Bare areas or areas of low vegetation are within ½ mile of site	<u>40</u>	<u>40</u>	<u>40</u>
Bare areas or areas of low vegetation are within 1 mile of site	<u>30</u>	<u>30</u>	<u>30</u>
Bare areas or areas of low vegetation are within 2 miles of site	<u>20</u>	<u>20</u>	<u>20</u>
Bare areas or areas of low vegetation are within 4 miles of site	<u>10</u>	<u>10</u>	<u>10</u>
Bare areas or areas of low vegetation are within >4 miles of site	<u>0</u>	<u>0</u>	<u>0</u>

Proximity to Sagebrush cover - How close is the nearest sagebrush cover?

Sagebrush patches are within 1/16 mile of site	<u>40</u>	<u>40</u>	<u>40</u>
Sagebrush patches are within ¼ mile of site	<u>30</u>	<u>30</u>	<u>30</u>
Sagebrush patches are within 1 miles of site	<u>20</u>	<u>20</u>	<u>20</u>
Sagebrush patches are within 2 miles of site	<u>10</u>	<u>10</u>	<u>10</u>
Sagebrush patches are within >2 miles of site	<u>0</u>	<u>0</u>	<u>0</u>

Lowest score of 2 rated criteria = Limiting Factor for Breeding Habitat

<input type="text"/>	<input type="text"/>	<input type="text"/>
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Nesting Cover Components: Last year’s growth must be available during nesting season (April 1 to July 30).

Nesting Cover Quality –What percentage of the site has mid-tall grasses and sagebrush?

50 percent or more of home range is a plant community with preferred grasses and sagebrush	<u>40</u>	<u>40</u>	<u>40</u>
40 to 50 percent of home range is a plant community with preferred grasses and sagebrush	<u>30</u>	<u>30</u>	<u>30</u>
20 to 40 percent of home range is a plant community with preferred grasses and sagebrush	<u>20</u>	<u>20</u>	<u>20</u>
1 to 20 percent of home range is a plant community with preferred grasses and sagebrush	<u>10</u>	<u>10</u>	<u>10</u>
Home range does not have plant community with preferred grasses or sagebrush	<u>0</u>	<u>0</u>	<u>0</u>

Sagebrush Nesting Cover – How dense is the sagebrush canopy cover?

Sagebrush Canopy cover >35%	<u>30</u>	<u>30</u>	<u>30</u>
Sagebrush Canopy cover 25-35%	<u>40</u>	<u>40</u>	<u>40</u>
Sagebrush Canopy cover 10-24%	<u>20</u>	<u>20</u>	<u>20</u>
Sagebrush Canopy cover <10%	<u>10</u>	<u>10</u>	<u>10</u>

Nesting Cover Height - How tall is the herbaceous nesting cover?

Degree of utilization Light or None (>7”)	<u>40</u>	<u>40</u>	<u>40</u>
Degree of utilization Moderate (>5-7”)	<u>30</u>	<u>30</u>	<u>30</u>
Degree of utilization Heavy (4-5”)	<u>10</u>	<u>10</u>	<u>10</u>
Degree of utilization Severe (<4”) (check the appropriate box)	<u>0</u>	<u>0</u>	<u>0</u>

Lowest score of 2 rated criteria = Limiting Factor for Nesting Cover

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Brood Habitat Components:

Brood Food – How much of the site is made up of desirable forbs?

10 percent or more of the plant community is made up of desirable forbs	<u>40</u>	<u>40</u>	<u>40</u>
5 to 10 percent of the plant community is made up of desirable forbs	<u>30</u>	<u>30</u>	<u>30</u>
1 to 4 percent of the plant community is made up of desirable forbs	<u>20</u>	<u>20</u>	<u>20</u>
<1 percent of the plant community is made up of desirable forbs	<u>0</u>	<u>0</u>	<u>0</u>

Brood protective cover quality How many edges are there between herbaceous vegetation and sagebrush patches?

The area has 4 edge changes or more	<u>40</u>	<u>40</u>	<u>40</u>
The area has 2 to 3 edge changes	<u>30</u>	<u>30</u>	<u>30</u>
The area has 1 edge change	<u>20</u>	<u>20</u>	<u>20</u>
The area has no edge change	<u>5</u>	<u>5</u>	<u>5</u>

Lowest score of 2 rated criteria = Limiting Factor for Brood Habitat

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Winter Habitat Components: Escape and loafing cover made up of native woody shrubs, low growing trees, or artificially created brush piles interspersed throughout the home range.

Winter Protective Cover - How much protective cover is there?

Sagebrush Canopy cover >35%	<u>30</u>	<u>30</u>	<u>30</u>
Sagebrush Canopy cover 25-35%	<u>40</u>	<u>40</u>	<u>40</u>
Sagebrush Canopy cover 10-24%	<u>20</u>	<u>20</u>	<u>20</u>
Sagebrush Canopy cover <10%	<u>0</u>	<u>0</u>	<u>0</u>

Winter Food – What is the height of the sagebrush?

Sagebrush height is greater than 24”	<u>40</u>	<u>40</u>	<u>40</u>
Sagebrush height is 20-24”	<u>30</u>	<u>30</u>	<u>30</u>
Sagebrush height is 15-19”	<u>10</u>	<u>10</u>	<u>10</u>
Sagebrush height is <15”	<u>0</u>	<u>0</u>	<u>0</u>

Lowest score of 2 rated criteria = Limiting Factor for Protective Cover

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Site Integrity: Invasive Plants

Are invasive plants present?

No – does not exceed 5%	<u>40</u>	<u>40</u>	<u>40</u>
Yes – resource value rating desirable	<u>20</u>	<u>20</u>	<u>20</u>
Yes – resource value rating undesirable	<u>5</u>	<u>5</u>	<u>5</u>

Lowest score of 1 rated criteria = Limiting Factor for Site Integrity

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Site 1. Summary

(A) Breeding (B) Nesting Habitat (C) Brood Habitat (D)Winter Habitat (E) Site Integrity

Site 1. Summary

(A) Breeding (B) Nesting Habitat (C) Brood Habitat (D)Winter Habitat (E) Site Integrity

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Habitat Rating Based on the Limiting Factor (lowest value)

Excellent_____ Good_____ Fair_____ Poor_____
(31 to 40) (21 to 30) (11 to 20) (<11)

Site 2. Summary

(A) Breeding (B) Nesting Habitat (C) Brood Habitat (D)Winter Habitat (E) Site Integrity

Habitat Rating Based on the Limiting Factor (lowest value)

Excellent	Good	Fair	Poor
(31 to 40)	(21 to 30)	(11 to 20)	(<11)

Site 3. Summary

(A) Breeding (B) Nesting Habitat (C) Brood Habitat (D)Winter Habitat (E) Site Integrity

Habitat Rating Based on the Limiting Factor (lowest value)

Excellent	Good	Fair	Poor
(31 to 40)	(21 to 30)	(11 to 20)	(<11)



GUIDE TO MANAGEMENT PRACTICES FOR GREATER SAGE GROUSE

CONTINUE PRESENT MANAGEMENT — Use when the current management objective is met by the present conditions of the site.

IMPROVE OR DEVELOP BREEDING HABITAT – Use when breeding habitat is the limiting factor. Improvement can be achieved by increasing bare ground or low vegetation is lacking or by increasing sagebrush stands in proximity to lekking areas.

IMPROVE OR DEVELOP NESTING COVER — Use when nesting cover quality or sagebrush canopy cover is the limiting factor. Do not burn, mow, intensively graze, or otherwise remove needed nesting cover (previous year’s growth) (needed from March through June). Protect nesting cover from severe or heavy grazing. Protect nesting cover from burning by choosing an appropriate fire prescription. Note that fires seldom completely burn an area, even in wildfire situations.

DECREASE LIVESTOCK USE — Use when herbaceous nesting cover height is a limiting factor.

IMPROVE OR DEVELOP BROOD REARING HABITAT — Use when brood food or brood protective cover quality is the limiting factor. Remove grass or shrub canopy using spot treatments of mowing, herbicide, burning or grazing to stimulate forb growth or to increase the number of edges.

IMPROVE OR DEVELOP WINTER HABITAT — Use when protective cover quantity, composition, or canopy is the limiting factor. Increase woody plants such sagebrush, or other low growing shrubs or small trees if they are native to the site.

APPLY INVASIVE PLANT CONTROL — Use when invasive plants are the limiting factor. Invasive plants include locally invasive (e.g. Rocky Mountain Juniper, prickly pear etc.) or introduced plants (e.g. cheatgrass, leafy spurge, musk thistle, etc.). Control may be in the form of prescribed fire, herbicide, mechanical, biological, or grazing/browsing. Some invasive plants are difficult to control with existing technology. If more than one plant occurs on the site, choose the plant with the lowest resource value rating.



Musk Thistle

Ranch Map

One of the most important parts of range management is having a grazing plan. This plan need not be complex. Using a ranch map allows ranchers to evaluate the conditions of their ranch and use that information to plan range improvements to maximize production and range health. In range judging, the situation map is used to recommend some of the most common of these range improvements. For contest purposes, teams will be required to evaluate the current situation and stocking rate for a range situation map. They also will be required to suggest practices that can be used to improve the rangeland based on their observations. Situations encountered could range from undeveloped ranches to complex planned rotational grazing systems. In the contest, the situation map utilizes all of the information learned about rangeland through ecological sites and plant identification. Much of the information in this section is likely a review of these concepts.

Part 1: Range Evaluation

Before any management can be done on rangeland, the rancher first must know what conditions currently exist on his/her land. The two most important pieces of information are the ecological site and similarity index (SI) combination. In the range judging contest, this information will be indicated on the situation map, as will the acreage of each ecological site/similarity index combination.

EXAMPLE:

Silty
45 acres good condition (SI = 53%) 30 acres fair condition (SI = 38%)

Sandy
15 acres excellent condition (SI = 78%) 50 acres fair condition (SI = 42%)

Carrying Capacity

Ecological sites play a major role in the production of the plant community that grows on them. The soil properties can help or hinder production of herbage (green plant tissue). The similarity index of rangeland is also a factor in determining how much herbage will be produced. The final factor that influences herbage production is the vegetative zone (Page 11) where the pasture is located.



The combination of an ecological site and similarity index, in a particular vegetative zone, will produce a base amount of forage for grazing livestock. This information has been collected by professional agencies and will be made available to judges during the contest .

This total production will support a given number of animals, which will be discussed later.

EXAMPLE:
45 acres in the lowland ecological site with a similarity index rating of good condition (60%) in the Northern Plains vegetative zone.

45 acres X 0.70 AUMs/acre
= 31.5 AUMs

45 acres of silty rangeland in good condition (60%) can support 31.5 AUMs.

Stocking Rate

Different types of livestock and wildlife differ in their monthly consumption of forage because of differences in size and physiology. Therefore, knowledge of how much a class of animal consumes is important to minimize overgrazing. Animal Unit Equivalents (AUEs) are assigned to each animal species depending on forage intake.

This information is presented in Table 1 (Page 27).

Animal Unit Equivalents Guide

Kinds and Classes of Animals Animal-Unit Equivalent (AUE)

- Cow, dry 1.00
- Cow, with calf 1.00
- Bull, mature 1.25
- Cattle, 1year of age .60
- Cattle, 2 years of age .80
- Horse, mature 1.25
- Sheep, mature .20
- Lamb, 1year of age .15
- Bison, mature 1.00

The stocking rate is calculated the same way for the range situation map as it is for the field judging activity. Multiply the number of animals for each class by the appropriate AUE. Then multiply this value by the number of months grazed.

EXAMPLE:

100 cow/calf pairs grazed from May 1 through Oct. 1

1 cow/calf pair = 1 1 AUE
(Table 1, Page 27)

100 pairs x 1 AUE x 5 months = 500AUMs

The stocking rate should be as close to the carrying capacity as possible for maximum livestock use. Overuse and underuse can result in deterioration of rangeland. For this reason, if the stocking rate exceeds the carrying capacity, the stocking rate should be decreased and defer part of the grazing season. If the stocking rate is less than the carrying capacity, the rate should be increased. Always round your final stocking rate to the nearest number to eliminate decimal points (for example, 178.8 AUMs would be 179 AUMs).

Part 2: Range Improvements

The goal of range improvements is to use all grazing land to its optimum potential for vegetation and forage production. By using range improvement practices, a rancher can distribute grazing evenly across the land. This will minimize overuse and underuse of the rangelands. Range improvements will result in healthier, more productive rangelands. Several practices will be used in the contest situation.



Develop Water

Water should be provided in plentiful quantity and good quality with accessibility in all pastures. While lakes and streams/rivers provide natural water sources, livestock can cause damage to shorelines and banks. Experts recommend that additional water supplies, such as stock tanks, dams, dugouts or other water sources, be available, especially in large pastures. Water should always be within 1.5 miles on level to gently rolling terrain, and within one-half mile on rough or hilly terrain (Table 3). In large pastures (greater than 640 acres), having only one water source can lead to overuse around the site. Areas farthest from the tank will have less use. Additional water sources should be added in this case.

Fence Development

Fencing is one of the most effective tools to control grazing distribution. Cross-fences should be used to divide areas of different production potential (different ecological sites and different similarity indexes). Producers with pastures less than 10 acres in size need not worry about additional fencing in normal situations. Cross-fences also are used to establish a rotational grazing system.

- 1. Fencing is required when pastures have poor livestock distribution patterns. An example would be a pasture with patches of overgrazed and undergrazed vegetation.
- 2. Fencing also is required when pastures have very uneven similarity indexes (poor to excellent) and/or complex combinations of ecological sites.
- 3. When a pasture has a mix of native and planted tame-grass locations, fencing is required to separate the tame grass from the native vegetation.
- 4. Whenever fencing is installed, a planned grazing system must be implemented.

Burn and Mow Old Growth

Burning or mowing old growth is required when pastures are left idle or are undergrazed for long periods of time to restore rangeland health. Burning or mowing also is required when the pasture is dominated by undesirable plant species. Burning or mowing is required when old growth or undesirable species are greater than 70 percent by cover of any pasture or cell within a grazing system.

Livestock will be attracted to these burned or mowed areas due to an increase in the amount of fresh, green herbage. Part of the growing season should be deferred to prevent damage to mowed or burned areas.

Change or Add Salting Locations

Placement of salt and mineral may be the easiest and cheapest practice to improve poor distribution.

- 1. This practice should be done regularly (at least once a year, although more often is preferred). Without movement, these areas can become overused much like water locations.
- 2. Salt and mineral should be placed away from water, in areas that are more lightly used. New locations of salt and minerals should be within sight of the old location so livestock do not have to search for them.

While placing salt licks on the ground is common practice, it is not recommended because salt can be incorporated into the soil, leading livestock back to old salt locations. Unless specified, changing salt and mineral locations always is recommended.

Reseed (full seed) Specific Areas

Land that is in cultivation or disturbed by mining or similar activities within any pasture or cell within a grazing system is required to be reseeded into native or specific introduced grass species. This practice can eliminate many undesirable plants and improves production on these areas. Because of the establishment time and severe disturbance of the soil required for this practice, deferring two or more growing seasons is required.

Interseed Specific Areas

Rangelands with a similarity index of poor condition (0 to 25 percent SI) can benefit from interseeding desirable species into the existing vegetation. Legumes and decreaser plants often are selected for interseeding. This practice will improve the similarity index and forage value of the land.

If greater than 30 percent of any pasture or cell within a grazing system has a similarity index rating of poor condition (0 to 25 percent SI), interseeding those specific areas is required. Deferment of one growing season is required for establishment when interseeding a specific area.

Control Blowouts and Gullies

Coarse surface soils with poor plant cover are subject to severe wind and water erosion. These blowouts or gullies always should be controlled. Mulching and reseeding or similar sod-replacing techniques should be used to control blowouts when present. If greater than 10 percent of any pasture or cell within a grazing system has a blowout or gully, deferment of one growing season is required to allow plants to re-establish and stabilize the topsoil.

Contour Furrowing or Pitting

Mechanical treatments can be used to slow runoff and aid in water infiltration. The practices of contour furrowing and pitting can be used to accomplish this goal. They are best used on fine-textured soils with nearly level to moderate slopes. Because of the mechanical disturbance, deferment of one growing season is necessary.

Apply Woody Plant Control

When greater than 30 percent of the canopy cover of a pasture consists of woody species, they must be controlled. When the similarity index is fair or poor, experts recommend control of these plants when woody species create the low similarity index.

Control Noxious Weeds

Noxious weeds are a major problem facing rangelands. Without control, these species can overtake a site and reduce forage quality and rangeland health. Controlling noxious weeds is required whenever any of them are present. Noxious weeds in Wyoming include absinth wormwood, Canada thistle, diffuse knapweed, leafy spurge, musk thistle, purple loosestrife, Russian knapweed, spotted knapweed, yellow toadflax, Dalmatian toadflax and saltcedar.

Install or Change a Grazing System

Grazing lands in Wyoming and many other Great Plains states developed under periodic grazing from wildlife herds. Weather patterns differ from year to year, causing differences in potential forage production (and consequently, differences in carrying capacity). For these reasons, implementing a planned grazing system always is required to maximize forage production on native rangelands. This practice need not be used on cool-season, tame-grass pastures or if a properly managed rotation system is used.

Deferments

As has been noted in several of the practices, deferment of part, one and two or more growing seasons is at times recommended to maximize the effect of the improvement practice. In contest situations, only the longest time period required for deferment needs to be checked.

EXAMPLE:

If reseeding is used (defer two or more grazing seasons) and mowing also is needed (defer part of a grazing season) within the same pasture, then only the box for “defer two or more growing seasons” needs to be checked.

Conclusion

A key is provided with each map to help decipher map symbols. All information necessary for deter- mining stocking rates, carrying capacities and any practices is included with the map. Some example situation maps follow this section.



Ranch Map

Continue present management — If no range improvement practices are needed and stocking rate is kept the same.

Develop water — If slope is less than 5 percent, water can be 1.5 miles away; if slope is 5 to 10 percent, water can be one mile away; if slope is 11 to 15 percent, water can be .75 mile away; or if slope is greater than 15 percent, water must be within 0.5 mile. When the water location does not meet these requirements, development of water is needed.

Relocate Fence

Divide Pasture (Cross Fence) — Use when pastures have poor livestock distribution patterns, very uneven similarity indexes (for example poor and excellent) and/or complex combinations of ecological sites or mixture of native and planted tame-grass locations.

Change or Add salting locations— Unless specified, changing salt and mineral locations always is recommended.

Reseed specific areas — Use when land is cultivated or disturbed by mining or similar activities.

Control blowouts and gullies — When present, controlling blowouts and gullies always is required.

Apply woody plant control — Use when the woody plant canopy cover is greater than 30 percent or when the similarity index is fair or poor because of woody plant species.

Apply invasive plant control — When present, controlling noxious weeds or other invasive species always is required.

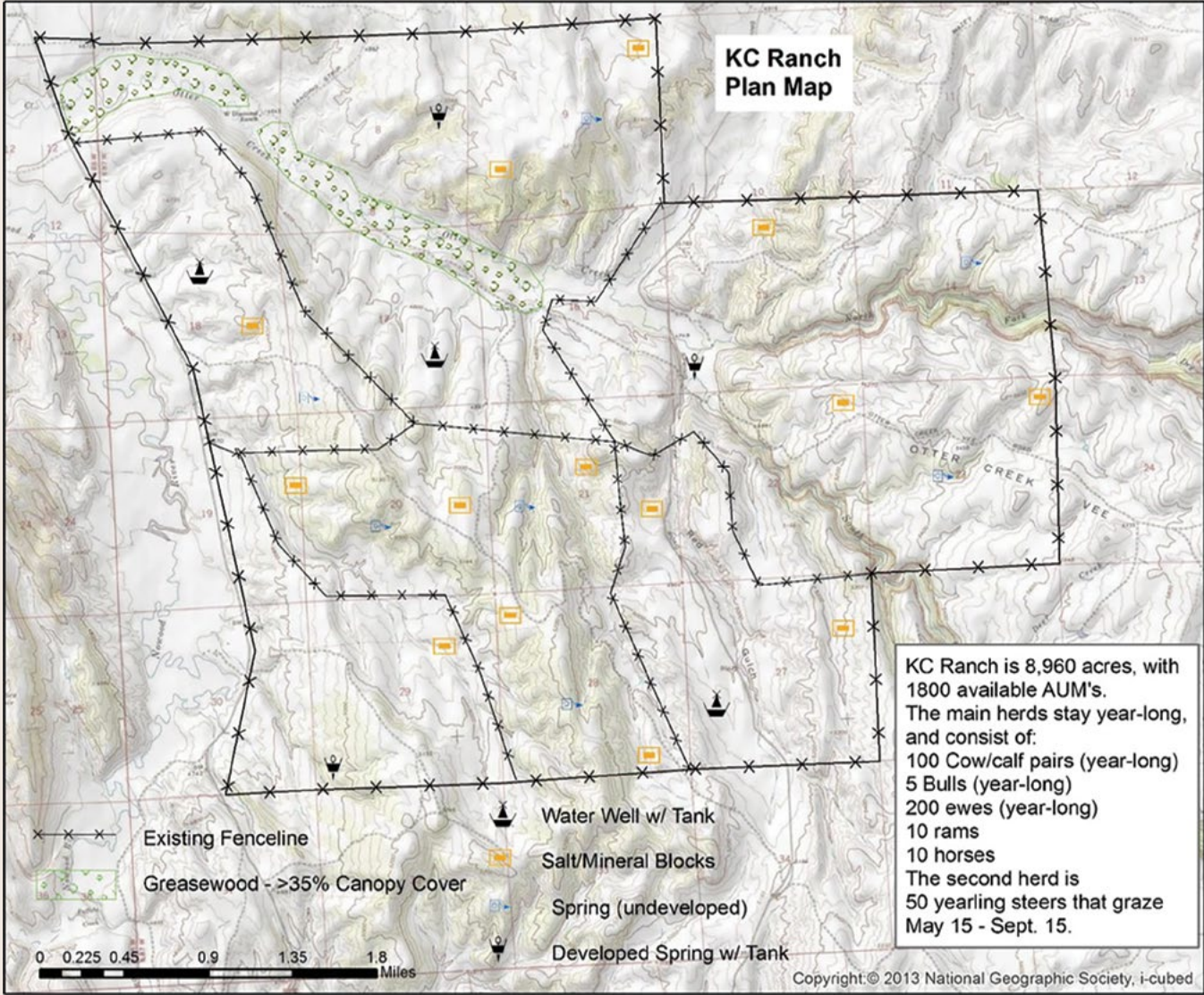
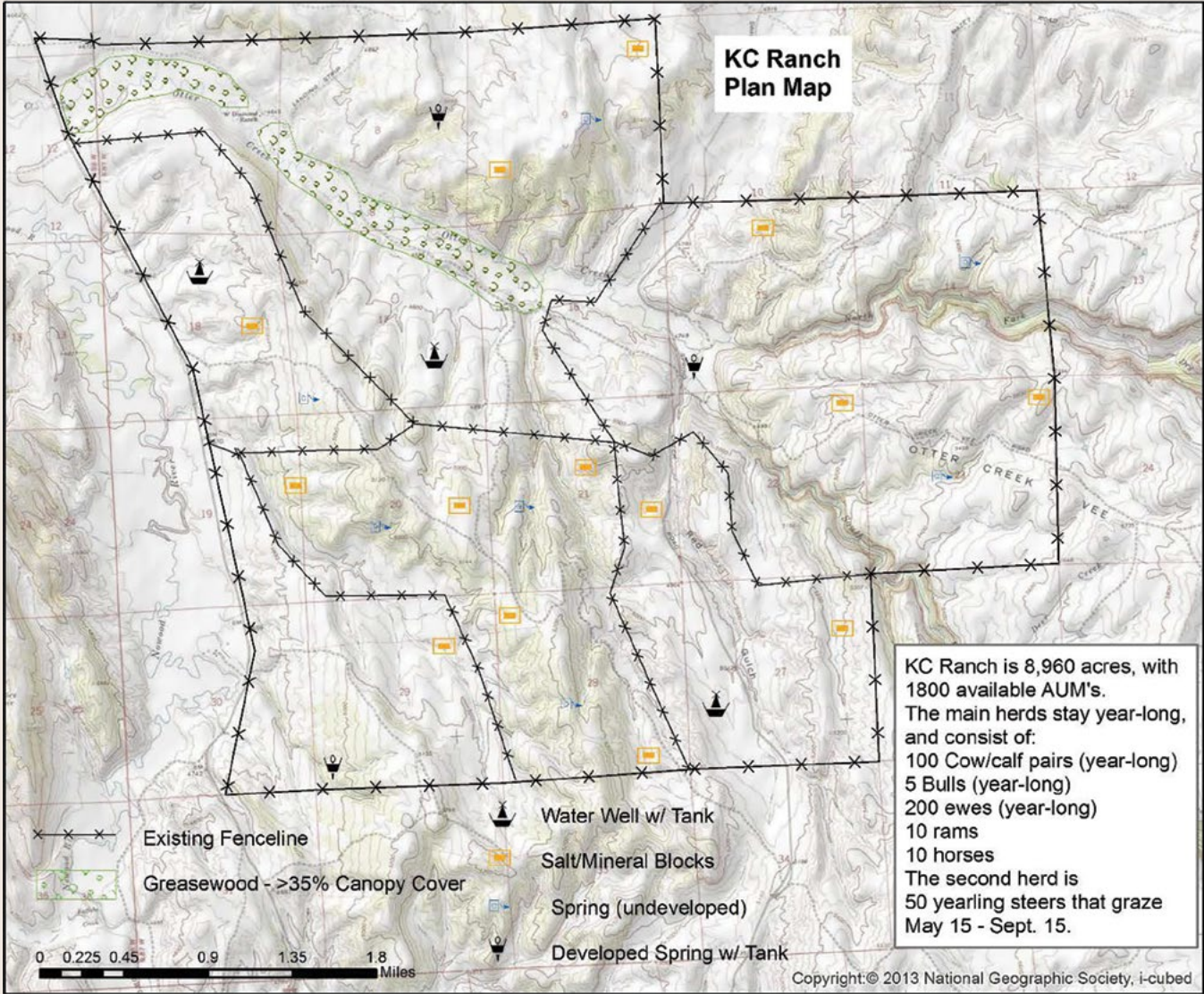
Install or Change a grazing system — Always use this practice except when a pasture is a cool-season, tame-grass pasture or if a properly managed rotation system is used.

Defer part of grazing season — Use whenever you decrease the stocking rate or burn or mow old growth.

Defer one growing season — Use whenever you interseed specific areas or when you control blowouts and gullies that make up greater than 10 percent of any pasture or cell within a grazing system.

Defer two or more growing seasons — Use whenever you reseed specific areas

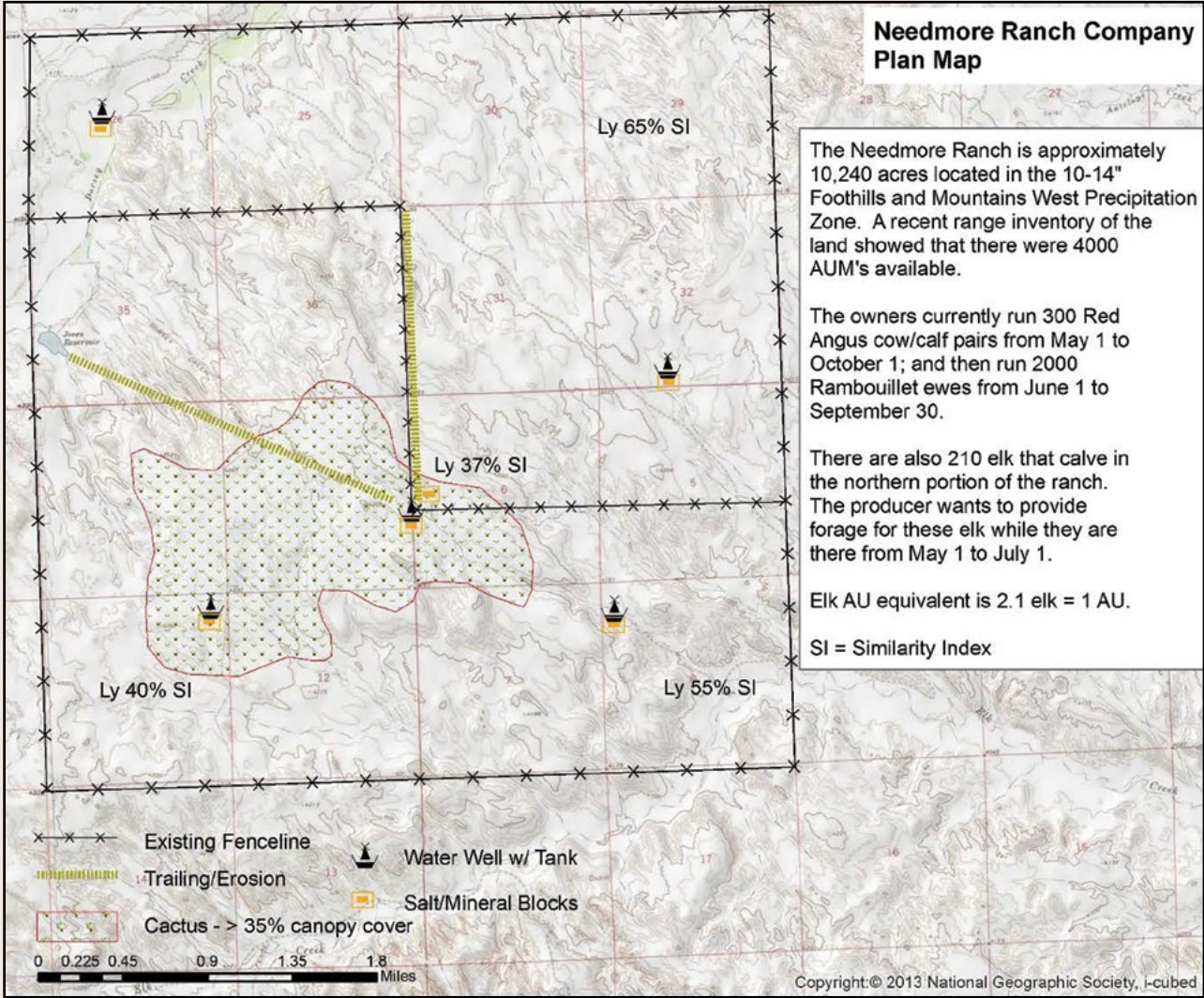
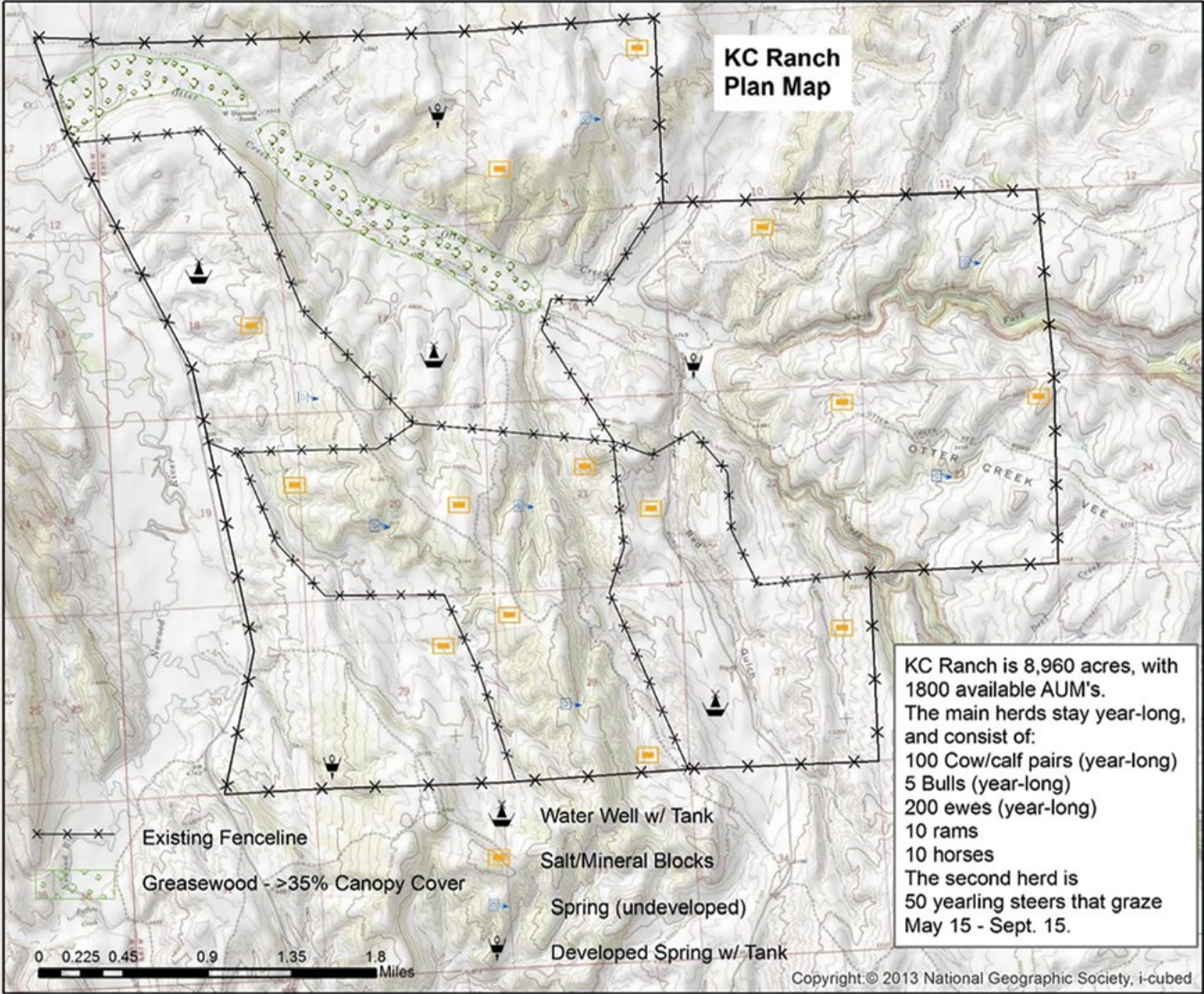
Example 1: KC Ranch



The Solution:

- The main herd is year long and has the following aum's needed:
 - 100 Cow/calf pairs X 1 AU = 100 AU X 12 months = 1200 aum's
 - 5 Bulls X 1.25 AU = 6.25 AU X 12 months = 75 aum's
 - 200 ewes X 0.2 AU = 40 AU X 12 months = 480 aum's
 - 10 rams X 0.2 AU = 2 AU X 12 months = 24 aum's
 - 10 horses X 1.25 AU = 12.5 AU X 12 months = 150 aum's
- The second herd of 50 yearling steers graze May 15 = Sept. 15:
 - 50 yearling steers X 0.6 AU = 30 AU X 4 months = 120 aum's
- The ranch has 1800 available aum's:
 - 1200 aum's (cow/calf) + 75 aum's (bulls) + 480 aum's (ewes) + 24 aum's (rams) + 150 aum's (horses) + 120 aum's (yrling steers) = 2049 aum's
- We need to **DECREASE** the stocking rate.

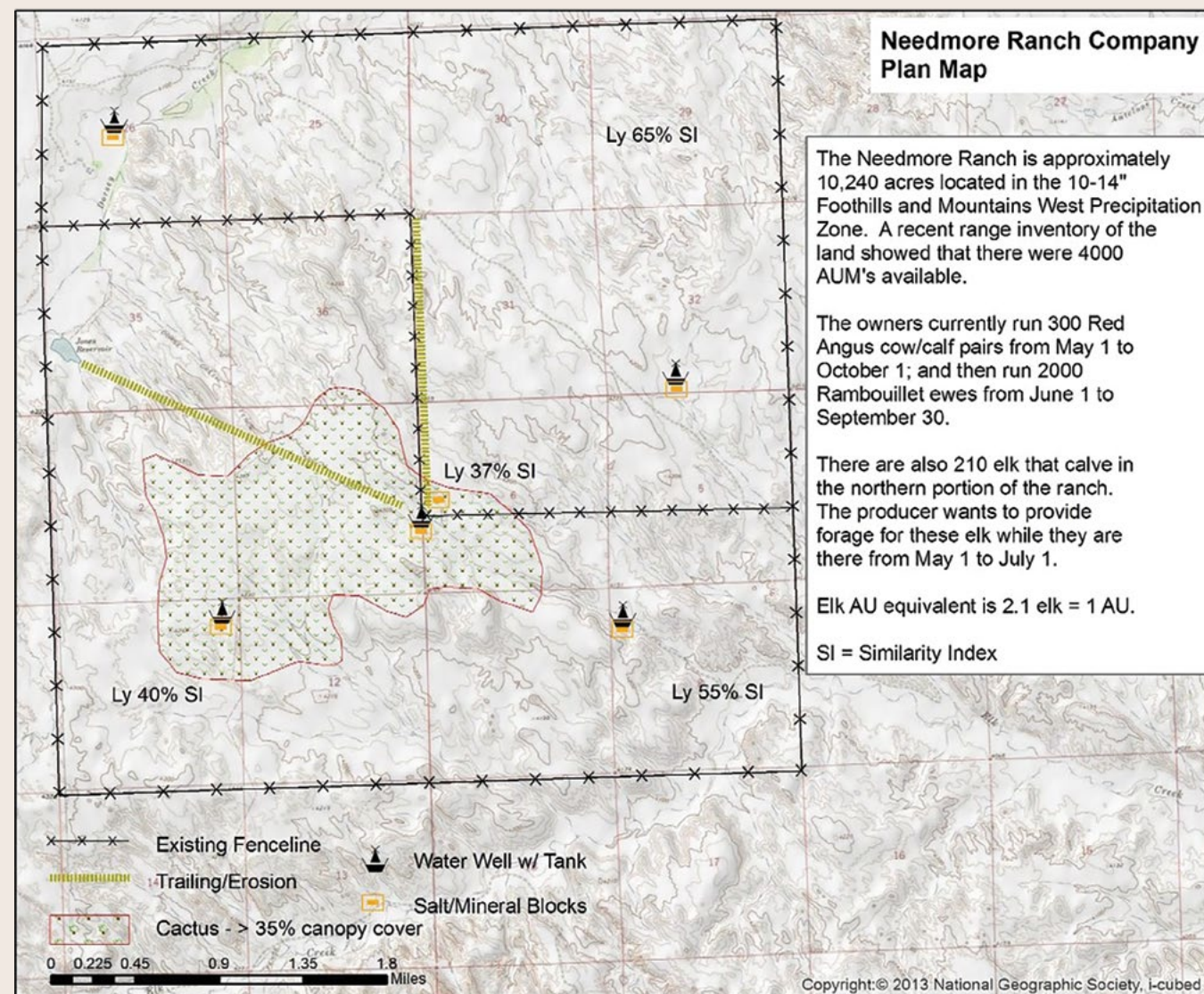
Example 2: Needmore Ranch Company



The Solution:
The necessary improvements are:

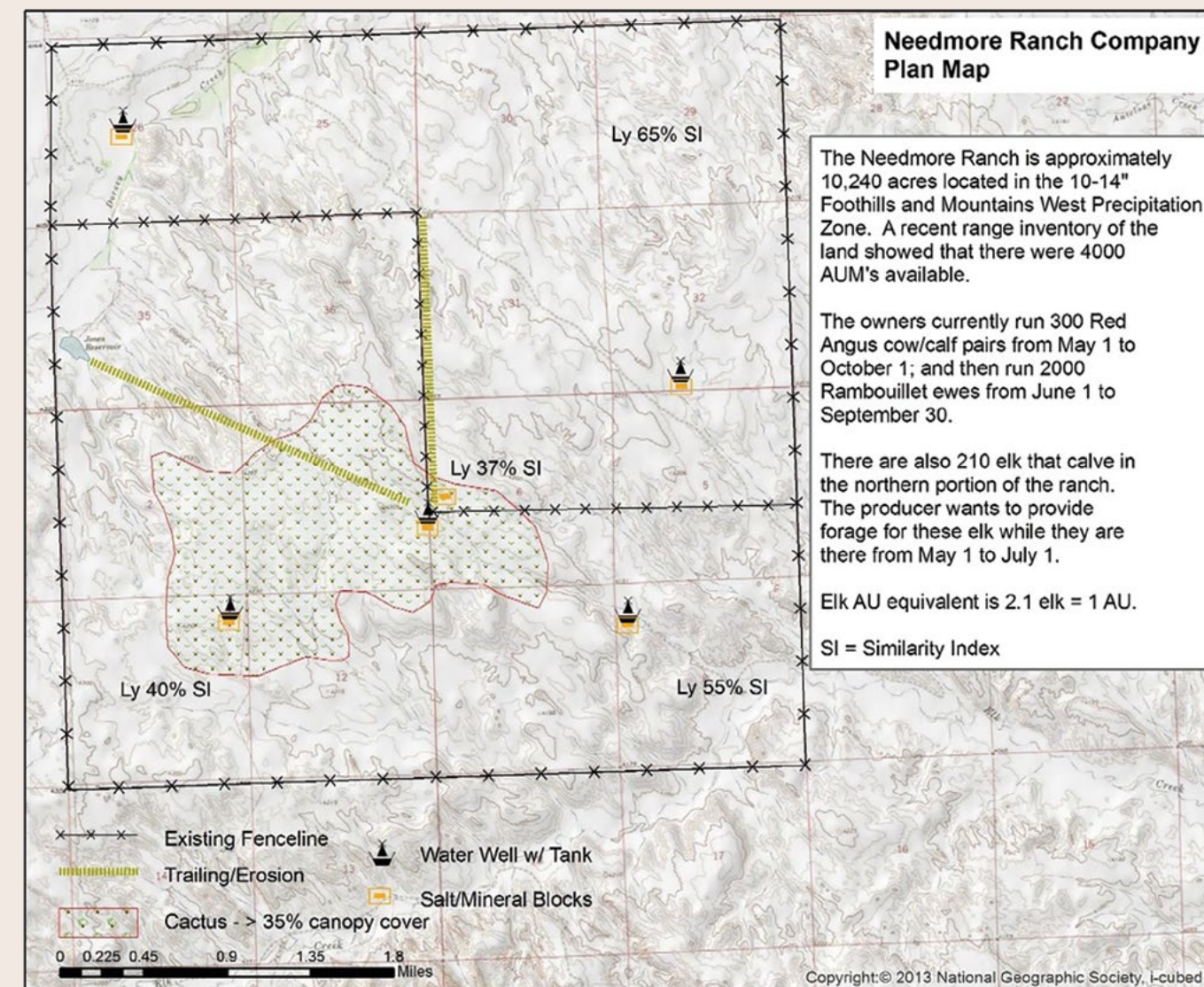
1. Install water source - There are undeveloped springs that should be developed for livestock or other water sources put in to protect the springs. No deferment is necessary.
2. Control brush or weeds - the greasewood is thick enough incanopy it needs to be thinned or controlled. This will require at least a part of a growing season defermtnt or as much as two or more growing seasons, depending on the type of treatment completed.
3. Install or change grazing system - by installing water and by implementing brush control, the grazing system will need to be changed.
4. Notes: Since the topography is so broken and the fences follow natural breaks in this landscape, it would be hard to change or further cross fence. Since no trailing is noted, do not implement any fencing projects. Salting locations are scattered across the landscape and appear to be covering the pastures well, sono additional blocks are needed.





The Solution:

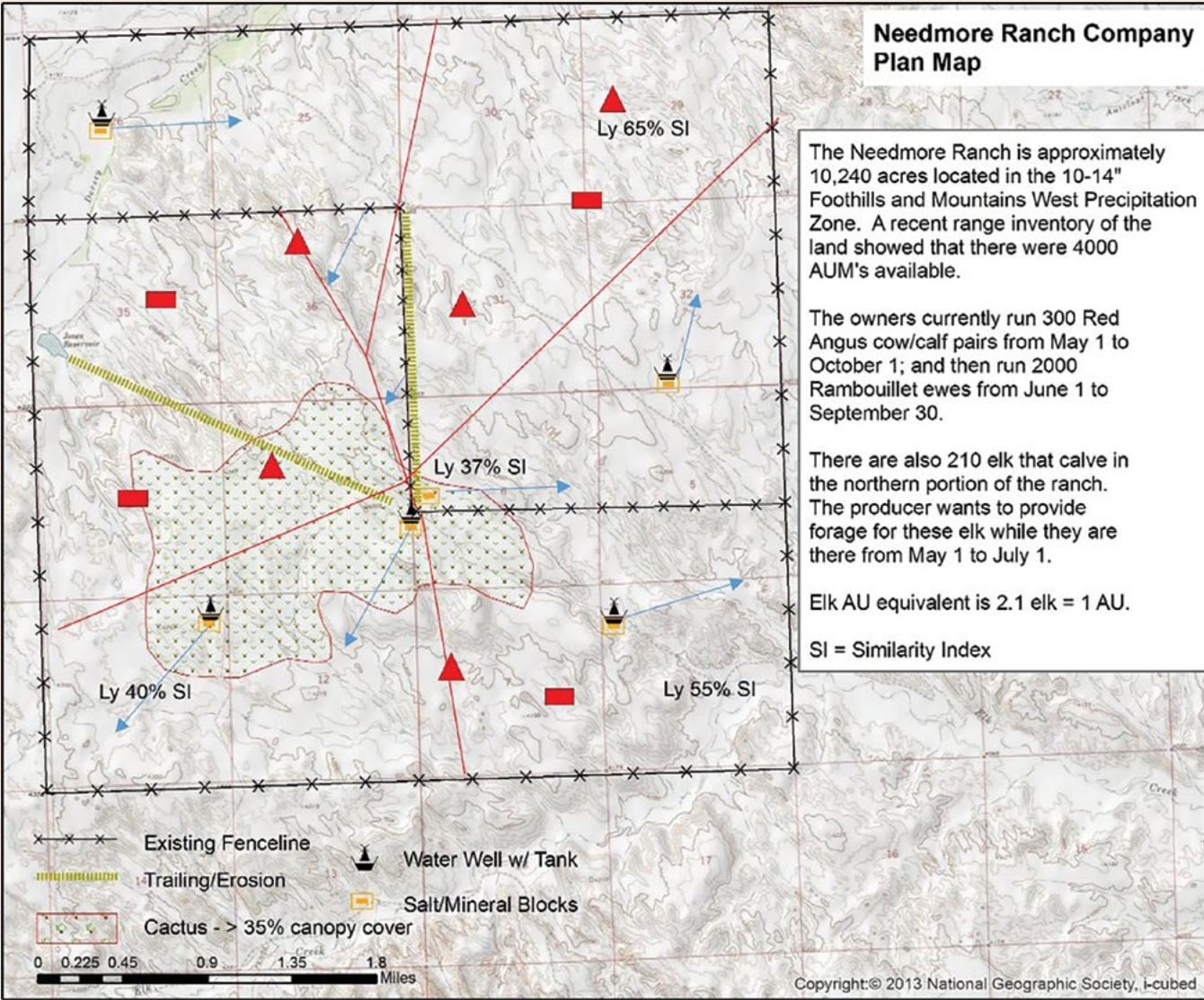
- 300 Cow/calf pairs grazed from May 1 to October 1:
 - 300 cow/calf pairs X 1 AU = 300 AU X 5 months = 1500 aum's
- 2000 ewes grazed from June 1 to Sept. 30:
 - 2000 ewes X 0.2 AU = 400 AU X 4 months = 1600 aum's
- 210 elk graze from May 1 to July 1 with 1 AU = 2.1 elk:
 - 210 elk / 2.1 elk per AU = 100 AU X 2 months = 200 aum's
- The Ranch has 4000 available AUM'S:
 - 1500 aum's (cow/calf) + 1600 aum's (ewes) + 200 aum's (elk) = 3300 aum's.
- We need to **INCREASE** the stocking rate.
- The necessary range improvements are:



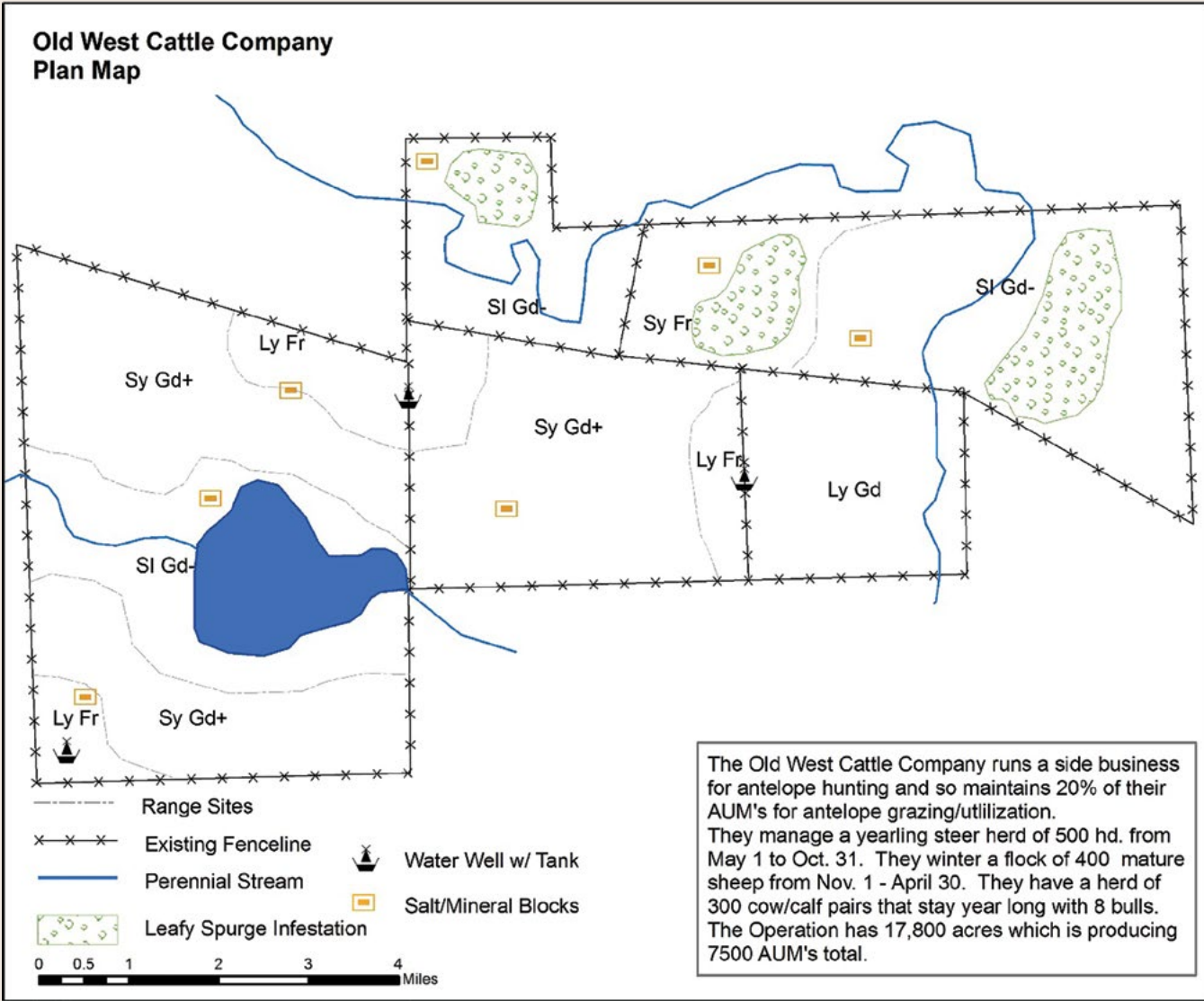
The Solution:

The necessary range improvements are:

- Install water source - This ranch has some rougher terrain and so should have water every 3/4 of a mile, which it does not have. So more water sources are needed. No deferment is required.
- Relocate fence - The erosion and trailing along the existing fence and the trailing between water sources suggests that a fence needs to be located and another fence added (as well as water sources) to prevent this from occurring/continuing. No deferment if necessary.
- Divide Pasture(s) - Cross Fence - The large pastures and decline in areas indicates that division of the pastures is necessary to aid in managing all the resources. No deferment is required.
- Change or add salting locations - Salt locations need to be further from the water sources to help distribute cattle and as more pastures are created and water sources added, it may be necessary to add salt locations.
- Control brush or weeds - The cactus is very dense and since it was identified as a concern on the map, would be necessary to treat it. Depending on the treatment plan a deferment for part, one or two or more growing seasons may be required.
- Install grazing system - Addition of pastures, water systems, and fence locations, as well as the need to treat the cactus, a grazing system will need to be adjusted to fit the new pastures. This will require a deferment for part of the growing season for at least one of the pastures.



Example 3: Old West Cattle Company

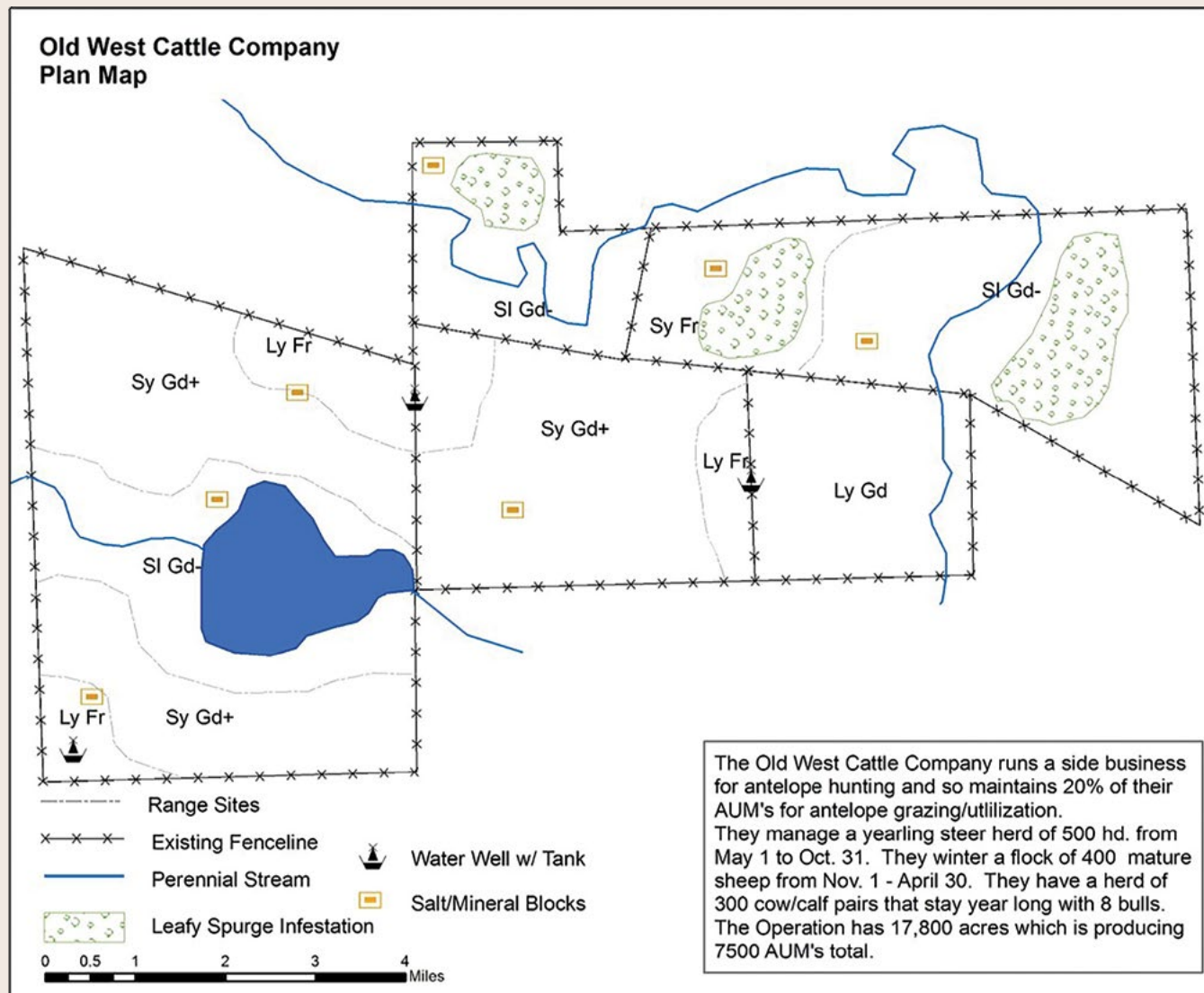


The Solution:

The necessary range improvements are:

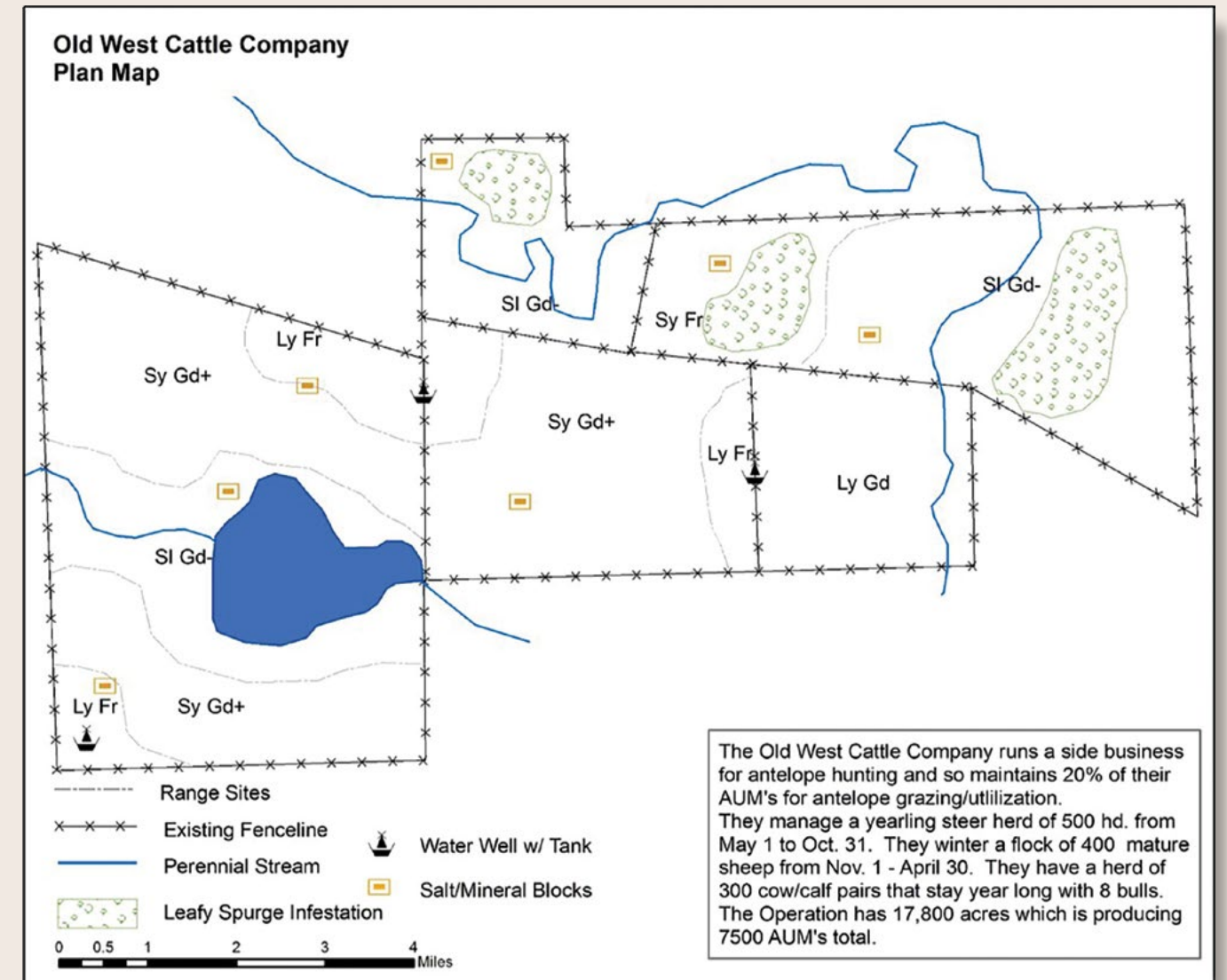
1. Install water source - This ranch has some rougher terrain and so should have water every 3/4 of a mile, which it does not have. So more water sources are needed. No deferment is required.
2. Relocate fence - The erosion and trailing along the existing fence and the trailing between water sources suggests that a fence needs to be located and another fence added (as well as water sources) to prevent this from occurring/continuing. No deferment if necessary.
3. Divide Pasture(s) - Cross Fence - The large pastures and decline in areas indicates that division of the pastures is necessary to aid in managing all the resources. No deferment is required.
4. Change or add salting locations - Salt locations need to be further from the water sources to help distribute cattle and as more pastures are created and water sources added, it may be necessary to add salt locations.
5. Control brush or weeds - The cactus is very dense and since it was identified as a concern on the map, would be necessary to treat it. Depending on the treatment plan a deferment for part, one or two or more growing seasons may be required.
6. Install grazing system - Addition of pastures, water systems, and fence locations, as well as the need to treat the cactus, a grazing system will need to be adjusted to fit the new pastures. This will require a deferment for part of the growing season for at least one of the pastures.





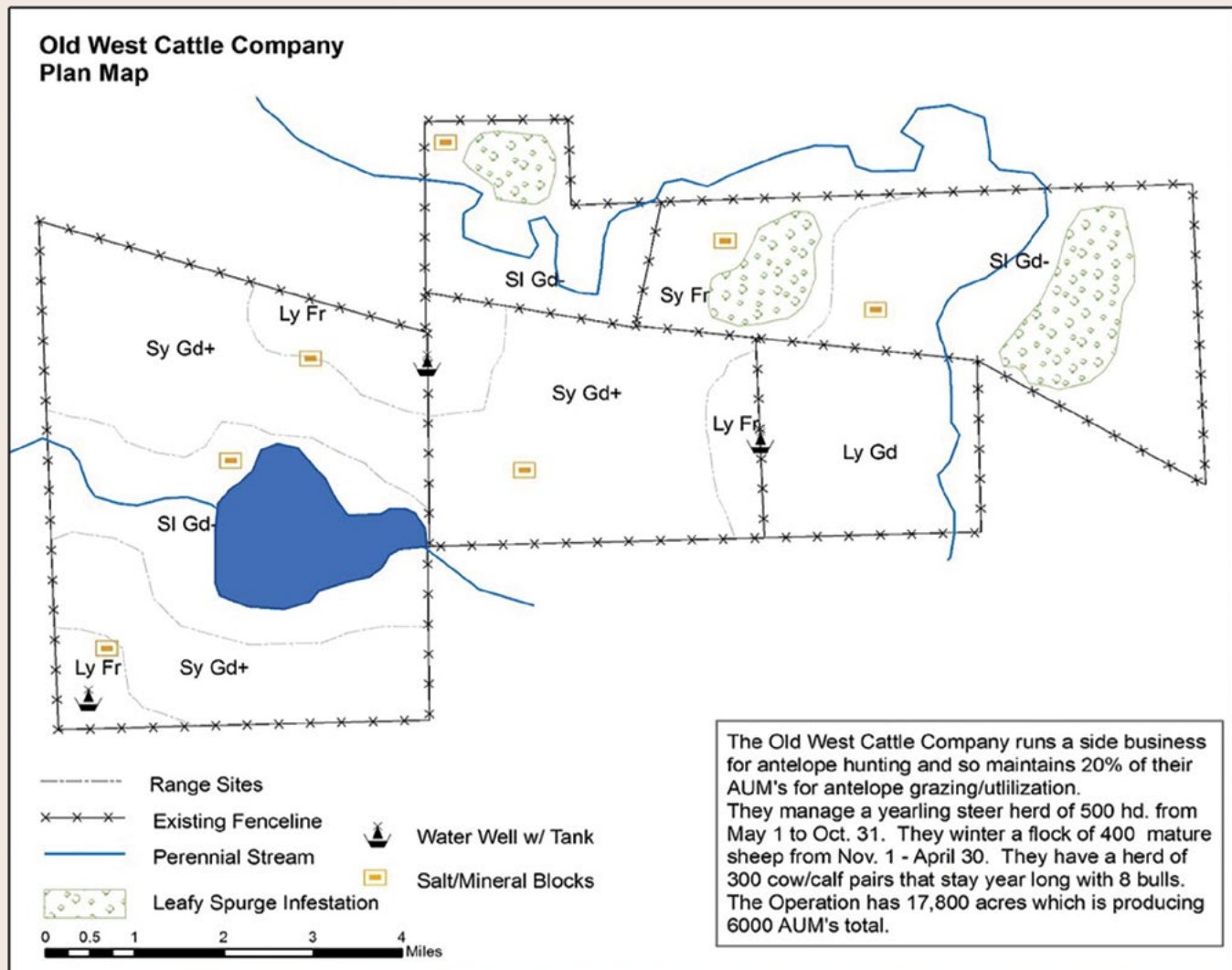
The Solution:

- 20% of the aum's are reserved for antelope, so we need to take the 7500 total aum's and reduce them by the 20%.
 - $7500 \times .20 = 1500$ aum's.
 - $7500 - 1500 = 6000$ available aum's.
- The 500 yearling steer herd is grazed from May 1 to Oct. 31:
 - $500 \times 0.6 \text{ AU} = 300 \text{ AU}$
 - $300 \text{ AU} \times 6 \text{ months} = 1800 \text{ aum's}$
- 400 Mature Sheep are grazed from Nov. 1 to April 30:
 - $400 \times .2 \text{ AU} = 80 \text{ AU}$
 - $80 \text{ AU} \times 6 \text{ months} = 480 \text{ aum's}$
- The 300 Cow/Calf pairs are grazed year long:
 - $300 \times 1.0 \text{ AU} = 300 \text{ AU}$
 - $300 \text{ AU} \times 12 \text{ months} = 3600 \text{ aum's}$
- The 8 Bulls are grazed year long:
 - $8 \times 1.25 \text{ AU} = 10 \text{ AU}$
 - $10 \text{ AU} \times 12 \text{ months} = 120 \text{ aum's}$
- So the total aum's that are needed to support the livestock are:
 - $1800 \text{ aum's (yings.)} + 480 \text{ aum's (sheep)} + 3600 \text{ aum's (cow/calf)} + 120 \text{ aum's (bulls)} = 6000 \text{ aum's}$
- The Total available aum's is:
 - Have 6000 aum's available (see #1 above); need 6000 aum's (see #6 above); so we are overstocked to allow for antelope.
- So we need to **STAY THE SAME** for the stocking rate.



The Solution:

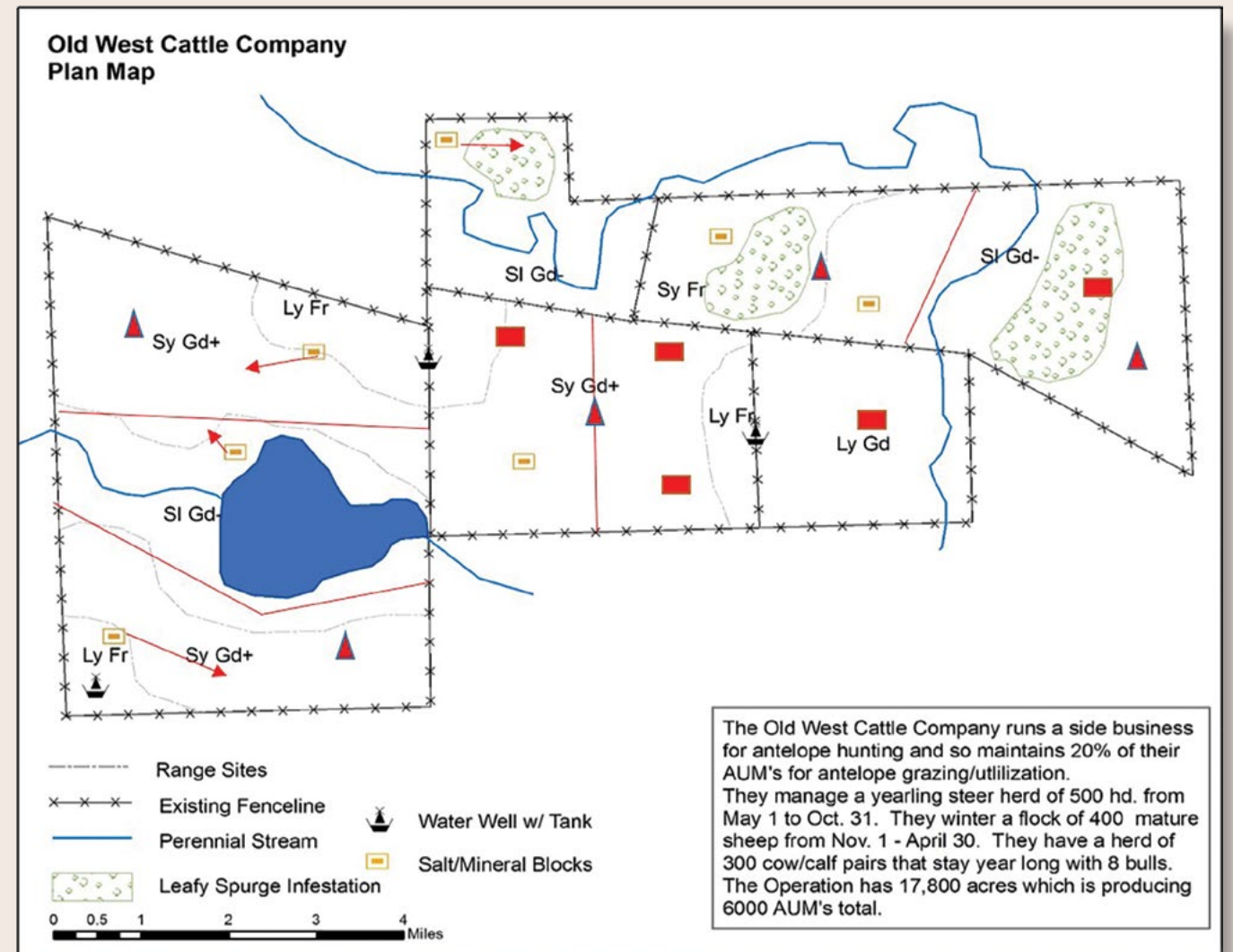
- 20% of the aum's are reserved for antelope, so we need to take the 7500 total aum's and reduce them by the 20%.
 - $7500 \times .20 = 1500$ aum's.
 - $7500 - 1500 = 6000$ available aum's.
- The 500 yearling steer herd is grazed from May 1 to Oct. 31:
 - $500 \times 0.6 \text{ AU} = 300 \text{ AU}$
 - $300 \text{ AU} \times 6 \text{ months} = 1800 \text{ aum's}$
- 400 Mature Sheep are grazed from Nov. 1 to April 30:
 - $400 \times .2 \text{ AU} = 80 \text{ AU}$
 - $80 \text{ AU} \times 6 \text{ months} = 480 \text{ aum's}$
- The 300 Cow/Calf pairs are grazed year long:
 - $300 \times 1.0 \text{ AU} = 300 \text{ AU}$
 - $300 \text{ AU} \times 12 \text{ months} = 3600 \text{ aum's}$
- The 8 Bulls are grazed year long:
 - $8 \times 1.25 \text{ AU} = 10 \text{ AU}$
 - $10 \text{ AU} \times 12 \text{ months} = 120 \text{ aum's}$
- So the total aum's that are needed to support the livestock are:
 - $1800 \text{ aum's (yings.)} + 480 \text{ aum's (sheep)} + 3600 \text{ aum's (cow/calf)} + 120 \text{ aum's (bulls)} = 6000 \text{ aum's}$
- The Total available aum's is:
 - Have 6000 aum's available (see #1 above); need 6000 aum's (see #6 above); so we are overstocked to allow for antelope.
- So we need to **STAY THE SAME** for the stocking rate.



The Solution:

The necessary range improvements are:

1. Install water source - This map does not give you topographic changes, so you can use 1 mile between water sources. With this rule of thumb, the area is short water sources so need to add some. This has no deferment needed.
2. Divide Pasture (s) - The pastures are varied in size but there are two that are large, and two that have resource concerns that could be better addressed if the pasture was divided. The lake should be a smaller pasture of its own if possible, and the creek on the furthest north east pasture would be better managed as its own pasture. No deferment needed.
3. Change or add salt locations - two of the salt stations are very close to the water sources, these should be moved, and there could be benefit to adding salt in a few areas. No deferment needed.
4. Control Brush or weeds - The invasive weed - leafy spurge - needs to be aggressively treated/controlled. This will require at least part of a growing season up to two or more growing seasons of deferment to allow treatment, dependent on treatment choice.
5. Install or change grazing system - By cross fencing (dividing pastures), adding water sources and with the need to treat the Leafy Spurge, it will be necessary to adjust or change the grazing system. This will require at least part of a growing seasons deferment for one or more pastures.
6. The symbols provided above are intended for general ideas of how the issues captured above could be addressed - not all possible solutions are listed.



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Wyoming Range Plants

Plant Names

Both the scientific and common name for each plant are listed. Each plant has only one correct scientific name, which consists of two parts. The first part of the name is the genus and the second part is the species or specific epithet. Changes in scientific names come from botanists studying a particular plant group and changing the classification of a plant to a different genus or specific epithet. Another reason for changing the scientific name is if an earlier published name for a plant is found. At the bottom of many plant descriptions, a plant synonym is listed if the name has been changed recently.



Russian Thistle

Common names can change from one region to the next, or more than one common name may be used for the same plant within an area. “Broadleaf plantain” is just one of over fifty different common names for a single common lawn weed. Russian thistle and tumbleweed are both common names used for the same plant in Wyoming. The common names used in this text represent an accepted common plant name for Wyoming for each plant, based on the National List of Scientific Plant Names, Vol. 1 (USDA-Soil Conservation Service, 1982) and the Plant Information Network (PIN) Data Base: Colorado, Montana, North Dakota, Utah, and Wyoming. (USDI-Fish and Wildlife Service, 1983).

Life Span

The life span of a plant is the duration of time in which the plant grows, flowers and reproduces seed, and then dies. Plants are grouped into three types of life spans.

ANNUAL plants live only one year. They do not grow a second year from roots or crowns, but sprout each year from seed. Some annual plants will germinate in the fall and mature in the spring (winter annuals).

BIENNIAL plants live for two years. Vegetative growth is exhibited the first year. The plant overwinters, produces a flower stalk and seed the second year, and dies.

PERENNIAL plants live from year to year. They produce leaves and stems for more than two years from the same crown. Many perennials live for three or four years others live much longer.



Bull Thistle



Prairie Coneflower

Origin

The origin of plants is based on whether they are natural part of North American plant communities.

NATIVE plants are those which have always grown or evolved within North America.

INTRODUCED plants are those which have been brought into North America, either intentionally or accidentally. Tame species are plants that were introduced to an area for hayland or pasture.

Season of Growth

The season of growth is important in the grazing management of plants, especially grasses, and refers to the part of the year when the plant achieves its principal growth.



Toadflax

COOL-SEASON plants make their principal growth during cool weather in the spring and fall if sufficient moisture is available.

WARM-SEASON plants generally make their principal growth during the frost-free period and develop seed in late summer or early fall.

Response to Grazing

The ability of species to withstand or not withstand various levels of grazing pressure will determine the composition of the plant Community. Range plant species are placed into groups depending on the population’s response to grazing. In some cases, a plant may be an increaser in one area, and be a decreaser in another. Many forbs and shrubs increase under cattle use, but decrease with sheep use.

DECREASER- plants whose population tends to decrease when influenced by grazing pressure. These plants are usually highly palatable, sometimes called “ice cream” plants.

INCREASER - plants whose population tends to increase when influenced by grazing pressure. These include many rhizomatous species and plants that are difficult to graze closely. If abusive grazing practices continue for several seasons, these plants can also be removed from the plant community.

INVADER - plants that do not belong in the plant community. They are often annuals or plants that originated outside North America. All noxious weeds are invaders.



Leafy Spurge



Scarlet Globemallow

The Plant Group

GRASSES

The grasses all belong to one plant family, the Poaceae (Graminae). Grasses have jointed stems that are usually hollow except at the nodes joints) and are sometimes branched. Leaves appear in two rows on the stem and are usually flattened; leaf veins are parallel.

Grasses are our most important range plants. An estimated 200 native and 100 introduced grasses grow in Wyoming; western wheatgrass, blue grama, and prairie junegrass are common natives. (Western wheatgrass is the Wyoming state grass). Introduced species include Russian wildrye, smooth brome grass, and cheatgrass.

GRASS-LIKE PLANTS

Grass-like plants look similar to grasses and are sometimes confused with them. Sedges and rushes are the most common plants in this category found in Wyoming. Both sedges and rushes have parallel veined leaves, but neither has nodes on the stems as grasses do. Sedges often have solid stems that are triangular in crosssection. Sedge leaves are usually flattened and appear in three rows on the stem. Rush stems are either hollow or pithy, usually rounded and unbranched below the floral parts. Leaves are mostly near the base of the plant and may be either round or flattened. Threadleaf sedge and baltic rush are common plants in this group. The rhyme, “sedges have edges and rushes are round” often works in separating these two groups.



Western Yarrow

FORBS

Forbs are called herbs in some literature, and are broadleaf plants which die back each year. Many are the showy plants sought by wildflower enthusiasts. Leaves usually have netted veins, although plants in some families’, such as the Lily family (Liliaceae) and Iris family (Iridaceae), have parallel veins. Forbs are often referred to as weeds. This term is incorrect when referring to forbs, because many of them, such as alfalfa, are beneficial or provide valuable livestock ‘ forage. Most of the medicinal and edible plants used in ancient and modem herbology are forbs. Common forbs are alfalfa, western yarrow, and Indian paintbrush. (Indian paintbrush is our state flower).

WOODY PLANTS

Trees, shrubs and half-shrubs are included in this group and are called browse plants in some literature. Shrubs are plants that live from one year to the next with woody stems that usually branch out from near the base of the plant. Big sagebrush, rabbitbrush, and greasewood are examples of common shrubs.

Half-shrubs are a group that don’t really fit into forbs or woody plants. They either have stems that are long-lived but aren’t woody, or have a stem that is woody near the ground and each year’s herbaceous growth dies back to the woody point.

Trees are also woody plants that live from year to year, but usually have a single stem which branches well above ground. Quaking aspen, lodgepole pine, and cottonwood are examples of common trees.

POISONOUS PLANTS

Most of the poisonous plants found in Wyoming are forbs. Some are poisonous in various degrees to humans as well as livestock. Some plants may be poisonous to all classes of livestock throughout the year, while others may affect only one or two classes of livestock, and may be poisonous only during a small part of the growing season. Almost without exception, livestock poisoning on native range indicates poor range management. Larkspur, death camas and poison hemlock are examples of poisonous plants in Wyoming.



Larkspur



Death Camas

NOXIOUS WEEDS

Noxious weeds are classified as such because of their harmful effects and/or because they are difficult to control. Most are noxious because their aggressive root system allows them to out-compete desirable vegetation. In addition, production of large quantities of viable seed allows noxious weeds to spread rapidly. Our more serious noxious weeds include Canada thistle, leafy spurge and Russian knapweed.



Poison Hemlock

Wyoming Range Plant List	Life Span P = Perennial B = Biennial A = Annual	Season of Growth C = Cool Season W = Warm Season	Grazing Response D = Decreaser Ic = Increaser I = Invader	Plant Origin N = Native I = Introduced	Ecological and Resource Rating Desirable = De Undesirable-Un		
					Greater Sage Grouse		Cattle Food
					Food	Cover	
Plant Name							
Forbs							
1) Alfalfa	P		Iv	I	D	D	D
2) Alsike Clover	P		Iv	I	D	U	D
3) American Bistort	P		D	N	U	U	U
4) American Licorice	P		Ic	N	D	U	U
5) American Vetch	P		D	N	D	U	D
6) Arnica	P		Ic	N	D	U	U
7) Arrowgrass	P		Ic	N	U	U	U
8) Arrowleaf Balsamroot	P		Ic	N	D	U	U
9) Bitterroot	P		Ic	N	D	U	U
10) Black Medic	P		Iv	I	D	U	U
11) Black Samson	P		D	N	D	U	D
12) Black Henbane	A/B		Iv	I	U	U	U
13) Blanket Flower	P		Ic	N	D	U	U
14) Blue Lettuce	P		Ic	N	D	U	U
15) Bluebell	P		D	N	D	U	U
16) Breadroot Scurfpea	P		Ic	N	U	U	U
17) Bull Thistle	B		Iv	I	U	U	U
18) Canada Thistle	B		Iv	I	U	D	U
19) Cattail	B		Ic	N	U	D	U
19) Cinquefoil	B		Ic	N	U	U	U

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					Greater Sage Grouse		Cattle Food
					Food	Cover	
Plant Name							
Forbs							
21) Cocklebur	A		Iv	I	U	U	U
22) Common Dandelion	P		Iv	I	D	U	U
23) Common Ragweed	A		Iv	N	U	U	U
24) Common Sunflower	A		Iv	N	D	U	D
25) Crazyweed	P		Ic	N	D	U	U
26) Cudweed Sagewort	P		Ic	N	D	U	U
27) Curlycup Gumweed	B		Iv	N	D	U	U
28) Curly Dock	P		Iv	I	D	U	U
29) Deathcamus	P		Ic	N	D	U	U
30) Dense Clubmoss	P		Ic	N	U	U	U
31) Desert Princesplume	P		Ic	N	D	U	U
32) Diffuse Knapweed	P		Iv	I	U	U	U
33) Dotted Gayfeather	P		D	N	D	U	U
34) Dyer's Woad	A/P		Iv	I	U	U	U
35) False Boneset	P		D	N	D	U	D
36) Field Chickweed	P		Ic	N	D	U	U
37) Fireweed Willowherb	P		Ic	N	D	D	U
38) Fleabane	P/B		Ic	N	U	U	U
39) Goldenrod	P		Ic	N	D	U	U
40) Goldenweed	P		Ic	N	D	U	U

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					Greater Sage Grouse		Cattle Food
					Food	Cover	
Plant Name							
Forbs							
41) Groundsel	P		Ic	N	D	U	U
42) Hairy Goldaster	P		Iv	N	D	U	U
43) Halogeton	A		Iv	I	U	U	U
44) Hawksbeard	P		D	N	D	U	D
45) Hoary Cress	P		Iv	I	U	U	U
46) Hood's Phlox	P		Ic	N	D	U	U
47) Horsetail	P		Ic	N	U	U	U
48) Houndstongue	P		Iv	I	U	U	U
49) Indian Paintbrush	P		D	N	D	U	D
50) Kochia	A		Iv	I	U	D	D
51) Lambsquarter Goosefoot	A		Iv	I	D	U	U
52) Larkspur	P		Ic	N	D	U	U
53) Leafy Spurge	P		Iv	I	U	U	U
54) Lemon Scurfpea	P		Ic	N	D	U	U
55) Lewis Flax	P		Ic	N	D	U	U
56) Longleaf Phlox	P		Ic	N	D	U	U
57) Lupine	P		Ic	N	D	U	U
58) Marijuana Hemp	A		Iv	I	D	D	U
59) Milkvetch (Locoweed)	P		Ic	N	D	U	U
60) Miner's Candle	P		Ic	N	D	U	D

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					Greater Sage Grouse		Cattle Food
					Food	Cover	
Plant Name							
Forbs							
61) Monkeyflower	P		D	N	D	U	U
62) Mulesear Wyethia	P		Ic	N	D	D	U
63) Mullein	B		Iv	I	U	U	U
64) Musk Thistle	B		Iv	I	U	U	U
65) Oxeye Daisy	P		Iv	I	D	U	U
66) Pale Agoseris	P		D	N	D	U	U
67) Pasqueflower	P		D	N	D	U	U
68) Penstemon	P		D	N	D	U	D
69) Perennial Pepperweed	P		Iv	I	D	U	U
70) Plumeless Thistle	B		Iv	I	U	U	U
71) Poison Hemlock	B		Iv	I	U	U	U
72) Prairieclover (Purple or White)	P		D	N	D	U	U
73) Prairie Coneflower	P		Ic	N	D	U	U
74) Prairie Thermopsis	P		D	N	D	U	D
55) Pussytoes	P		Ic	N	D	U	U
76) Red Clover	P		Iv	I	D	U	D
77) Richardson Geranium	P		Ic	N	D	U	U
78) Rocky Mountain Beeplant	A		Iv	N	D	U	U
79) Rocky Mountain Iris	P		Ic	N	D	U	U
80) Rush Skeletonweed	P		Ic	N	D	U	D

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					Greater Sage Grouse		Cattle Food
					Food	Cover	
Plant Name							
Forbs							
81) Russian Knapweed	P		Iv	I	U	U	U
82) Russian Thistle	A		Iv	I	U	U	U
83) Sagebrush Buttercup	P		Ic	N	D	U	U
84) Salsify	B		Iv	I	D	U	U
85) Scarlet Guara	P		Ic	N	D	U	U
86) Scarlet Globemallow	P		Ic	N	D	U	U
87) Pasqueflower	B		Iv	I	U	U	U
88) Segolily	P		D	N	D	U	U
89) Showy Milkweed	P		Iv	N	D	U	U
90) Silverleaf Scurfpea	P		Ic	N	D	U	U
91) Skeletonleaf Bursage	P		Ic	N	U	U	U
92) Slimflower Scurfpea	P		Ic	N	D	U	U
93) Smaller Burdock	B		Iv	I	U	U	U
94) Sowthistle	P		Iv	I	U	U	U
95) Snow-on-the-mountain	A		Iv	N	D	U	U
96) Spidlewort	P		D	N	D	U	U
97) Spotted Knapweed	P		Iv	I	U	U	U
98) Sticky Geranium	P		Ic	N	D	U	U
99) St. Johnswort	P		Iv	I	U	U	U
100) Tenpetal Blazingstar	P		Ic	N	D	U	U

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					Greater Sage Grouse		Cattle Food
					Food	Cover	
Plant Name							
Forbs							
101) Toadflax	P		Iv	I	D	U	U
102) Tufted Evening Primrose	P		Ic	N	D	U	U
103) Violet	P		D	N	D	U	U
104) Waterhemlock	P		Ic/Iv	N	U	U	U
105) Western Ragweed	P		Iv	N	D	U	U
106) Western Wallflower	B		Ic	N	D	U	D
107) Western Yarrow	P		Ic	N	D	U	U
108) Wild Onion	P		Ic/D	N	D	U	U
109) Woolly Plantain	A		Iv	N	D	U	U
110) Yellow Sweetclover	B		Iv	I	D	D	D
111) Wild Buckwheat	P/A/B		Ic	N	D	U	U
Grasses							
112) Alkali Cordgrass	P	W	D	N	U	D	D
113) Alkali Sacaton	P	W	D	N	U	D	D
114) Alpine Timothy	P	C	D	N	U	D	D
115) Basin Wildrye	P	C	Ic/D	N	U	D	D
116) Bearded Wheatgrass	P	C	D	N	U	D	D
117) Big Bluegrass	P	C	D	N	U	U	D
118) Big Bluestem	P	W	D	N	U	D	D
119) Blue Grama	P	W	Ic	N	U	U	D

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					Greater Sage Grouse		Cattle Food
					Food	Cover	
120) Blue Wildrye	P	C	D	N	U	D	D
121) Bluebunch Wheatgrass	P	C	D	N	U	D	D
122) Bottlebrush Squirreltail	P	C	D/Ic	N	U	U	U
123) Buffalograss	P	W	Ic	N	U	U	D
124) Canada Wildrye	P	C	D	N	U	D	D
125) Canby Bluegrass	P	C	D	N	U	U	D
126) Cheatgrass Brome	A	C	Iv	I	U	U	U
127) Columbia Needlegrass	P	C	D	N	U	D	D
128) Common Reed	P	W	Ic	N	U	D	D
129) Crested Wheatgrass	P	C	Iv	I	U	D	D
130) Cusick Bluegrass	P	C	D	N	U	U	D
131) Foxtail Barley	P	C	Iv	N	U	U	U
132) Garrison Creeping Foxtail	P	C	Iv	I	U	D	D
133) Green Needlegrass	P	C	D	N	U	U	U
134) Hairy Grama	P	W	Ic	N	U	U	D
135) Idaho Fescue	P	C	D	N	U	D	D
136) Indian Ricegrass	P	C	D	N	U	D	D
137) Indiangrass	P	W	D	N	U	D	D
138) Inland Saltgrass	P	W	D	N	U	U	U
139) Intermediate Wheatgrass	P	C	Iv	I	U	D	D
140) Japanese Brome	A	C	Iv	I	U	U	U

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					Greater Sage Grouse		Cattle Food
					Food	Cover	
141) Kentucky Bluegrass	P	C	Iv	I	U	U	D
142) King Spike Fescue	P	C	D	N	U	D	D
143) Letterman Needlegrass	P	C	D	N	U	D	D
144) Little Bluestem	P	W	D	N	U	D	D
145) Mat Muhly	P	C	Ic	N	U	U	D
146) Mountain Brome	P	C	D	N	U	D	D
147) Muttongrass	P	C	D	N	U	U	D
148) Needleandthread	P	C	D	N	U	D	D
149) Nevada Bluegrass	P	C	D	N	U	U	D
150) Nuttail Alikaligrass	P	C	Ic	N	U	D	D
151) Oatgrass (danthonia)	P	C	D	N	U	D	D
152) Oniongrass	P	C	D	N	U	U	D
153) Orchardgrass	P	C	Iv	I	U	D	D
154) Plains Muhly	P	W	Ic	N	U	U	D
155) Plains Reedgrass	P	C	D	N	U	D	D
156) Porcupinegrass	P	C	D	N	U	D	D
157) Prairie Cordgrass	P	W	D	N	U	D	D
158) Prairies Junegrass	P	C	Ic	N	U	U	D
159) Prairie Sandreed	P	W	D	N	U	D	D
160) Pubescent Wheatgrass	P	C	Iv	I	U	D	D
161) Quackgrass	P	C	Iv	I	U	U	U

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					Greater Sage Grouse		Cattle Food
					Food	Cover	
Plant Name							
162) Red Threeawn	P	W	Ic/Iv	N	U	U	U
163) Redtop	P	C	Iv	I	U	D	D
164) Reed Canarygrass	P	W	Ic	N	U	D	D
165) Rough Fescue	P	C	D	N	U	D	D
166) Russian Wildrye	P	C	Iv	I	U	D	D
167) Sand Bluestem	P	W	D	N	U	D	D
168) Sand Dropseed	P	W	Ic	N	U	D	D
169) Sand Paspalum	P	W	Ic/D	N	U	U	D
170) Sandberg Bluegrass	P	C	D	N	U	U	D
171) Scribner Panicum	P	W	D	N	U	U	D
172) Sideoats Grama	P	W	Ic	N	U	U	D
173) Sixweeks Fescue	A	C	Iv	N	U	U	U
174) Slender Wheatgrass	P	C	D	N	U	D	D
175) Smooth Brome	P	C	Iv	I	U	D	D
176) Spike Trisetum	P	C	D	N	U	U	D
177) Switchgrass	P	W	D	N	U	D	D
178) Tall Fescue	P	C	Iv	I	U	D	D
179) Tall Wheatgrass	P	C	Iv	I	U	D	D
180) Thickspike Wheatgrass	P	C	Ic	N	U	D	D
181) Timothy	P	C	Iv	I	U	D	D
182) Tufted Hairgrass	P	C	D	N	U	U	D

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					Greater Sage Grouse		Cattle Food
					Food	Cover	
Plant Name							
183) Tumblegrass	P	W	Ic	N	U	U	U
184) Western Wheatgrass	P	C	D	N	U	D	D
Sedges and Rushes							
185) Balticrush	P	C	Ic	N	U	U	U
186) Bulrush	P	C	Ic	N	U	U	U
187) Nebraska Sedge	P	C	D	N	U	D	D
188) Needleleaf Sedge	P	C	Ic	N	U	U	D
189) Threadleaf Sedge	P	C	Ic	N	U	U	D
Half Shrubs							
190) Birdfoot Sagebrush	P		Ic	N	D	U	U
191) Broom Snakeweed	P		Ic	N	U	U	U
192) Bud Sagebrush	P		Ic	N	D	U	U
193) Common Woody Aster	P		Ic	N	U	U	U
194) Fringed Sagewort	P		Ic	N	D	U	U
195) Gardner’s Saltbush	P		Ic	N	U	U	U
196) Green Sagewort	P		Ic	N	D	U	U
197) Pricklypear Cactus	P		Iv	N	U	U	U
198) Winterfat	P		D	N	D	U	D
Shrubs and Trees							
199) American Plum	P		Ic	N	D	D	U
200) Antelope Bitterbush	P		D	N	U	D	D

Wyoming Range Plant List Plant Name	Life Span P = Perennial B = Biennial A = Annual	Season of Growth C = Cool Season W = Warm Season	Grazing Response D = Decreaser Ic = Increaser I = Invader	Plant Origin N = Native I = Introduced	Ecological and Resource Rating Desirable = De Undesirable-Un		
					Greater Sage Grouse		Cattle Food
					Food	Cover	
201) Big Sagebrush	P		Ic	N	D	D	U
202) Black Sagebrush	P		Ic	N	D	U	U
203) Boxelder	P		Ic/D	N	U	U	U
204) Buffaloberry	P		Ic	N	U	D	U
205) Common Chokecherry	P		D	N	D	D	D
206) Cottonwood	P		Ic	N	U	U	D
207) Curlleaf Mountainmahogany	P		D	N	D	U	U
208) Current	P		D	N	D	D	D
209) Douglas Fir	P		N/A	N	U	U	U
210) Fir	P		N/A	N	U	U	U
211) Fourwing Saltbush	P		Ic	N	U	D	U
212) Greasewood	P		Ic	N	U	D	U
213) Green Rabbitbrush	P		Ic	N	U	D	U
214) Grey Horsebrush	P		Ic	N	U	D	U
215) Kinnikinnick	P		Ic	N	U	U	U
216) Leadpaint	P		D	N	U	U	D
217) Oak	P		Ic	N	U	U	U
218) Pine	P		N/A	N	U	U	U
219) Poison Ivy	P		Ic	N	D	D	U
220) Quaking Aspen	P		D	N	U	U	U
221) Rocky Mountain Juniper	P		Ic	N	U	U	U

Wyoming Range Plant List Plant Name	Life Span P = Perennial B = Biennial A = Annual	Season of Growth C = Cool Season W = Warm Season	Grazing Response D = Decreaser Ic = Increaser I = Invader	Plant Origin N = Native I = Introduced	Ecological and Resource Rating Desirable = De Undesirable-Un		
					Greater Sage Grouse		Cattle Food
					Food	Cover	
222) Rose	P		D	N	U	U	D
223) Rubber Rabbitbrush	P		Ic	N	U	D	U
224) Sand Sagebrush	P		Ic	N	D	D	U
225) Serviceberry	P		D	N	U	D	D
226) Shadscale	P		Ic	N	U	D	U
227) Shrubby Cinquefoil	P		Ic/Iv	N	U	D	U
228) Silver Sagebrush	P		Ic	N	D	D	U
229) Skunkbush Sumac	P		Ic	N	U	D	U
230) Small Soapweed (Yucca)	P		Ic	N	U	U	U
231) Snowberrry	P		Ic	N	U	D	U
232) Snowbrush Ceanothus	P		Ic	N	U	U	U
233) Spiny Hopsage	P		Ic/D	N	U	D	U
234) Spruce	P		N/A	N	U	U	U
235) Threetip Sagebrush	P		Ic	N	D	D	U
236) True Mountainmahogany	P		D	N	U	D	D
237) Willow	P		Ic/D	N	D	D	U

Plant Anatomy

Plant anatomy is the study and understanding of plant parts based on the morphology of plants.

General Plant Morphology

Plant morphology is the study of the form and structure of plants. The identification of various plant species is based on the differences in their various parts. Each plant species has some part or characteristic which makes it different from all other species.

The grasses are different from the forbs and woody plants in many vegetative and floral characteristics. For this reason, the stems, leaves, and inflorescences of grasses are discussed separately from the forbs and woody plants. Roots and specialized stems are similar for both, and are discussed collectively.

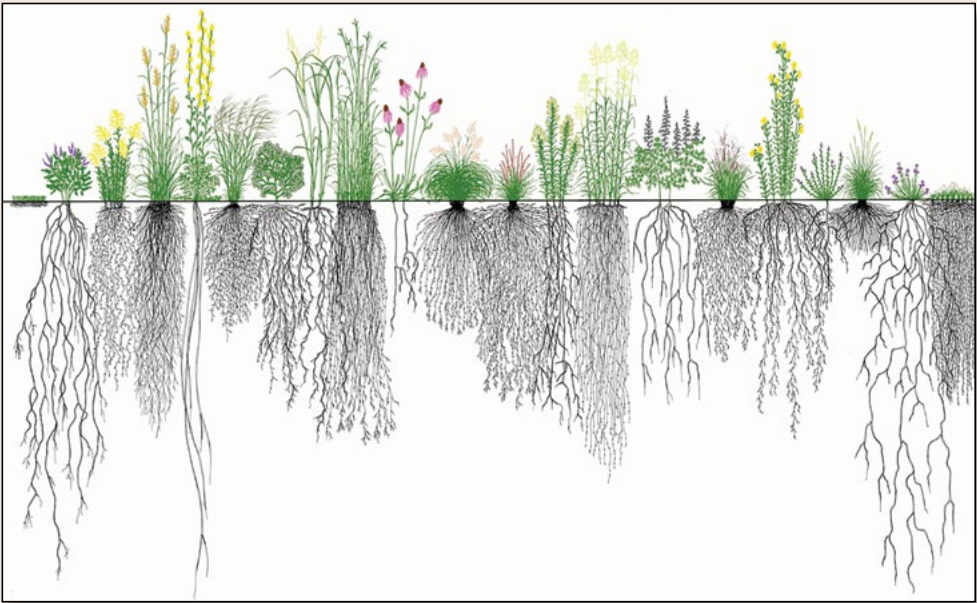
ROOTS

Roots often are not fully appreciated by those who study plants. Roots are underground and go unnoticed, but they are as important as the showy above-ground parts. Actually, roots often make up more than 50 percent of the plant’s dry weight. Carrots and turnips are specialized and enlarged fleshy roots which store large amounts of reserve food and water in their tissues.

Some roots are fibrous, meaning they are made up of many long, slender, branched roots of about the same diameter. This type of root system is typical of grasses. Most forb root systems develop from a prominent structure called the primary root. Offshoots from the primary are called secondary roots. If the primary root remains prominent during the growing season, as occurs in beets and carrots, it is known as a tap root.

SPECIALIZED STEMS

Rhizomes and stolons are specialized stems that are found primarily in grasses and forbs. Rhizomes are creeping, underground stems with joints and leaf-like scales. New plants may be produced at the growing tip or at the nodes. Rhizomes store food that is manufactured in leaves as well as producing new plants. Western wheatgrass, Canadian thistle, and cudweed sagewort are good examples of rhizomatous plants. Stolons are above-ground, horizontal stems; they are sometimes called runners or suckers. Stolons store food and produce new plants. Buffalograss, common in eastern Wyoming, has stolons. The runners in strawberry plants are also a good example of stolons.



Grass Morphology

Pollination of grass flowers is done mainly by the wind. The anthers release their pollen in great quantities to insure successful pollination. Evolution has reduced floral parts, since showy flowers are not needed to attract insects or animals for pollination. The terminology for the grass flower parts is unique, since the flowers are different from other plants.

INFLORESCENCE

The inflorescence is the arrangement of the flowers on the stem. In the grasses the inflorescence consists of a main stem called the rachis and the floral unit called the spikelet. There are three types of inflorescences in the grasses.

PANICLE- an inflorescence with a main stem (rachis) and branches that are divided at least once; the spikelets are at the end of the branches. Panicles range from an open, multiple branched inflorescence, such as in alkali sacaton, to a contracted, few branched inflorescence, as in prairie junegrass and timothy.

SPIKE - an inflorescence with the spikelets directly on the main stem (sessile), without any branching or stalks. For example, all the wheatgrasses have a spike inflorescence.

RACEME- an inflorescence with the spikelets on short unbranched stalks (pedicels) from the main stem (rachis). The raceme is the least common of the inflorescences. Blue grama is an example of a raceme.

SPIKELET- The spikelet is the actual grass flower. Most spikelets have two bracts at the base called glumes, and then one to many reduced flowers called florets. When there is more than one, each floret is supported on a short stem known as a rachila. There may be both sterile and fertile florets.

Fertile florets are made up of two bracts that surround the reproductive parts. The inner bract is the palea and the outer, and larger, bract is the lemma. Sterile florets have only a lemma and palea. The female reproductive part of the floret is the seed (caryopsis). The male reproductive parts are the stamens, which consist of a stalk (filament) and the pollen-bearing anthers. The grasses are either bisexual, with the florets having both male and female parts; or unisexual, with male spikelets and female spikelets on the same plant (monocious) or on different plants (dioceciuous).

In most grasses, such as wheatgrasses, the ripe seed falls out of the glumes. In some grasses, such as switchgrass, the seed and glumes both fall as a unit.



Grass Flowers



AWNS

Awns are short to long bristles found on the glumes and/or lemmas of some grasses, and are a key identifying character. Needlegrasses have awns that arise from the end of the lemma, prairie cordgrass has one glume awned, blue grama usually has three short awns from the lemmas, and foxtail barley has awns arising from both glumes and lemmas.

LEAVES

In grasses, leaves arise from nodes on the stem. The leaf is made up of two parts: the sheath, which fits tightly around the stem, and the blade, which is the flattened expanded portion. These two parts are joined together at the collar.

On the inside of the collar, next to the stem, is often found a projection known as the ligule. Sometimes small and inconspicuous, it may be a membrane-like structure or a tuft of hairs. Some grasses have two tips or projections from the collar, clasping the stem. These tips are called auricles.

The growing points of grass leaves are at the collar and at the base of the sheath. If a grass leaf is grazed before it is fully developed, it will continue to grow. If it is fully developed when grazed, it will not continue to grow.



STEMS

Grass stems (culms) are made up of nodes (joints) and internodes (stem length between joints). The stems are usually hollow except at the nodes but sometimes have pith in the center similar to corn stalks (corn is in the grass family). Branching of the stem occurs at the nodes. The stem’s main function is to transport water and minerals from roots to leaves and manufactured food from leaves to roots.

Buds are the growing points of the grass plant and are usually close to the ground surface. Seldom do livestock remove the buds by grazing; if they do, the stem will no longer grow.

Forbs and Woody Plants Morphology

Forbs and woody plant species are usually identified by their flowers, fruits, and leaves. These characters are usually visible, allowing easy plant identification.

INFLORESCENCE

For forbs and woody plants, the flower arrangements described for grasses are also used. The amount of branching to individual flowers determines the type of inflorescence. Panicle, spike, and raceme, umbel and head are the most common inflorescence types.

FLOWERS

Flowers are the easiest character to identify. Their base is the receptacle, which is the expanded part of the stem to which other floral parts attach. The sepals (collectively known as the calyx) are usually green and make up the outer row of floral bracts. They are most apparent in the flower’s bud stage and open to display the petals. The petals (collectively called the corolla) are just inside the sepals and are usually showy or brightly colored.

The stamens (male structures) are located just inside the petals. Each consists of a filament or slender stalk and an anther (pollen sac) attached to the end of the filament.

The innermost floral part is the pistil (female structure) composed of stigma, style, and ovary. The stigma is the tip of the pistil, where pollen grains are received. The style is the slender central portion of the pistil that connects the stigma with the ovary. The ovary is the basal portion of the pistil and contains one or more ovules, which mature into seeds.

Flowers are highly variable. Some parts may be in the “spur” in larkspur. In other flowers, some of the parts described are missing.

LEAVES

Leaves of forbs and woody plants consist of several variable parts. There are commonly three main leaf parts. These are: the blade, an expanded part of the leaf; the petiole, a stalk connecting the blade to the stem; and the stipules, a pair of small appendages situated at the base of the petiole. Often the stipules are absent and occasionally other leaf parts are missing.

Leaves are classified as either simple or compound. Simple leaves are those with a single blade and petiole. They are quite varied and are classified by each leaf’s overall shape and the type of margin, base and tip. Compound leaves are divided into separate segments called leaflets. Compound leaves are either pinnately compound or palmately compound. Pinnately compound leaves may be divided more than once, the leaflets themselves being divided into leaflets.

Another key character of leaves in identifying plants is their arrangement on the stem. Three major arrangements of leaves on the stems are recognized. Alternate leaves appear on the stem as one leaf per node. Opposite leaves have two leaves per node, while whorled leaves have three or more leaves per node. Basal leaves may have any one of these arrangements, but are found at the base of the stem.



There are a few leaf modifications that are important. Bracts are leaves that are reduced in size and are usually associated with flowers or inflorescences. Tendrils are a modified leaf or leaflet that twines around objects to support the plant. Tendrils may also be modified stems.

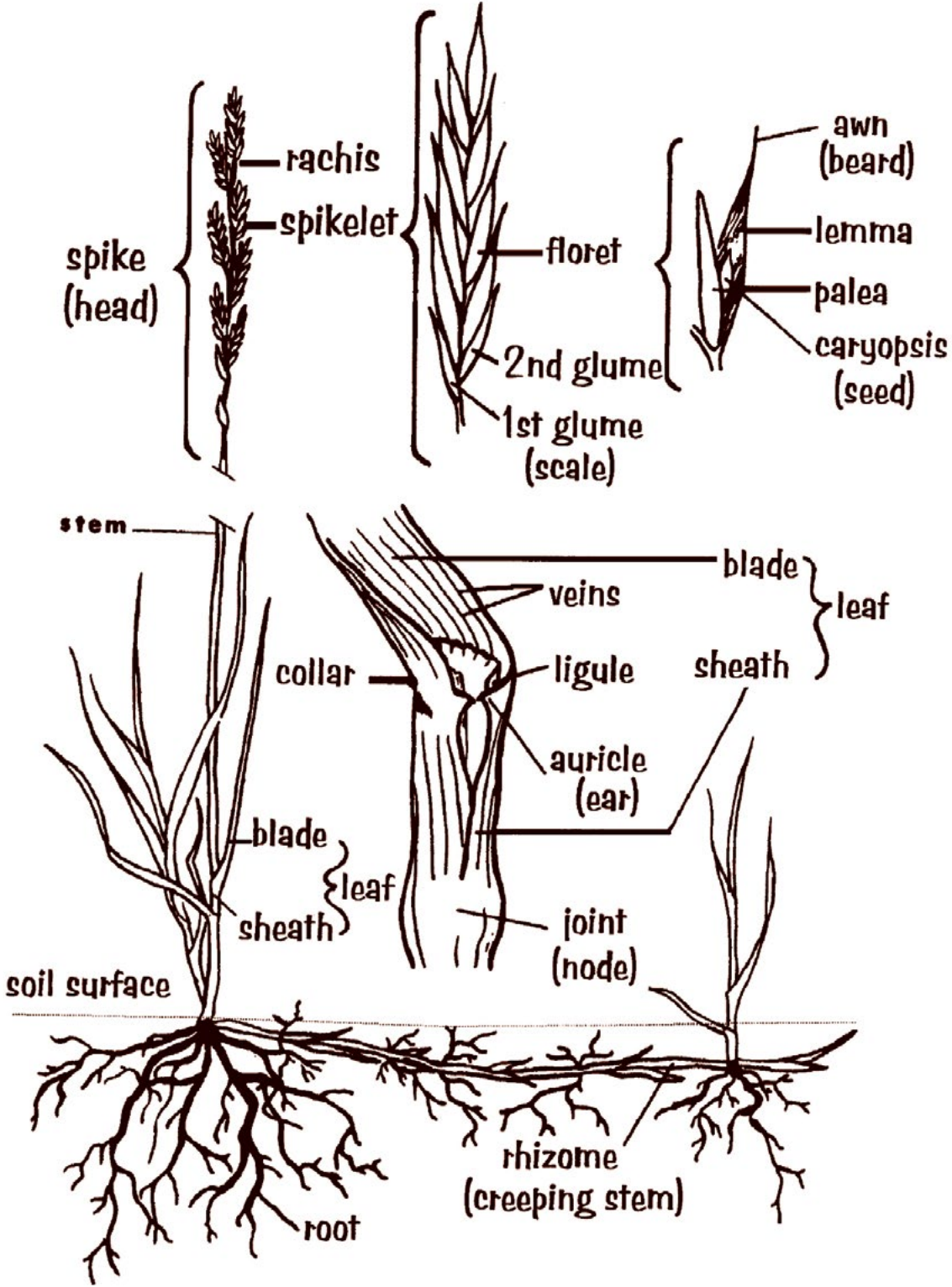
STEMS

Stems of forbs, like grasses, have nodes and internodes (stem length between nodes). Stem branches and new leaves arise from buds at stem nodes. Stems are classified as prostrate (spreading on the ground), erect, or climbing (as in vines). Many species of forbs, such as the common dandelion, produce vegetative stems so short they are unnoticed. Such plants are called acaulescent or stemless.

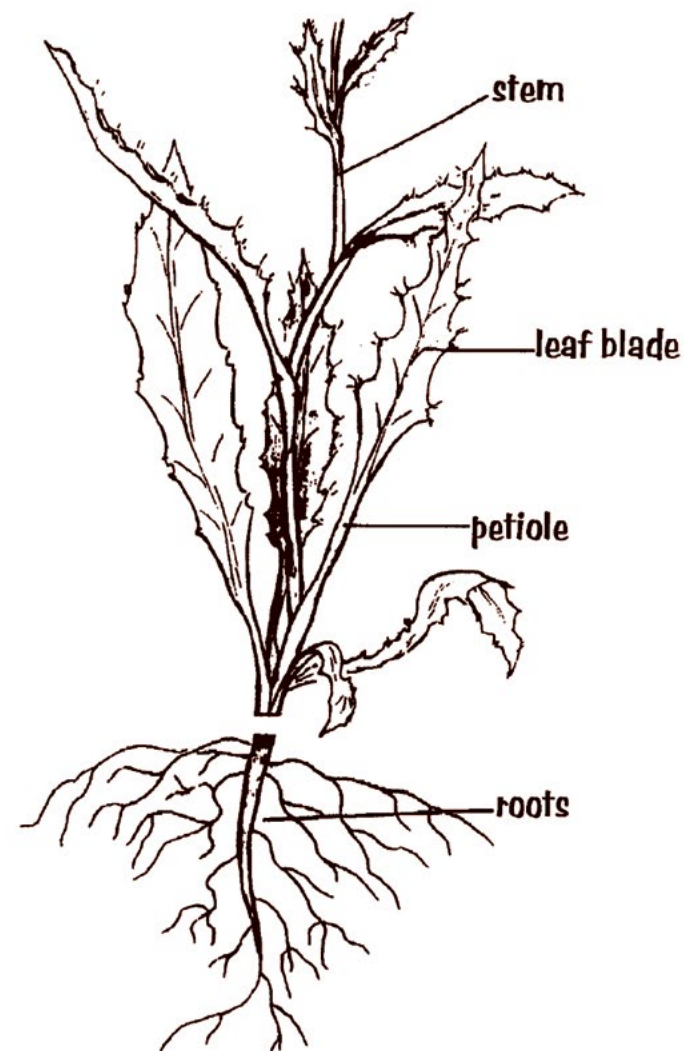
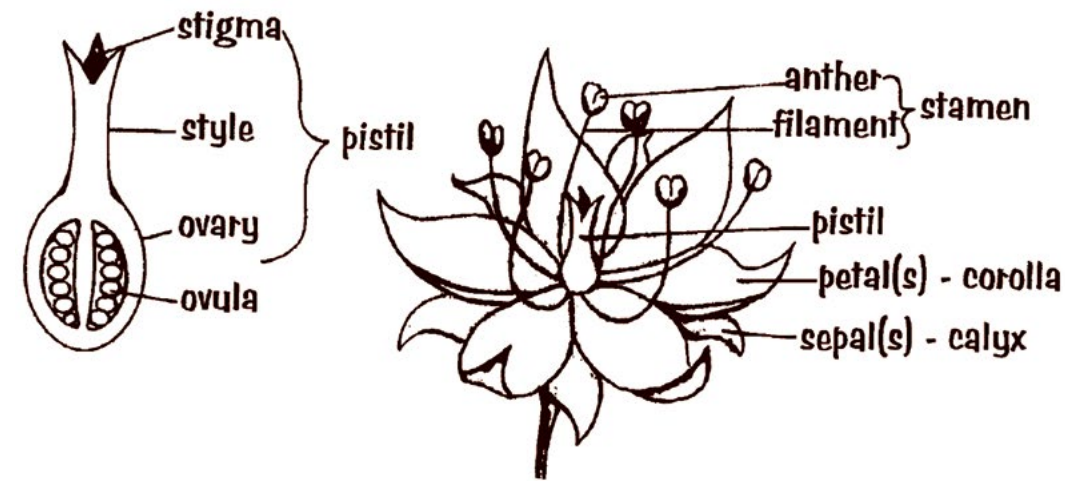
Forb stems die back to the ground each year. The stems of the woody plants are long-lived, woody, and produce new growth along the stem each year. As described earlier, half-shrubs either have stems that are long-lived but aren't woody, or have a stem that is woody near the ground and each year's herbaceous growth dies back to the woody point.



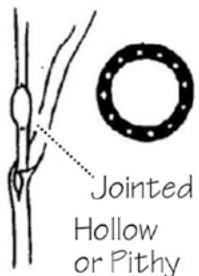





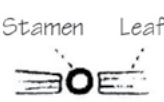

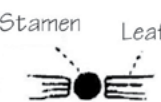
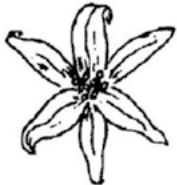

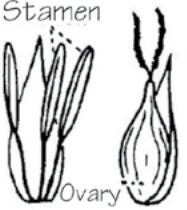






Parts of A Typical Grass Plant



Parts of A Typical Forb

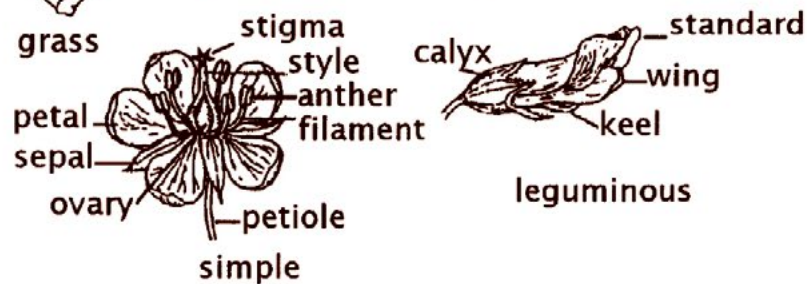
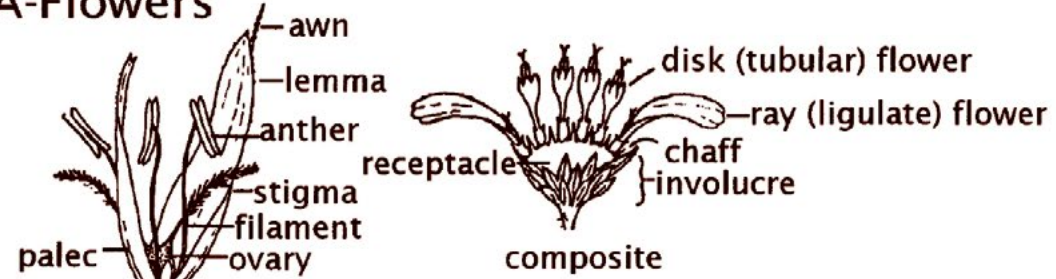


IMPORTANT RANGE PLANT GROUPS

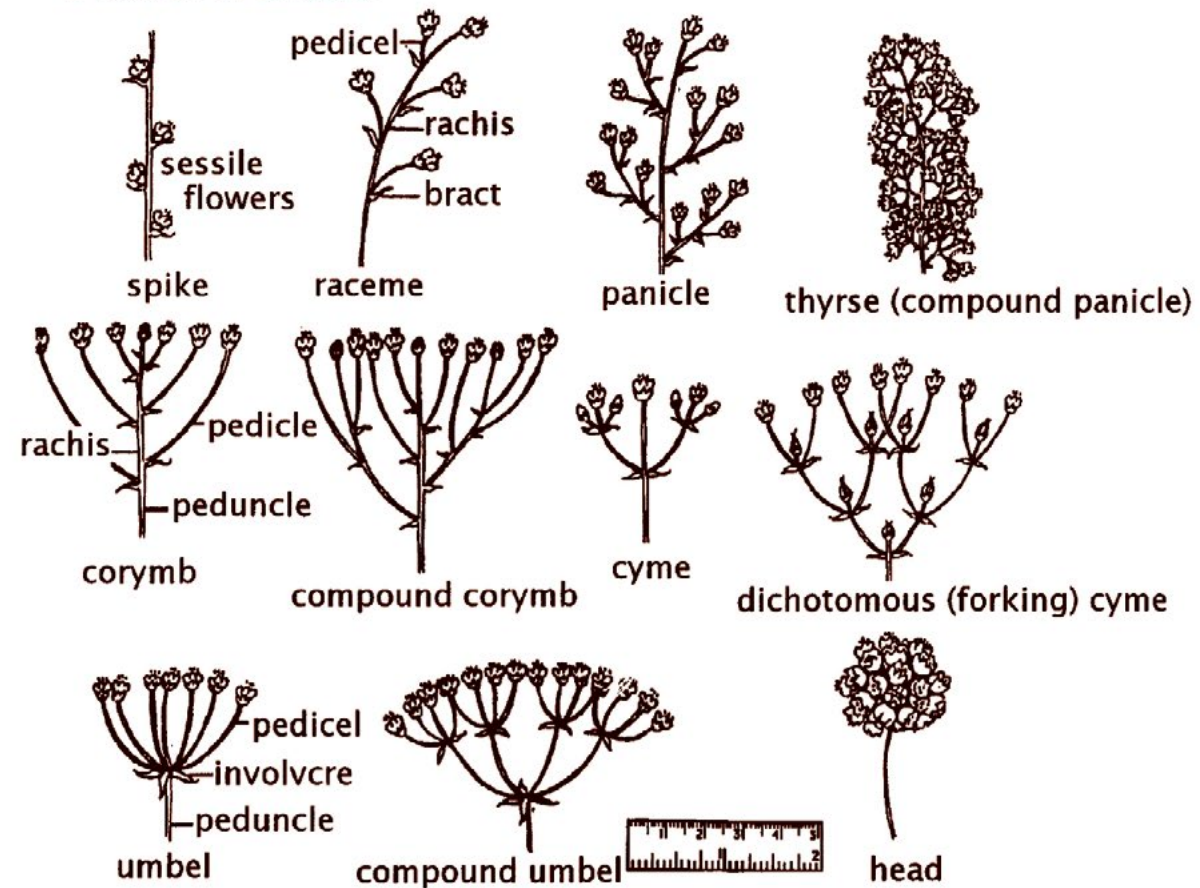
	Grasses	Grasslike		Forbs	Shrubs
		Sedges	Rushes		
STEMS	 Jointed Hollow or Pithy	 Solid not Jointed		 Solid	 Growth Rings Solid
LEAVES	 Parallel Veins			 "Veins" are netlike	
FLOWERS	 Leaves on 2 sides of stem	 Leaves on 3 sides of stem	 Leaves on 2 sides of stem rounded	 Usually Showy	
	 (floret)	 Male Female (May be combined)			
EXAMPLES	 Western Wheatgrass	 Threadleaf Sedge	 Wire Rush	 Yarrow	 Big Sagebrush (twig)

Flower Parts /Types

A-Flowers



B-Inflorescences

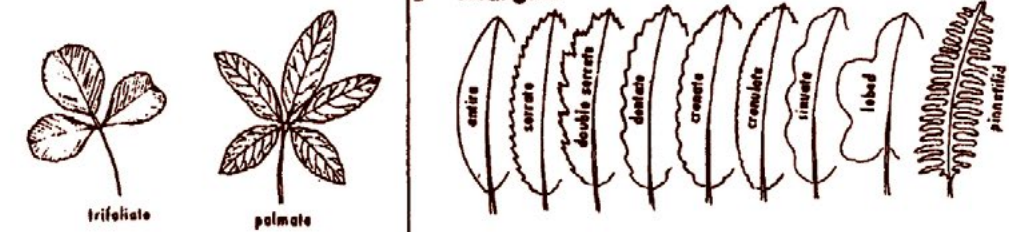


Leaves

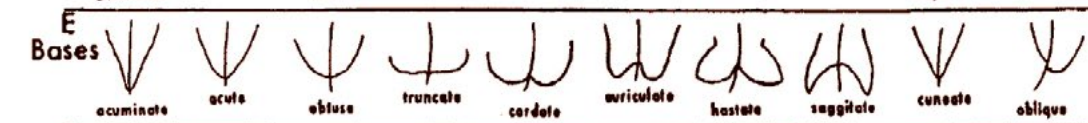
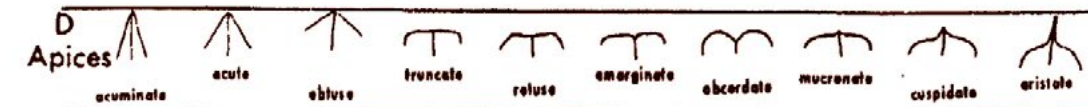
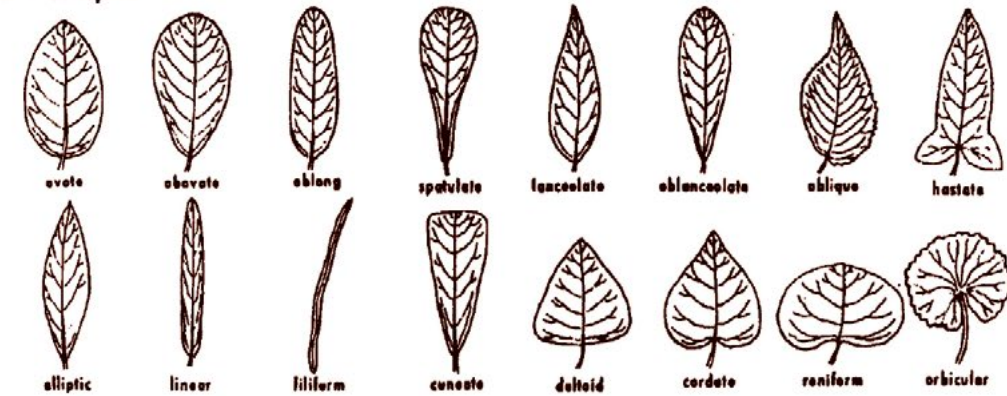
A - Simple and Compound Leaves



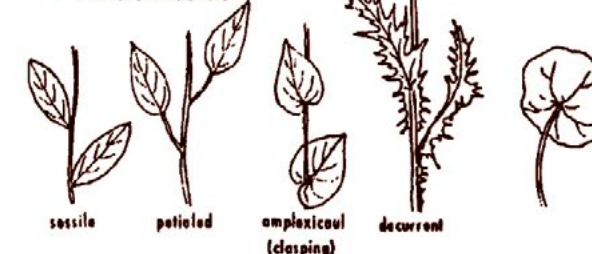
B - Margins



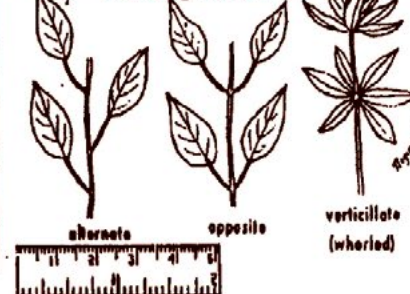
C - Shapes



F - Attachments

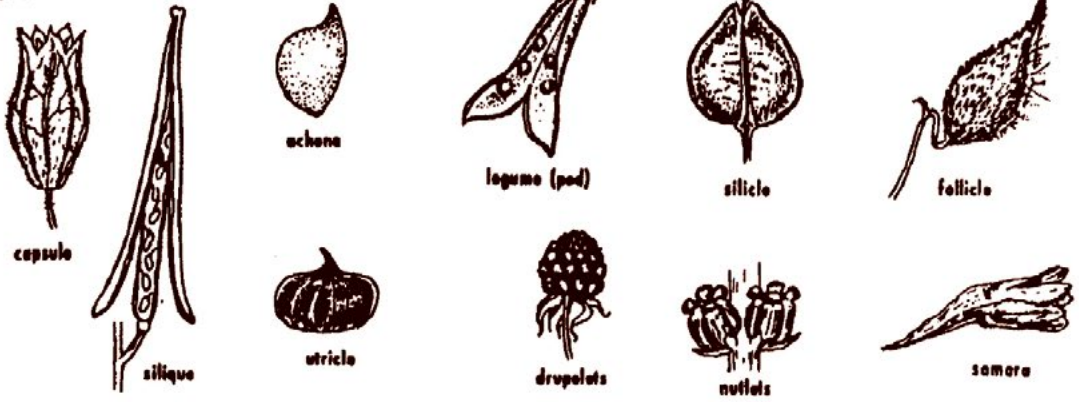


G - Arrangements

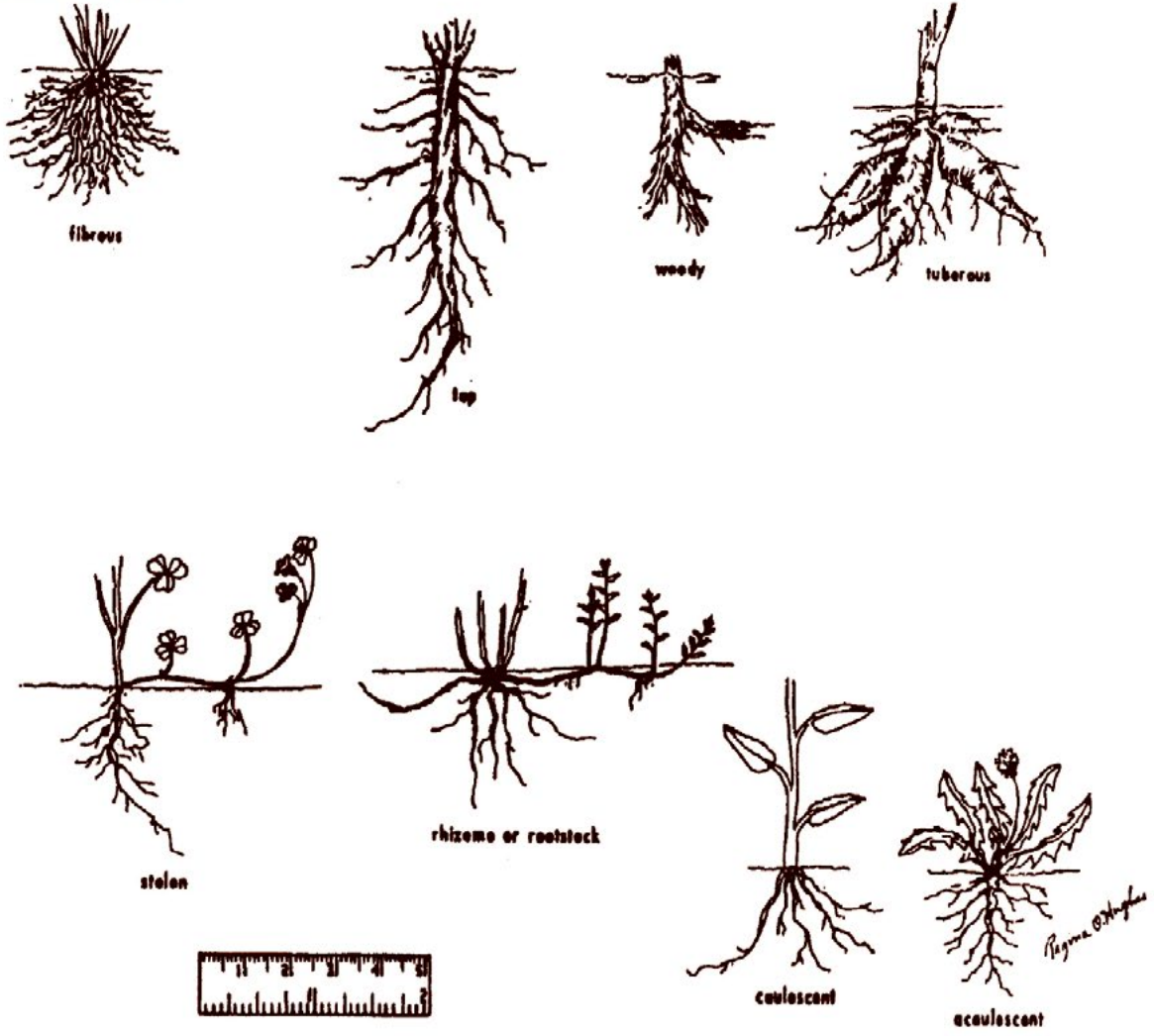


Fruits and Roots

A. Fruits



B. Roots and Stems



Contestant Name: _____ County/Chapter: _____
Phone #: _____ Site: _____

Wyoming Range Judging Card

Instructions: Clearly print the plant ID number from the key at the left in the appropriate blank. Place an X in the column(s) describing characteristics and ecological factors.

Plant Identification Number	Life Span			Season of Growth			Grazing Response			Plant Origin		Ecological and Resource Rating		
	Desirable = De			Undesirable = Un			Greater Sage Grouse			Food		Cover		Cattle
	P	A	B	C	W	D	Ic	Iv	N	I	De	Un	De	Un
1.)														
2.)														
3.)														
4.)														
5.)														
6.)														
7.)														
8.)														
9.)														
10.)														
11.)														
12.)														
13.)														
14.)														
15.)														
16.)														
17.)														
18.)														
19.)														
20.)														

- Forbs**
- 1. Alfalfa
 - 2. Alsike Clover
 - 3. Prairie cloverflower
 - 4. American bistort
 - 5. American licorice
 - 6. American vetch
 - 7. Arnica
 - 8. Arrowgrass
 - 9. Bitterroot
 - 10. Black medic
 - 11. Black salsify
 - 12. Black snakeroot
 - 13. Blackberry
 - 14. Blue lupine
 - 15. Blue wildflower
 - 16. Broadleaf scurfeweed
 - 17. Bull thistle
 - 18. Canada thistle
 - 19. Cattail
 - 20. Chickweed
 - 21. Cocklebur
 - 22. Common dandelion
 - 23. Common ragweed
 - 24. Common sunflower
 - 25. Crazyweed
 - 26. Cudweed
 - 27. Curly dock
 - 28. Curlycup gumweed
 - 29. Death camas
 - 30. Dense thistle
 - 31. Desert princeplume
 - 32. Diffuse knapweed
 - 33. Dotted gayfeather
 - 34. Dyer's woad
 - 35. False boneset
 - 36. Field chickweed
 - 37. Fireweed
 - 38. Fleabane
 - 39. Goldenrod
 - 40. Groundsel
 - 41. Groundsage
 - 42. Hairgrass
 - 43. Hairy wood
 - 44. Hawkweed
 - 45. Hoary cress
 - 46. Hood's phlox
 - 47. Horsetail
 - 48. Houndstongue
 - 49. Indian paintbrush
 - 50. Kochia
 - 51. Lambsquarters
 - 52. Larkspur
 - 53. Leafy spurge
 - 54. Lemon scurfeweed
 - 55. Lewis flax
 - 56. Longleaf phlox
 - 57. Lupine
 - 58. Marijuana hemp
 - 59. Milkweed
 - 60. Miner's candle
 - 61. Monardella
 - 62. Mullein
 - 63. Musk thistle
 - 64. Oxeye daisy
 - 65. Pale agave
 - 66. Pale agave
 - 67. Pasqueflower
 - 68. Penstemon
 - 69. Perennial pepperweed
 - 70. Plumless thistle
 - 71. Poison hemlock
- Grasses**
- 72. Prairie clover (Purple & White)
 - 73. Prairie clover (White)
 - 74. Pseudotsuga
 - 75. Pussytoes
 - 76. Red clover
 - 77. Richardson's
 - 78. Rocky Mountain
 - 79. Rye grass
 - 80. Rye grass (Blue)
 - 81. Russian knapweed
 - 82. Russian thistle
 - 83. Sagebrush
 - 84. Salsify
 - 85. Scarlet gaura
 - 86. Scarlet globe thistle
 - 87. Scotch thistle
 - 88. Segg
 - 89. Showy milkweed
 - 90. Silver cholla
 - 91. Silver cholla
 - 92. Skunkweed
 - 93. Smaller burdock
 - 94. Snow-on-the-mountain
 - 95. Sowthistle
 - 96. Spiderwort
 - 97. Spotted knapweed
 - 98. Sticky geranium
 - 99. St. Johnswort
 - 100. Tapered blazingstar
 - 101. Toadflax
 - 102. Tufted evening primrose
 - 103. Violet
 - 104. Water hemlock
 - 105. Western ragweed
 - 106. Western wallflower
 - 107. Western yarrow
 - 108. Wild onion
 - 109. Woolly plantain
 - 110. Yellow sweetclover
 - 111. Wild buckwheat
- Sedges and Rushes**
- 112. Alkali Cordgrass
 - 113. Alkali Sacaton
 - 114. Alpine Timothy
 - 115. Basin wildrye
 - 116. Bearded wheatgrass
 - 117. Big bluegrass
 - 118. Blue grama
 - 119. Blue grama
 - 120. Blue wildrye
 - 121. Blue bunch wheatgrass
 - 122. Bottlebrush
 - 123. Buffalo grass
 - 124. Canada wildrye
 - 125. Canby bluegrass
 - 126. Cheatgrass
 - 127. Columbia needlegrass
 - 128. Common reed
 - 129. Crested wheatgrass
 - 130. Cuscuta bluegrass
 - 131. Foxtail barley
 - 132. Garrison creeping foxtail
 - 133. Green needlegrass
 - 134. Hairy grama
 - 135. Idaho fescue
 - 136. Indian ricegrass
- Half Shrubs**
- 137. Indian grass
 - 138. Inland saltgrass
 - 139. Intermediate wheatgrass
 - 140. Japanese brome
 - 141. Kentucky bluegrass
 - 142. King spikegrass
 - 143. Letterman needlegrass
 - 144. Little bluestem
 - 145. Mat muhly
 - 146. Mountain brome
 - 147. Multigrass
 - 148. Needleandthread
 - 149. Nevada bluegrass
 - 150. Nuttall alkaligrass
 - 151. Oatgrass
 - 152. Orchardgrass
 - 153. Orchardgrass
 - 154. Plains reedgrass
 - 155. Porcupinegrass
 - 156. Prairie cordgrass
 - 157. Prairie junegrass
 - 158. Prairie sandreed
 - 159. Pubescent wheatgrass
 - 160. Quackgrass
 - 161. Red thread
 - 162. Red thread
 - 163. Redtop
 - 164. Reed canarygrass
 - 165. Rough fescue
 - 166. Russian wildrye
 - 167. Sand dunegrass
 - 168. Sand dropseed
 - 169. Sand paspalum
 - 170. Sandberg bluegrass
 - 171. Scribner panicum
 - 172. Sideoats grama
 - 173. Sixweeks fescue
 - 174. Slender wheatgrass
 - 175. Smooth brome
 - 176. Spike trisetum
 - 177. Switchgrass
 - 178. Tall fescue
 - 179. Tall wheatgrass
 - 180. Thickspike
 - 181. Timothy
 - 182. Tufted hairgrass
 - 183. Tumblegrass
 - 184. Western wheatgrass
- Shrubs and Trees**
- 185. Bulrush
 - 186. Bulrush
 - 187. Nebraska sedge
 - 188. Needleleaf sedge
 - 189. Threadleaf sedge
 - 190. Birdfoot sagebrush
 - 191. Broom snakeweed
 - 192. Bud sagebrush
 - 193. Common Woody Aster
 - 194. Fringed sagebrush
 - 195. Garner's saltbush
 - 196. Green sagebrush
 - 197. Pricklypear cactus
 - 198. Winterfat
 - 199. American plum
 - 200. Antelope bitterbrush
 - 201. Big sagebrush

Contestant Name:_____County/Chapter:_____
Phone #:_____Site:_____



Wyoming Range Judging Card

Ecological Site 1 2 3 Greater Sage Grouse Site Evaluation
Subirrigated [] [] [] Excellent (31 to 40) [] [] []
Saline Subirrigated [] [] [] Good (20 to 30) [] [] []
Lowland [] [] [] Fair (11 to 20) [] [] []
Saline Lowland [] [] [] Poor (0 to 11) [] [] []
Sands [] [] []
Sandy [] [] []
Loamy [] [] []
Clayey [] [] []
Saline Upland [] [] []
Shallow [] [] []
Very Shallow [] [] []

Recommended Management Practices
Continue Present Management [] [] []
Improve Breeding Habitat [] [] []
Improve Nesting Cover [] [] []
Decrease Livestock Grazing [] [] []
Improve Brood Rearing Habitat [] [] []
Improve Winter Habitat [] [] []
Apply Invasive Plant Control [] [] []

Similarity Index (choose one)
76 to 100% of potential [] [] []
51 to 75% of potential [] [] []
26 to 50% of potential [] [] []
0 to 25% of potential [] [] []

Beef Cattle Site Evaluation
Excellent (31 to 40) [] [] []
Good (20 to 30) [] [] []
Fair (11 to 20) [] [] []
Poor (0 to 11) [] [] []

Recommended Management Practices
Continue Present Management [] [] []
Decrease Stocking Rate [] [] []
Increase Stocking Rate [] [] []
Begin a Planned Grazing System [] [] []
Develop Water [] [] []
Change Kind of Livestock [] [] []
Apply Grass & Forb Control [] [] []
Apply Woody Plant Control [] [] []
Apply Invasive Plant Control [] [] []
Plant Adapted Forage Species [] [] []

Ranch Map
Decrease Stocking Rate [] [] []
Increase Stocking Rate [] [] []
Keep the Same Stocking Rate [] [] []
Continue Present Management [] [] []
Develop Water [] [] []
Relocate Fence [] [] []
Divide Pasture (Cross fence) [] [] []
Change or add Salting locations [] [] []
Reseed Specific Areas [] [] []
Control Blowouts [] [] []
Apply Woody Plant Control [] [] []
Apply Invasive Plant Control [] [] []
Install or Change Grazing System [] [] []
Defer Part of Growing Season [] [] []
Defer One Growing Season [] [] []
Defer Two or More Growing Seasons [] [] []

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