



Reviewed July 2010

# Range Judging in Utah



**Mindy S. Pratt  
G. Allen Rasmussen  
Roger E. Banner**



## **PREFACE**

This manual was prepared to serve as the guide for preparing students for the Utah State FFA Range Judging Contest, which has been revised for the 2001 contest. Thus, this manual is meant to replace the former guidelines presented in the 1997 Range Judging Manual. It will require similar types of preparation activities as before, with the difference being some clarification on questions and allowing mounted plants in the contest.

As presented, I hope that this information can serve as a resource in other educational activities, whether in the classroom or out in the field. As such, it follows closely the Natural Resources Curriculum that was developed for the 1997 school year for FFA Programs out of the Rangeland Resources Department. Together, each can serve as a way of providing a “context” for better understanding the functioning of rangeland systems, and how management strategies can be used to help achieve the desired goals for the site.

Mindy S. Pratt  
Extension Associate  
Rangeland Resources Department  
Utah State University

# TABLE OF CONTENTS

<b>Introduction</b> .....	<b>1</b>
Contest Description .....	1
<b>Section I – Plant Identification</b> .....	<b>3</b>
Contest Arrangement, Rules, and Scoring .....	5
<b>Section II – Rangeland Site Evaluation</b> .....	<b>7</b>
Contest Content .....	7
Question 1 – Climatic Zone .....	8
Question 2 – General Soil Type .....	8
Question 3 – Plant Identification .....	10
Question 4 – Abiotic Factors .....	10
Question 5 – Biotic Factors .....	11
Question 6 – Location on Watershed .....	12
Question 7 – Infiltration vs. Overland Flow .....	13
Questions 8 – 10 – Habitat Description .....	13
Question 11 – Current Plant Production .....	15
Question 12 – Evident Uses on Site .....	16
Question 13 – “Use” Effects on Site .....	17
Question 14 – Current Animal Use .....	19
Question 15 – Management Activities .....	21
<b>Appendix</b> .....	<b>24</b>
Utah Master Plant List	
Sample Test Forms	
Plant Identification	
Range Site Evaluation	

Utah State University is committed to providing an environment free from harassment and other forms of illegal discrimination based on race, color, religion, sex, national origin, age (40 and older), disability, and veteran’s status. USU’s policy also prohibits discrimination on the basis of sexual orientation in employment and academic related practices and decisions.

Utah State University employees and students cannot, because of race, color, religion, sex, national origin, age disability, or veterans status, refuse to hire; discharge; promote; demote; terminate; discriminate in compensation; or discriminate regarding terms, privileges, or conditions of employment, against any person otherwise qualified. Employees and students also cannot discriminate in the classroom, residence halls, or in on/off campus, USU-sponsored events and activities.

This publication is issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Noelle E. Cockett, Vice President for Extension and Agriculture, Utah State University (NR-505, May 2002).

## INTRODUCTION

Management of Utah's largest land type, rangeland, requires a working knowledge of important characteristics and how individual components function together as a system. Since this system operates through basic principles, the application of these principles in any setting is important to understand. A contest such as range judging is one way that these principles can be both set forth and applied to rangeland environments.

With this in mind, this manual has been developed for several purposes:

1. To present information necessary for students to learn in order to compete in the Utah FFA Range Judging Contest;
2. To describe rangeland principles, and show how they can be applied to natural settings in order to evaluate a particular site's status;
3. To provide a means by which students can strengthen their critical thinking and observational skills towards natural resources and system components; and
4. To review the State FFA Range Contest design, rules and scoring procedures.

The purpose of this new manual is to build on the previous manual, "Range Judging in Utah: A Manual" (August 1997). Most of the changes in this manual focus on clarifying what is being asked in questions, providing better examples, and adding additional rules to make it more feasible to administer range judging contests. The hope in presenting this information is that beyond the actual contest, it will stimulate further interest on the part of contest participants to learn more about rangelands and their management.

## CONTEST DESCRIPTION

The range judging contest will consist of two interrelated sections: *Plant Identification* and *Rangeland Evaluation*. Each is briefly described as follows:

### *Section I - Plant Identification*

From the Utah Master Plant List (see Appendix), contestants will be required to identify 10 live or mounted plants, using their provided common name. They will also be required to provide characteristics for each plant in the following areas: growth form, longevity, origin, economic value for livestock and wildlife, poisonous potential, and ecological zone of occurrence. Each of these plants will be marked and labeled with a number, which corresponds to the number on the answer form (see Appendix). Each

plant, with its specific characteristics, will be worth 10 points, giving a total of 100 points possible for this section.

### *Section II - Range "Site" Evaluation*

This part represents the major portion of the contest. A general area will be outlined, taking in many of the characteristics of the site. Contestants will be required to answer several questions testing not only their observational skills, but also their critical thinking skills as they combine what they observe with what should or should not be done on this site, based on management goals. Each question will be valued differently, but a possible score will generally run greater than 100 pts, as noted on the Range Evaluation answer form (see Appendix).

Range judging contestants can compete in either the FFA or 4-H category. Contest honors are given both for teams and individuals. A team will consist of as many as four members, but with only the top three scores counted towards the team score. Individuals need not be a member of a team to enter the contest. Those not belonging to a team will compete for individual honors only. All team members are automatically considered for individual recognition.

In the event of inclement weather, a written version of this exam will be administered to the participants. Questions will follow the same format, with information being provided to help determine the correct answers. Plants for this exam will be mounted specimens, with all else staying the same.

Outside of the State FFA Range Judging Contest (which is held in October), additional contests may be scheduled, based on interest and availability, at other times of the year. Also, training and/or practice tests and additional resources may be scheduled (if time permits) or secured by contacting the contest administrator at the following address:

*Roger Banner, Range Extension Specialist  
Department of Forest, Range, and Wildlife Sciences  
Utah State University  
Logan, UT 84322-5230*

*Phone: (435)797-2472  
Fax: (435)797-3796*

## SECTION I - PLANT IDENTIFICATION

The foundation to understanding rangelands and how they function is the ability to not only identify the plants that are present, but also to understand their role in the rangeland system. Plants can indicate and influence many things about a particular site: its history, the sustainability of it, and its potential. They can also help us to understand which animals are best suited for the site, how well food and cover needs of animals are met, and the impact of the various users and uses that have occurred. Because of these indicators, plants can also provide a guide as to what types of management practices can successfully be used on an area to continue it towards the accepted goals. It is for these reasons that plant identification has continued to be incorporated into this contest.

For this portion of the contest, contestants will be required to provide several plant characteristics for each of the identified plants. Each of these are noted and explained as follows:

### ***Identification***

Contestants must provide the “accepted” common name in identifying each marked plant. This name is provided in the Utah Master Plant List (found in Appendix) and must be correctly spelled. Any other name used will be counted as incorrect. In addition, each plant must be correctly identified to receive points from all other required characteristics. Thus, if a plant is incorrectly identified, the full points will be subtracted for that particular plant. Also, if a plant name is correct, but misspelled, one point will be subtracted.

### ***Growth Form***

Each plant must be marked with its correct growth form. Categories include the following:

Trees - Most understand that these are woody plants, usually greater than 10 feet tall at maturity, having one or more main trunks. Their leaves are either evergreen (retain leaves more than one growing season) or deciduous (leaves shed annually).

Shrubs - These are woody plants, usually less than 10 feet tall at maturity. They usually have many stems, with leaves that are broad with net-like venation. Shrub flowers are generally large and showy (colorful), but on some plants like sagebrush, they will be small and inconspicuous.

Forbs - These plants share all the characteristics of shrubs, except for one: their stems are not woody. They tend to be a large and diverse group, containing most of the plants we think of as wildflowers.

Grasses - Grasses usually have hollow or “pithy” stems, that is, the stem appears to be filled with a honey-combed material. Grass stems also have solid joints (properly called “nodes”). Leaves are found on two sides of the stem as viewed from the top of the plant. The leaves are long, thin, and have parallel veins.

Grass-likes - These plants are often mistaken for grasses. They have solid stems without nodes. Stems can either be round or triangular. Grass-like plants having round stems are called rushes. Their leaves are located on opposite sides of the stem. Grass-like plants with triangular stems are called sedges and have leaves on three stem sides. One way to remember this is to use the following expression: “rushes are round, and sedges have edges.”

### ***Longevity***

This characteristic refers to the life cycle of each species. Those that live for one year and then die are referred to as “Annuals;” those that live for 2 years and die, “Biennial;” and those that live beyond 2 years, “Perennials.”

### ***Origin***

This refers to the origin of each species. Those that are “native” naturally grow in North America. In contrast, those that are “introduced” were brought to North America from some other area of the world.

### ***Economic Value for Wildlife and Livestock***

This refers to the value of each species to both wildlife and livestock animals in terms of food. It is based on desirability and nutritive quality for each class of animals. The highest rating of each animal species (regardless of kind) was used based on the various animals in each group: Wildlife = deer, elk, antelope, bison, grouse, pheasant; Livestock = cattle, horse, sheep, goats. “Good” means that this plant is highly sought out and of high nutritive quality; “Fair” means that it is commonly sought out and average in its nutrition; while “Poor” means that it is commonly ignored, low in nutrition, and not used as food.

### **Poisonous Plant**

This category is noted if the plant has enough of a toxic substance at certain stages of growth, and if eaten in sufficient quantity, it will cause sickness or death to either wildlife or livestock.



**Figure 1:** Greasewood, a commonly grazed range plant in alkaline and saline areas, can be poisonous to sheep late in the growing season.

### **Ecological Zone of Occurrence**

This categorizes the particular zone where each species is highly likely to occur throughout the state. If a plant species appears in a diverse set of zones, it is marked with a “W” for “Widespread.” However, those that appear to be mostly confined to certain zones are noted with the following:

- Desert = under 8” precipitation
- Semidesert = 8 - 12” precipitation
- Upland = 13 - 16” precipitation
- Mountain = 17 – 22” precipitation
- High Mountain = 23 - 35” precipitation
- Alpine - Above 35” precipitation

## **CONTEST ARRANGEMENT, RULES AND SCORING**

The following provides an overview of the necessary information needed to complete the Plant Identification section of the contest:

- Plants to be identified will be marked with numbered, colored ribbons. The numbers correspond to the numbers on the answer forms. Thus, each contestant is responsible for making sure he/she writes the answers on the line next to the appropriate number on the answer form.
- Mounted Plants used will be labeled with where it was collected as well as its ecological zone of occurrence. For example: South of St. George, desert zone.
- A “trail” will be marked with ribbon or rope, which will take each contestant to each designated plant. All contestants will line up single file at the start of the “plant trail” and proceed to the next plant only when told to move. Only one student will be stationed at each plant specimen.

- For each specimen, the following should be recorded on the score form:
  - common name
  - growth form
  - longevity
  - origin
  - economic value for both wildlife and livestock
  - poisoning/toxic potential, if applicable
  - ecological zone of occurrence
- Once the contestant has reached the end of the trail, score forms should be quickly reviewed and then turned in. All should remain quiet and courteous for those still taking the test until all contestants are finished.

➤ At the end of the contest, correct answers will be supplied and discussed.

➤ Scoring will be based on the following point system:

Correct Identification	= 4 pts
Correct ID, but misspelled	= -1 pt
Growth Form	= 1 pt
Longevity	= 1 pt
Origin	= 1 pt
Economic Value: Wildlife	= 1 pt
Livestock	= 1 pt
Ecological Zone of Occurrence	= 1 pt
Plant is poisonous, not marked	= -1 pt

**Total Possible for each plant = 10 pts**

- Contestants will be expected to do their own work, and no talking will be allowed during the contest. Any form of cheating and/or visiting with others during the contest will result in immediate disqualification from the contest.
- Scores from this part will be added to the scores from the Site Evaluation in order to obtain a total score for the whole contest, both as teams and individuals.

## **SECTION II - RANGELAND SITE EVALUATION**

### **CONTEST INSTRUCTIONS**

This portion of the Contest will center around a particular area or site. It is important to not only evaluate and observe the immediate vicinity of the site (within a 100 feet radius), but also its relation to the area around the site as a whole. Questions will cover aspects of both.

Each participant will receive an answer form to complete for this part of the contest. In order to complete this section, participants are required to have the following:

- 2 pencils/ eraser
- clipboard
- calculator (if desired)

Thirty (30) minutes will be allowed for participants to complete this section. Each are expected to do their own work, without any talking, or disqualification will result. Any questions concerning the contest should be directed to the on-site contest administrator.

Throughout this part of the contest, various pieces of information will be provided in order to assist the participants in answering the questions. This may be given on the answer sheet itself, or on an on-site flipchart. Instruct students to pay attention to this detail.

Scoring will vary depending on the question, and is noted in the following explanations, as well as on the answer form. It is important to fully complete each question. All scores from this section will be added to the Plant ID score to arrive at a total score for the contest.

### **CONTEST CONTENT**

In the following sections, each of the specific areas of content is discussed, with instructions provided on how to complete the answer form. Some background information is provided in order to assist in developing both the principle and its application in a field setting. In some instances, answers to one question will be needed to complete other questions throughout this part of the site evaluation.

Some examples have also been provided to assist preparation. In the event that weather prohibits having the contest outside, a written exam will be administered for those competing in this contest. In this case, the written exam will take the form of the examples that are provided.

### **Question 1 - Climatic Zone of Site (5 pts)**

Within any ecological site, the climatic characteristics, particularly precipitation, greatly dictate much of the potential of the site in terms of plant occurrence and production. For this contest, contestants will be required to record the correct climatic zone based on the amount of precipitation received by this site. A precipitation amount will be provided for all contestants. Based on the following, an identified climatic zone can be recorded:

- Desert = under 8" precipitation
- Semidesert = 8 - 12" precipitation
- Upland = 13 - 16" precipitation
- Mountain = 17 – 22" precipitation
- High Mountain = 23 - 35" precipitation
- Alpine - Above 35" precipitation

The above information will not be available to students during the contest, thus, each will need to learn this for themselves.

**Example Question:** A site receives 9 inches of precipitation, either in the form of rain or snow. What is its climatic zone? Answer: Semidesert.

### **Question 2 - General Soil Type (5 pts) (Adapted from "Utah Range Judging Handbook")**

Soil characteristics are very important in determining the kinds and amount of plant life because of the influence they have on the actual amount of water available for plant growth. Factors such as depth, restrictive layers, rock content and soil texture greatly affect any site. Five common soil types will be recognized and used for the purposes of this contest. These sites are common throughout Utah and represent a range of the characteristics involved in separating one site from another. Contestants should be aware that many other soil types exist. More information about soils can be obtained from a local office of the Natural Resources Conservation Service. The five types used for this contest include the following:

Shallow Loam - Soils here are less than 20 inches (50 cm) to bedrock and have a loam texture in the upper horizons. Rock content of the soil is most often less than 35% by volume.

**Shallow Hardpan** - These soils are less than 20 inches (50 cm) in depth to a cemented (petrocalcic) horizon, claypan, or other restrictive layer other than bedrock. The upper horizons are generally of loam texture. Rock content of the soil is usually less than 35% by volume.

**Loam** - These soils are greater than 20 inches (50 cm) in depth and have a loamy texture in the upper horizons. Rock content is less than 35% by volume.

**Gravelly Loam** - Soils are greater than 20 inches (50 cm) in depth and have a loamy texture in the upper horizons. Rock (larger in size than sand but less than 3 inches (8 cm) in average diameter) content is 35-50% by volume.

**Stony Loam** - Soils are greater than 20 inches (50 cm) in depth and have a loamy texture in the upper horizons. Rock (greater than 3 inches (8 cm) in average diameter) content is greater than 50% by volume.

Figure 2 (below) provides a simple way of determining the correct soil type based on the given characteristics. Learning this type of “soil key” would be very helpful to the participants, as it will not be available during the contest.

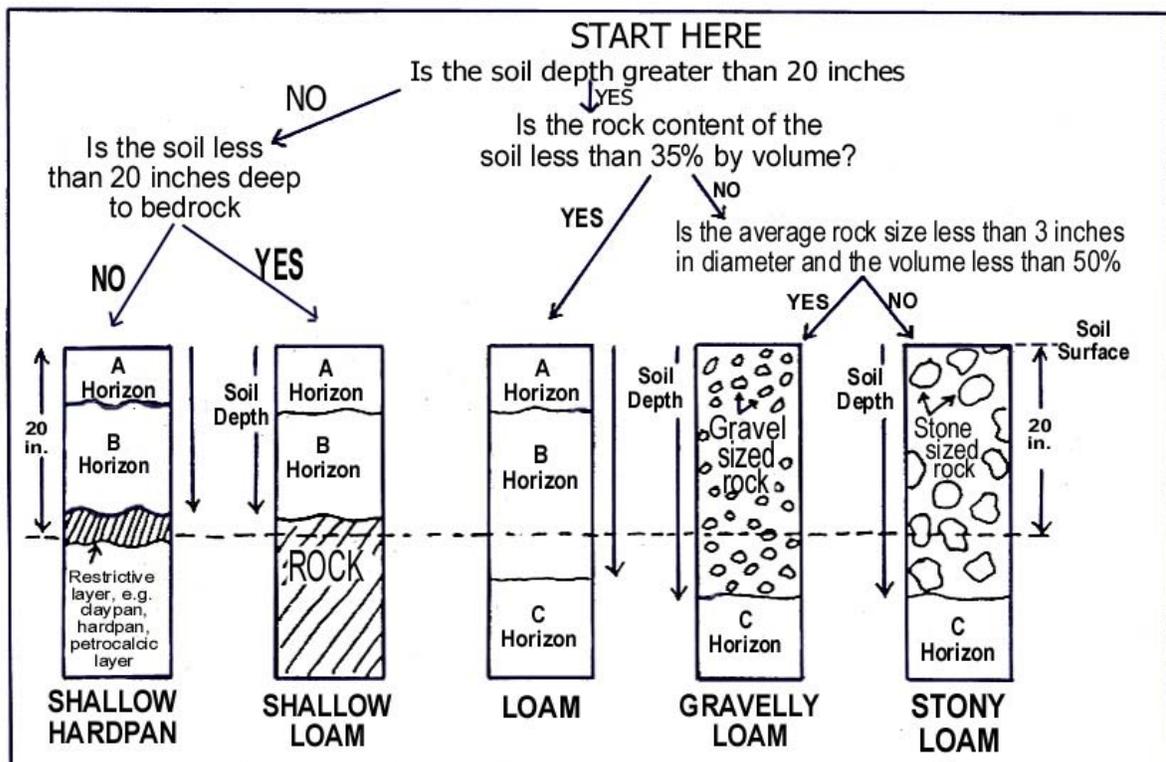


Figure 2: A Soil Key

A soil pit will be provided for contestants. Each characteristic (as provided in the descriptions) should be considered before deriving an answer.

**Example Question:** Soils in this area are 19 inches deep before a claypan occurs. What is this soil type? Answer: Shallow Hardpan.

### **Question 3 - Plant Identification (30 pts)**

Contestants will be asked to identify five (5) flagged plants located on the site (within a 100 feet radius). Each of these plants must be correctly identified (2 pts each), using the common names given in the Master List. In addition, for each of these plants, contestants will be required to record the economic value of each species for both wildlife and livestock (2 pts). This information is provided in the Utah Master Plant List. These designated species will be important in determining answers to other question on the contest.

**Example Question:** If Indian Ricegrass is flagged, contestants need to identify it as Indian Ricegrass and that it's forage value is Fair for Wildlife and Good for Livestock.

### **Question 4 - Abiotic Factors (10 pts)**



**Figure 3:** Fire is an important part of many range ecosystems.

Within rangeland systems, abiotic (nonliving) components of the system interact with each other. In addition, these same factors also interact with the biotic (living) components. Each of the following abiotic factors plays an important role in rangelands, and contestants are asked to evaluate the site, select one factor, and briefly explain its influence on the contest site. The key here is to briefly and succinctly demonstrate how these factors have played a role in producing what is present on the site. Brief explanations of each are provided:

Fire - presence or absence, wild vs. managed, effect on plant and/or soil, event occurrences (frequency).

Climate - temperature regimes, precipitation events and forms.

Water - its presence or lack of, its quality, its form (ice, snow, rain, etc.), chemistry, the water cycle, effect on soil and plants

Topography - the general shape and slope of the terrain.

Soil - depth, quality, types, water-holding capacity, chemistry.

**Example Question:** Choose one of the following ABIOTIC factors and explain how it helped determine this site. After observing the site, it appears that soils contain alkali.  
Answer: Soils on the site contain alkali, which limits plant species that are able to grow.

### **Question 5 - Biotic Factors (10 pts)**

Like abiotic factors, living organisms greatly affect not only one another, but that which is around them. Each contributes to the overall existence and functionality of rangeland systems. Based on what is seen and observed at the contest site, each contestant will be required to select one of the following biotic factors and briefly describe how it has contributed to the present state of the contest site:

- Plant life - address all forms, and the resulting habitat that is produced, competition with other plants, poisonous plant roles, shading, cover.
- Animal life - in the following groups, focus should evaluate influences in areas such as food sources (quantity and quality), shelter sites and requirements, population numbers, competition with other animals, trail formation due to migration, predation.
  - insects
  - birds
  - rodents
  - large wild mammals
  - large domestic mammals
  - humans

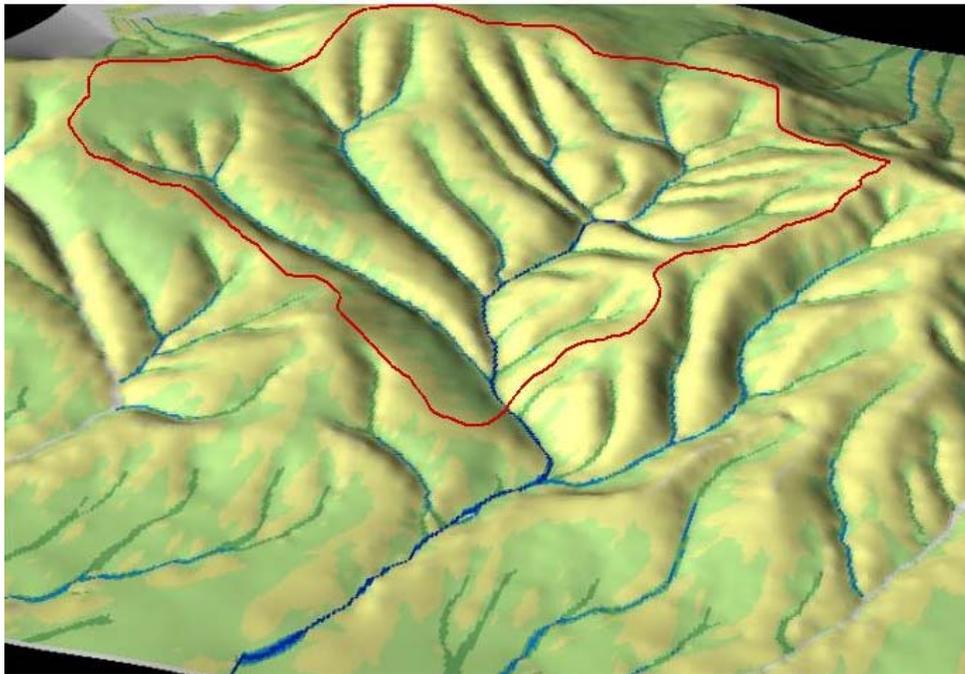


**Figure 4:** Mormon crickets, like the one pictured above, can cause extensive damage to rangelands

**Example Question:** Choose one of the following BIOTIC factors and explain how it has contributed to determining this site. After observing the site, it is evident that large domestic grazers have influenced this site by overgrazing. Answer: Large domestic grazers have influenced this site through overgrazing. This has changed the vegetative communities to less preferred species.

**Question 6 - Location on Watershed (5 pts)**

A “watershed” is a term used to delineate fairly discrete boundaries where water is collected and discharged through a specific point (Figure 5).



**Figure 5:** An illustration of a “watershed,” where ( — ) denotes the watersheds boundaries, and ( — ) denotes the water transport channels.

As such, it is important to recognize where a given site is located on a watershed, which in turn affects the quantity and quality of water, as well as its flow patterns. Contestants will need to identify the location of the contest site on the watershed. The location options offered include the following:

- Top - This location is typically characterized by mountainous regions at the peak, or where the uplift becomes narrow, bordering another watershed.
- Middle - located somewhere between the top or highest elevation of the border of the watershed, and the bottom or point where the water flows out of the delineated watershed.

- **Bottom** - The site where a majority of the collected water flows out of the watershed in the form of a stream, river, or gully, i.e. the focal point of water discharge from the given watershed region.

**Example Question:** If the site is in the mouth of a side canyon, is it at the top, middle, or bottom of the watershed? Answer: Middle

### **Question 7 - Infiltration vs. Overland Flow (5 pts)**

How water flows through a site is determined by many characteristics on the site. Usually, some of the more important characteristics include the vegetation, soil type, slope, and location on a watershed. Contestants are to evaluate the contest site and determine the type of water flow this site produces based on the presence of the following:

**Infiltration** - A site that encourages infiltration will usually have a high portion of the ground surface covered by plants or their resulting litter, a slope that is not extreme, a light textured soil (loamy to sandy) without surface restrictions like crusts, and a location usually towards the bottom of a watershed region.

**Overland Flow** - A site that encourages overland flow will usually have a ground surface with little plant cover, steep slopes, the presence of gullies/rills, soils with surface crusts or high levels of clay within the topsoil, and usually located near the top of a watershed.

**Example Question:** This site encourages infiltration – describe briefly how. Answer: Precipitation falling on the site is intercepted by vegetation and able to infiltrate into the soil. Little or no runoff occurring is evidenced by lack of gullies, rills, sediment, or pedestalling of plants. Plant cover and litter provide protection to the soil surface from raindrop splash and wind erosion.

### **Questions 8 – 10 - Habitat Description**

Every rangeland site will have some form of “habitat” that can be evaluated. Habitat specifically refers to characteristics of the site that address the needs of living organisms in regard to food, shelter and space. This is important, particularly in understanding why certain living organisms either prefer or are found present on the site. For the contest, all appropriate characteristics present on the site are to be noted on the answer form. A description of each of these characteristics follows:

**Question 8 – Comparisons of Species Diversity, Habitat type, and Accessibility (2 pts each)**

- Species Diversity - This refers to the number of individual species present within any plant growth form. The site should be evaluated collectively (of growth forms) and one of the following selected based on the general characteristics of the site:



**Figure 6:** The thick sagebrush on the left of the picture is indicative of low species diversity. The right side of the fence has a higher diversity.

- high - within the growth forms present, there is clearly a diverse population of species. Example: There are many species of grasses, forbs and shrubs.
- low - species present are very limited, with usually less than 5 species present per growth form as an average across growth forms. Example: There are less than 5 species each of grasses, forbs, and shrubs.

- Site - The general site is evaluated based on the surrounding area that can be seen. From this, the site can be determined to be either:
  - restricted - meaning that the site is atypical of the rest of the surrounding region in terms of plant life; or
  - widespread - meaning that it is representative of most of the area surrounding it.
- Site accessibility - This characteristic refers to how easily wildlife/livestock and/or humans can access this particular area.
  - inhibited - means that certain plant growth forms or land topography, such as tree/shrub thickets and/or steep canyon walls hinder easy access to the site both in/out or within the site.
  - uninhibited - means that the plant life and land topography tend to be more open, allowing for easy travel both in/out or within the site.

**Example Question:** Does this site have high species diversity or low species diversity? After observing the site, it appears to be a monoculture of sagebrush, with some cheatgrass in the interspaces. Answer: Low Species Diversity

### **Question 9 – Growth Form Diversity (2 pts)**

- Growth Form Diversity - This refers to the presence or absence of the generally recognized plant growth form:
  - mostly grass - most of the plant species present are grasses
  - mostly forb - most of the plant species present are forbs
  - mostly shrub - most of the plant species present are shrubs
  - mostly forest - most of the plant species present are tree species
  - mix - there is a general population present of most of the growth forms.

**Example Question:** Is the site mostly grass, mostly forb, mostly shrub, mostly forest, or a mix? After observing the site, it appears to be primarily sagebrush, with some cheatgrass in the interspaces. Answer: Mostly shrub.

### **Question 10 – Water Availability**

- Presence of surface water - This asks the question about the presence or absence of water available for all organisms within a ½ mile of the site, whether standing or running.
  - scarce - very little present. Usually no developed water sources (troughs, spring development, ponds) and/or streams nearby, with plant life reflecting little use by animals.
  - available - Either standing and/or running water present. Water-loving plants present, with obvious signs showing that wildlife/livestock and/or humans are utilizing it as well.

**Example Question:** Is water scarce or available and why? After observing the site you realize there is a pond across the road, but it is behind a fence. Answer: Water is available for most organisms (coyotes, rabbits, birds, insects, and deer), but scarce for livestock because the pond is fenced.

### **Question 11 - Current Plant Production on Site (5 pts for each growth form; 25 pts total)**

A knowledge of plant productivity, both quality and quantity, is important in managing rangeland sites for various uses. The assurance that adequate plant material is left on the site after any type of managed herbivory, is allowing what is termed “Proper Use.” This is a general guideline for determining how much plant material can be used (i.e. consumed) by wildlife, and/or livestock, while providing for continued sustainability for the future. In rangelands, the commonly used “Rule of Thumb” is – “Take half, leave half.” What this means is that of the total vegetation that is present, roughly only half should be used by wildlife and/or livestock. The other half is left to help insure that plants can adequately reproduce and sustain themselves, and that the soil is properly protected.

In this section, the following pieces of information will be supplied to the participant:

1. The Total Production of this particular site on a “per acre/hectare” basis.
2. Of this total production, the percent (%) for each of the following growth forms will also be provided:
  - shrubs --- grasses --- forbs --- trees --- grasslikes
1. Proper Use (PU), which is the percent of the total production which can be utilized by any animal. If no Proper Use percentage is given, 50% will be used (take half, leave half).

Participants will be asked to calculate, for each growth form, the amount of plant material (in #/ac or hectare) that is available for use (or consumption) by any animal. The key here is to reinforce this concept of sustainability, even though this area is being used as habitat. Keep in mind that this information will be necessary for calculating stocking rates in a later question.

**Example Question:** The total annual production of this site is 1500 lbs/ac and its composition is 75% shrubs and 25% grasses. How much forage is available for use?

Answer:

Shrubs:  $1500 \text{ lbs} * .75(\%) \text{ composition} * .5(\%) \text{ PU} = 562.5 \text{ lbs available for use}$

Grass:  $1500 \text{ lbs} * .25(\%) \text{ composition} * .5(\%) \text{ PU} = 187.5 \text{ lbs available for use}$

### **Question 12 - Evident Uses on Site (5 pts each)**

To answer this question, participants will need to evaluate the given site (about a 100 foot radius) and look for evidence of uses by various living organisms. Contestants will be asked to name 3 evident uses on the site. Any of the following uses could apply if evidences are observed:

- Livestock Grazing - hoof prints, droppings, plants trampled and/or grazed, hair.
- Wildlife grazing - hoof or foot prints, droppings, plants grazed or browsed, hair.
- Shelter for wildlife - plants laid down, burrows, nests, feathers, old egg shells.
- Soil medium for plants - plants are growing in the soil
- Shelter for livestock - resting areas marked by prints and/or dropping.

- Human recreation - ATV tracks, human footprints, garbage, trails.
- Food for birds - particular plants present with herbivory effects, “left-over” food evidences.
- Shelter for Rodents - burrows, storage spaces, droppings, tracks.
- Food for Rodents - visual contact, droppings, herbivory on plant life, tracks.



**Figure 7:** Prairie Dogs are only one of many animals that rely on rangelands for valuable habitat.

**Example Question:** Name three uses that are evident from observing this site: After observing the site, you find droppings from both deer and cattle. Answer: The following could be listed as possible uses:

- Livestock Grazing
- Wildlife Grazing
- Shelter for Livestock

**Question 13 - “Use” Effects on Site (1 pt each)**

Because of the recognized uses upon the site, participants will be asked to identify the observable effects of these uses. Any that apply should be marked. The answers are grouped according to specific types of effects:

- Soil Effects - refers to whether or not the soil on the site is:



**Figure 8:** A headcut, pictured above, is a sign of erosion.

- stable - meaning that a small amount of soil is actually moving as a result of wind/water erosion, usually due to adequate and widespread plant cover.
- eroding - meaning that observable evidence of wind/water erosion is present. Actively forming, or presence of, gullies, rills, channels, and pedestalling are examples.

- Availability of Water - Are activities on the soil surface modifying current water capacities and quality?
  - Available - Clean, fresh water is present.
  - Scarce - changes in environment (erosion, overuse by animals/humans, etc.) are influencing water supplies such that both the quality and quantity are decreasing for the site.
  
- Grazing by Livestock and/or Wildlife - In general, how is the area being used for food consumption?
  - Selective – Some species are obviously grazed while others are not touched.
  - Overgrazing – most plants show signs of grazing: plants are smaller stature or grazed off close to the ground. Species composition is poor. Plants show evidence of stress, some uprooted due to “hoof action.” High amounts of bare ground caused by plant removal and trampling. NOTE: Keep in mind the season, and current years precipitation (i.e. is the area experiencing a drought?).

- Habitat Sustainability - does the current site seem stable or in a state of change, in terms of site characteristics both of the land/soil and plant forms?



**Figure 9:** Numerous young Junipers are an indicator of a site converting from a shrub to tree dominated system.

- Stable - Widespread type, little evidence of plant “die-offs” and/or new plant regeneration;
  - Converting - Site shows evidence of plant form shifts (i.e. shrub community to tree community as demonstrated by widespread tree seedling presence or grassland community to shrubland community by widespread shrub seedling presence).
  
- Pollution - due to activities on the site, is any form of pollution observable?
  - air - smog, smoke from fire, dust clouds.
  - land - trash present, either manmade or other.
  - water - clarity of water, excessive sediment, debris in tank or stream.
  
- Land Conversion - is the present site currently being converted to some other form of land (ie. plowing for crops, roads, urban development).

- Weed Invasion - A “weed” is simply a plant species that is considered undesirable for the site based on the current goals for use. Some of the more commonly considered weeds include knapweed, leafy spurge, whitetop, thistle, cheatgrass, medusa head rye, and dyers woad. Is there any major weed invasion occurring with the present uses?



**Figure 10:** Squarrose knapweed infestation in Juab County.

**Example Question:** Is soil stability or soil erosion occurring on this site? After observing the site, which is predominantly sagebrush, with some cheatgrass in the interspaces, you see pedestalling of plants and the development of rills and gullies.  
Answer: Soil Erosion.

#### **Question 14 - Current Animal Use (30 pts)**

At any time, any given area of land can support only so many animals, for a given length of time, whether livestock or wildlife, as dictated by the available plant material which both need. Land managers must be careful to balance the “supply” (forage available through time) with the “demand” (number of animals present and using it through time), if the area is to be maintained or improved. One of the ways to do this is to assign a “stocking rate,” which is simply the number of animals present on a particular area for a specific time. This can be stated as AUM’s/acre or acres/AUM. An AUM, or Animal Unit Month is the approximate amount of forage that is required by an animal unit (AU),



**Figure 11:** Cattle grazing on rangeland.

which is comparable to the demand of a 1000 lb cow with calf, for one month – and is standardized at 800 lbs of herbage. In order to calculate stocking rates, several pieces of information must be known:

- Size of area to be used = # of acres or hectares
- Duration of use by animals = # of days or months
- Plant production of area = # per acre or hectare
- Kind and class of animal(s) that will be present (Animal Unit Equivalent) and amount of forage required/AUM
- Utilization level = % of herbage used

For the purpose of this contest, participants will be provided all of these pieces of information. Through their own calculations, they are to determine the stocking rate of the area. The current stocking rate of the area will be provided, and based on their calculations, students are to determine whether the area is:

- Appropriately stocked – means that given the site and the production, the current stocking rate reflects a balance between the plant material present and the number and kinds of animals present.
- Overstocked– means the current stocking rate is too high based on available forage.
- Understocked – means the current stocking rate is low, and could be raised if desired. More plant material is being left, rather than consumed.

Some common Animal Unit Equivalents, which are the amounts of forage consumed by the different kind and class of animals expressed as a portion of an animal unit, are listed in Table 1. This is important to have when the AUM calculation deals with animals other than cattle.

**TABLE 1: Commonly used Animal Unit Equivalents**

<b>CLASS OF ANIMAL</b>	<b>ANIMAL UNIT EQUIVALENT</b>
Horse, mature	1.25
Cow, 1000 lb, with calf	1.00
Bison, mature	1.00
Elk, mature	0.60
Deer, mule, mature	0.20
Sheep, mature	0.20
Sheep, bighorn, mature	0.20
Antelope, mature	0.20

**Example Question:**

A Forest Service allotment is managed for 60% utilization by sheep for 6 months. The pasture is 1000 acres in size, with a total herbage production of 1800 lbs/acre. The area's current stocking rate is 125 sheep for 6 months.

Are the sheep:      Appropriately stocked, overstocked, or understocked?

Calculations:

1. Find out available forage:

- a. Total Production = 1000 ac x 1800 lbs/ac = 1,800,000 lbs herbage in pasture
- b. Proper Use = 1,800,000 lbs x .6 (Proper Use %) = 1,080,000 lbs useable forage for animals

2. Calculate proper stocking per AUM:

- a. 1,080,000 lbs forage available / 800 lbs/AUM = 1350 AUM's

3. Calculate proper stocking rate for sheep:

- a. 1350 AUM's / .20 Conversion factor for sheep = 6,750 sheep for 1 month
- b. 6,750 sheep/ month / 6 months = 1125 sheep for 6 months

4. ANSWERS:      Sheep should be stocked at 1,125 sheep for 6 months, therefore, sheep are understocked.

**Question 15 - Management Activities (15 pts)**

Based on all the derived and provided information that has been accumulated during the course of this contest, each contestant will be asked to review and select one management option (either animal, plant, or human) that can be implemented on this particular site, and provide information as to why they believe it is needed. Participants will need to become very familiar with each of the following management activities and their prerequisites, since none of this will be available during the actual contest.

## **Animal Management:**

Reduce Stocking Rate - This should be used if, generally speaking, forage plants on the site are mainly undesirable, unhealthy and/or overgrazed, and if there is not enough forage produced to fill the animal requirements as revealed through stocking rate calculations.

Increase Stocking Rate - This is used if most plants are healthy, with little or no herbivory observable, and if stocking rate calculations reveal that the site is understocked.

Rest from Spring Grazing - Use this option if the site is in the Mountain, High Mountain or Sub-alpine climatic zone. This is to protect the soils, wet from spring rainfall or snowmelt, from possible trampling damage and erosion. It also protects plants during the stem elongation time of growth.

Rest From Grazing for a Growing Season - after brush or tree or weed control, or seeding, rest the area from grazing until desired plant species are established/re-established to the desired degree. The time required for establishment/re-establishment of desired plant species depends on existing population, weather, growing conditions, and other factors such as herbivory by insects or wildlife species.

Develop additional water sites - Select this option if 1) a need for additional water exists, and 2) water is somewhat available (within ½ mile) and useable, i.e. spring or stream is in close proximity.

## **Plant Management:**

Control brush - Use this option if shrubby species make up more of the total production of the site than is desired based on management goals. Attention needs to be paid to the type of animal grazing the area and the amount of shrubs desired for that animal. For example, if the area is used exclusively for deer habitat, the shrub component is important. If control is needed, it can be done by using mechanical means, herbicides, or burning.

Control noxious weeds - Use this option where it is observed that noxious weeds such as thistle, knapweed, dyers woad or whitetop are present.

Control trees - This applies if the site is being invaded or is dominated by trees such as maple, ash, juniper and/or pinyon pine trees. Control can be done using mechanical means, herbicides, or burning. Control could also be accomplished by using a combination of these control types.

Seed mixture of adapted plant species - Use this following any tree, brush or weed control option if grass and forb species produce less than 20% of the total production of the area.

Establish erosion control measure - Select this option if erosion events are actively occurring with current uses.

Use prescribed burns for shrub or tree control - This can be used if shrub or tree species, which are not sprouters, dominate sites, with little diversity of other species. If the understory is in good condition, no seeding is needed. If the understory is in poor condition, "Seed mixture of adapted species" must also be used.

### **Human Management:**

Reduce human recreation activities on site - Use this option if observable erosion is resulting from various activities like trails, ATV use, camping.

**Example Question:** Choose one of the following listed management activities that apply to this site and briefly describe why you believe it is needed. After observing the site, it appears to be a dense sagebrush community, with some grass in the interspaces. Answer: Control Brush. Why? Shrubs are composing over 50% of the total production of this site. Control could be done through chemicals, burning, or mechanical means. An adapted seed mixture should also be planted to prevent a monoculture of cheatgrass from forming.

## **APPENDIX**

## UTAH MASTER PLANT LIST

GROWTH FORM & PLANT NAME	LONGEVITY <sup>1</sup>	ORIGIN <sup>2</sup>	ECONOMIC VALUE		TOXIC PLANT	ECOLOGICAL ZONE OF OCCURRENCE <sup>4</sup>
			WILDLIFE <sup>3</sup>	LIVESTOCK <sup>3</sup>		
<b>GRASSES</b>						
Blue grama ( <i>Bouteloua gracilis</i> )	P	N	G	G		SD
Bluebunch Wheatgrass ( <i>Pseudoroegneria spicata</i> )	P	N	G	G		M
Cheatgrass ( <i>Bromus tectorum</i> )	A	I	P	F		W
Crested Wheatgrass ( <i>Agropyron cristatum</i> )	P	I	F	G		U
Foxtail Barley ( <i>Hordeum jubatum</i> )	P	N	F	P		W
Galleta ( <i>Pleuraphis jamesii</i> )	P	N	P	G		SD
Great Basin Wildrye ( <i>Leymus cinereus</i> )	P	N	F	G		M
Idaho Fescue ( <i>Festuca idahoensis</i> )	P	N	F	G		M
Indian Ricegrass ( <i>Achnatherum hymenoides</i> )	P	N	F	G		W
Intermediate Wheatgrass ( <i>Thinopyrum intermedium</i> )	P	I	G	F		W
Junegrass ( <i>Koeleria macrantha</i> )	P	N	F	G		M
Kentucky Bluegrass ( <i>Poa pratensis</i> )	P	I	G	G		W
Mountain Brome ( <i>Bromus marginatus</i> )	P	N	G	G		M
Needle-and-Thread ( <i>Hesperostipa comata</i> )	P	N	P	G		U
Orchardgrass ( <i>Dactylis glomerata</i> )	P	I	G	G		W
Red Brome ( <i>Bromus rubens</i> )	A	I	P	P		SD
Red-top ( <i>Agrostis stolonifera</i> )	P	I	F	G		M
Saltgrass ( <i>Distichlis spicata</i> )	P	N	P	P		SD
Sand Dropseed ( <i>Sporobolus cryptandrus</i> )	P	N	P	G		SD
Sandberg Bluegrass ( <i>Poa secunda</i> )	P	N	F	F		W
Slender Wheatgrass ( <i>Elymus trachycaulus</i> )	P	N	G	G		M
Smooth Brome ( <i>Bromus inermis</i> )	P	I	F	G		M
Squirreltail ( <i>Elymus elymoides</i> )	P	N	F	F		U
Three-awn ( <i>Aristida purpurea</i> )	P	N	P	P		SD
Timothy ( <i>Phleum pratense</i> )	P	I	F	G		W
Tufted Hairgrass ( <i>Deschampsia cespitosa</i> )	P	N	F	G		M
Western Wheatgrass ( <i>Pascopyrum smithii</i> )	P	N	F	G		U
<b>GRASS-LIKES</b>						
Baltic Rush ( <i>Juncus balticus</i> )	P	N	P	P		W
Nebraska Sedge ( <i>Carex nebrascensis</i> )	P	N	P	G		M
<b>FORBS</b>						
Arrowleaf Balsamroot ( <i>Balsamorhiza sagittata</i> )	P	N	F	F		W
Canada Thistle ( <i>Cirsium arvense</i> )	P	I	P	P		W
Curlycup Gumweed ( <i>Grindelia squarrosa</i> )	B	N	P	P		U
Dandelion ( <i>Taraxacum officinale</i> )	P	I	F	P		W
Death Camas ( <i>Zigadenus paniculatus</i> )	P	N	P	P	X	U

Filaree ( <i>Erodium sp.</i> )	A	I	F	G		U
Fireweed ( <i>Chamerion angustifolium</i> )	P	N	P	G		M
Geranium ( <i>Geranium sp.</i> )	P	N	F	F		M
Globemallow ( <i>Sphaeralcea sp.</i> )	P	N	F	P		W
Greenmolly ( <i>Kochia americana</i> )	P	N	F	G		D
Halogeton ( <i>Halogeton glomeratus</i> )	A	I	P	P	X	SD
Horsetail ( <i>Equisetum arvense</i> )	P	N	P	P	X	W
Indian Paintbrush ( <i>Castilleja sp.</i> )	P	N	P	F		M
Locoweed ( <i>Astragalus sp.</i> )	P	N	P	P	X	W
Louisiana Sage ( <i>Artemisia ludoviciana</i> )	P	N	F	P		M
Low Larkspur ( <i>Delphinium bicolor</i> )	P	N	P	P	X	U
Lupine ( <i>Lupinus sp.</i> )	P	N	P	P	X	M
Meadow Rue ( <i>Thalictrum fendleri</i> )	P	N	P	P		A
Mulesear ( <i>Wyethia amplexicaulis</i> )	P	N	G	P		M
Musk Thistle ( <i>Carduus nutans</i> )	P	I	P	P		W
Penstemon ( <i>Penstemon sp.</i> )	P	N	G	G		SD, U
Poison Hemlock ( <i>Conium maculatum</i> )	P	I	P	P	X	W
Prince's Plume ( <i>Stanleya pinnata</i> )	P	N	P	P	X	D
Russian Thistle ( <i>Salsola tragus</i> )	A	I	P	P	X	W
Tall Larkspur ( <i>Delphinium barbeyi</i> )	P	N	P	P	X	M
Tansey mustard ( <i>Descurainia pinnata</i> )	A	N	P	P	X	SD
Yarrow ( <i>Achillea millefolium</i> )	P	N	P	P		M
<b>SHRUBS</b>						
Big sagebrush ( <i>Artemisia tridentata</i> )	P	N	G	F		W
Bitterbrush ( <i>Purshia tridentata</i> )	P	N	G	F		U
Black sagebrush ( <i>Artemisia nova</i> )	P	N	F	F		SD
Blackbrush ( <i>Coleogyne ramosissima</i> )	P	N	F	G		D
Bud sagebrush ( <i>Picrothamnus desertorum</i> )	P	N	F	G		D
Chokecherry ( <i>Prunus virginiana</i> )	P	N	P	P	X	M
Coyote Willow ( <i>Salix exigua</i> )	P	N	P	P		W
Creosote bush ( <i>Larrea tridentata</i> )	P	N	P	P		D
Curleaf Mountain Mahogany ( <i>Cercocarpus ledifolius</i> )	P	N	G	F		M
Deerbrush ( <i>Ceanothus velutinus</i> )	P	N	P	P		M
Fourwing saltbush ( <i>Atriplex canescens</i> )	P	N	G	F		SD
Gambel oak ( <i>Quercus gambelii</i> )	P	N	P	P	X	M
Greasewood ( <i>Sarcobatus vermiculatus</i> )	P	N	P	P	X	SD
Green rabbitbrush ( <i>Chrysothamnus viscidiflorus</i> )	P	N	P	P		U
Grey horsebrush ( <i>Tetradymia canescens</i> )	P	N	P	P	X	SD
Mormon Tea ( <i>Ephedra sp.</i> )	P	N	F	F		W
Rubber rabbitbrush ( <i>Chrysothamnus nauseosus</i> )	P	N	F	P		SD
Serviceberry ( <i>Amelanchier sp.</i> )	P	N	F	F		M
Shadscale ( <i>Atriplex confertifolia</i> )	P	N	F	G		D, SD
Skunkbush ( <i>Rhus aromatica</i> )	P	N	P	P		U

Snakeweed ( <i>Gutierrezia sp.</i> )	P	N	P	P	X	U
Snowberry ( <i>Symphoricarpos sp.</i> )	P	N	F	F		M
Spiny hop-sage ( <i>Grayia spinosa</i> )	P	N	P	P		D
Wild rose ( <i>Rosa woodsii</i> )	P	N	F	P		M
Winterfat ( <i>Krascheninnikovia lanata</i> )	P	N	F	G		SD
<b>TREES</b>						
Big-tooth maple ( <i>Acer grandidentatum</i> )	P	N	F	F		M
Box-elder ( <i>Acer negundo</i> )	P	N	P	P		M
Douglas Fir ( <i>Pseudotsuga menziesii</i> )	P	N	P	P		HM
Pinyon Pine ( <i>Pinus edulis</i> )	P	N	P	P		U
Ponderosa Pine ( <i>Pinus Ponderosa</i> )	P	N	P	P	X	M
Quaking Aspen ( <i>Populus tremuloides</i> )	P	N	P	F		M
Rocky Mountain Juniper ( <i>Juniperus scopulorum</i> )	P	N	F	P		M
Subalpine Fir ( <i>Abies lasiocarpa</i> )	P	N	P	P		A
Utah Juniper ( <i>Juniperus osteosperma</i> )	P	N	F	P		U
Water Birch ( <i>Betula occidentalis</i> )	P	N	P	P		M

- 1      A      =      Annual  
          B      =      Biennial  
          P      =      Perennial
- 2      N      =      Native  
          I      =      Introduced
- 3      G      =      Good  
          F      =      Fair  
          P      =      Poor
- 4      D      =      Desert  
          SD     =      Semidesert  
          U      =      Upland  
          M      =      Mountain  
          HM     =      High Mountain  
          A      =      Alpine  
          W      =      Widespread

# PLANT IDENTIFICATION

NAME \_\_\_\_\_

SCORE \_\_\_\_\_

SCHOOL/TEAM \_\_\_\_\_

PLANT NAME	GROWTH FORM					LONGEVITY			ORIGIN		ECONOMIC VALUE						ECOLOGICAL ZONE OF OCCURRENCE									
											WILDLIFE			LIVESTOCK									TP			
	T	S	F	G	GL	A	B	P	N	I	G	F	P	G	F	P	D	SD	U	M	HM	A		W		
1.																										
2.																										
3.																										
4.																										
5.																										
6.																										
7.																										
8.																										
9.																										
10.																										

**Explanations:**

Plant Name = Provide common name

Growth Form:

- T = tree
- S = shrub
- F = forb
- G = grass
- GL = grasslike

Longevity:

- A = annual
- B = biennial
- P = perennial

Origin:

- N = native
- I = introduced

Economic Value for Both Wildlife and Livestock:

- G = Good
- F = Fair
- P = Poor

TP = Toxic or Poisonous Plant

Ecological Zone of Occurrence:

- D = Desert
- SD = Semidesert
- U = Upland
- M = Mountain
- HM = High Mountain
- A = Alpine
- W = Widespread

# RANGE SITE EVALUATION (Sample Test)

NAME \_\_\_\_\_ SCHOOL/TEAM \_\_\_\_\_ SCORE \_\_\_\_\_

1. This area receives 13 inches of annual precipitation, either in the form of rain or snow, what is the climatic zone? (5 pts)

2. Referring to the soil pit dug on the site, what is the soil type? (5 pts)

3. The five dominant plants of the site are flagged. Identify these by the number on the flag and provide their value (good, fair, poor) for both livestock and wildlife. (30 pts)

	Plant Name (2 pts)	Economic Value	
		Wildlife (2 pts)	Livestock (2 pts)
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____

4. Choose one of the following ABIOTIC factors and explain how it helped determine this site. (10 pts)

water      topography      temperature      fire      soil

---

---

---

5. Choose one of the following BIOTIC factors and explain how it has contributed to determining this site. (10 pts)

plant life      insects      birds      rodents  
large wild mammals      large domestic mammals      humans

---

---

---

6. Where is this site located on the watershed of this area? (5 pts)

top      middle      bottom

7. This site encourages water infiltration - describe briefly how. (5 pts)

8. Circle the appropriate characteristic of each group which describes the habitat on this site: (2 pts each)

GROUP A:	high plant diversity	low plant diversity
GROUP B:	habitat type is limited	habitat type is widespread
GROUP C:	access to site limited	uninhibited access

9. Which of the following describes the plant community of this site? (2 pts)

mostly grass      mostly shrub      mostly forb      mostly forest      mix of plant cover

10. Is water scarce or available? Explain your answer. (5 pts)

---

---

---

11. Determine the current production of plant material on the site: (5 pts each)

Total Production of Area = 1800 lbs/ac

Of Total, % total per type of plant:

How much (in #/ac) of each is available for use?

20% Shrub	Shrubs	_____
60% Grass	Grass	_____
15% Forbs	Forbs	_____
4% Trees	Trees	_____
1% Grass-likes	Grass-likes	_____

12. Name three uses that are evident from observing this site: (5 pts each)

1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_

13. Circle the EFFECTS that are occurring on this site due to the users and uses present: (1 pt each)

soil stability	or	soil erosion
healthy plants	or	weak plants
water available	or	water scarce
proper grazing	or	overgrazing
land pollution		water pollution
weed invasions		land conversion

STOCKING RATE PROBLEM:

**14. Current characteristics of animal use and their population on an area are as follows: (30 pts)**

This particular site is managed for 60% utilization by sheep. All growth forms are utilized except trees. Grazing duration is 6 months. The pasture is 10,000 acres in size, with a total production of 1800 lbs/acre. The areas current stocking rate is 1250 sheep for 6 months.

Using this information and the information in problem #11, determine whether the sheep are appropriately stocked, understocked, or overstocked. (SHOW ALL WORK!!!!!!) Use back of page if needed.

**15. Based on your observations of this site, choose one of the following management activities that apply to this site and briefly describe why you believe it is needed. (15 pts)**

- Reduce Stocking Rate
- Increase stocking rate
- Control brush
- Control trees
- Control noxious weeds
- Seed mixture of adapted plant species
- Annually rotate grazing between spring and fall
- Rest from spring grazing
- Develop additional water sites
- Rest from grazing after brush or tree or weed control, or seeding until desired vegetation has established/re-established
- Reduce human recreation activities on site
- Establish erosion control measures
- Use prescribed burns for shrub or tree control
- Graze intensively for a short period in early spring for weed control

---

---

---

---