West Virginia

Grassland Evaluation Contest

Teacher's Guide and Policy Manual

West Virginia Grazing Lands Steering Committee

West Virginia Grassland Evaluation Contest Committee

Revised December 2023

GRASSLAND EVALUATION CONTEST

TEACHER'S GUIDE

INTRODUCTION

The Grassland Evaluation program consists of four sections: 1) Grassland Condition, 2) Soil Interpretation, 3) Wildlife Habitat, and 4) Plant Identification. Each of these factors must be considered in evaluating pastures to best utilize the resource and to help make useful management decisions.

CONTEST LAYOUT

The judging site will be a typical pasture or area used for livestock grazing. Within the pasture area, one or more 50-foot x 50-foot plots will be marked off with stakes. Participants will not be allowed to walk into or touch plants within these plots, unless otherwise instructed during the event by contest officials. The plot(s) will be used by the participants to answer certain sections of the Pasture Evaluation Scorecard and may be used to answer certain sections of the Wildlife scorecard. Additional stakes at or near this site will be used to determine the percent of slope as required for the Soils Scorecard. Additional areas or sites will be designated by contest officials as needed to complete the contest.

A "scenario with landowner's goals for livestock and wildlife production" will be provided at the contest site. Appropriate soil survey information, aerial photos, maps, scorecards, and any other relative information will be made available to the contestants on the day of the contest. This information must be considered to complete the scorecard.

Plants marked for the Plant Identification portion of the contest will be marked in the field. Depending on the availability, certain plants may be potted specimens. Participants will not be allowed to touch the plants marked for this section of the contest.

GRASSLAND CONDITION

Grassland evaluation is a process of appraising the present conditions in a field and making decisions to correct problems or to utilize the resource in a manner that best suits the landowner's goals.

Many problems in grasslands and pastures develop from mismanagement or lack of planning. In order to correct problems, you must first determine the condition of the field then make corrective decisions that are based on sound agricultural practices compatible with the landowner's goals. The landowner's goals will be provided for each judging site. **Livestock production should be the primary interest for the field when filling out the Grassland Condition scorecard with wildlife as a secondary goal.**

WILDLIFE HABITAT

All wildlife species require adequate cover, food, space, and water year-round. Most wildlife populations will suffer if food or cover is continuously grazed and trampled by livestock throughout the year, especially in the winter. **When scoring the Wildlife Habitat scorecard, consider wildlife habitat improvement as the primary goal for the field with livestock production as only a**

secondary goal. Management decisions may differ between the two uses. Certain portions of the Wildlife scorecard will be answered by referring to the 50-foot x 50-foot plot or other designated areas.

SOIL INTERPRETATION

Soil properties strongly influence both forage selection and field management. Soil surveys published by the Natural Resources Conservation Service are basic tools to the grassland manager. They provide information about the properties of all the soils in a county.

The adaptation of plants to certain soils is also an important aspect of grassland management. Some plants thrive in deep, well-drained soils, but do poorly in shallow, poorly drained soils. Factors that limit plant adaptation may be soil fertility, poor soil drainage, soil depth or droughtiness. A successful grassland manager determines the soil type and matches adapted forages to that environment.

Soil survey information will be provided at the judging site. The correct soil series must be determined by locating the judging site and soil-mapping unit on an aerial photograph of the farm. The soil's slope will be determined using the site that is identified with stakes.

PLANT IDENTIFICATION

You cannot successfully manage grasslands without a working knowledge of plant identification. You must be able to identify the plants you are managing and also the weedy invaders that might occur. A basic knowledge of the plants that are considered good food for wildlife is necessary to successfully increase numbers. It is also important to know the life cycle of the major plants found in grasslands and pastures. Perennial plants are managed differently than annual plants. Likewise, control of undesirable plants depends upon whether it is an annual, perennial, broadleaf, grass or grass-like plant.

GRASSLAND EVALUATION CONTEST

RULES

Rules during competition:

- A contest team will consist of a maximum of four (4) or a minimum of three (3) students who are currently enrolled at the high school level (FFA or 4-H).
- Team members who have been on the state winning team for 2 years or on the national winning team for 1 year are ineligible for competition.
- Contestants will be supplied scorecards, appropriate maps or aerial photos and any necessary information. All scorecards, maps and aerial photos will be collected at each judging site.
- **Contestants will fill out their name and school name on the scorecard. If this information is left off of the scorecard, the individual will receive a zero (0) on the score sheet.**
- Contestants will be allowed twenty-five (25) minutes to judge each of the four (4) segments of the contest with three (3) minutes to move between judging sites. Total contest time is approximately two (2) hours.
- Contestants may use non-programmable handheld calculators. All other handheld electronic devices (e.g., cellular phones, mp3 players, etc.) are prohibited. Each participant will furnish their own pencils, calculator, and clipboard.
- Contestants will NOT be allowed to:
  1. Talk to anyone during the contest or use other printed material for reference.
  2. Touch plants for plant identification.
  3. Leave the contest site during the contest. THERE WILL BE NO EXCEPTIONS.
  4. Step into or touch plants within the 50 x 50 plot.
  5. Have cell phones, smart watches, or any other electronic device on contest site
- Only contestants and officials will be allowed within the contest area during the contest.
- **Judge's decisions will be final concerning any questions involving the contest.**
- Contest is held rain or shine, and students should dress appropriately.

SCORING RULES:

- The winning team will be determined by adding together the highest three (3) team member's scores. If less than three (3) members of a team are present, they may enter and compete as individuals.
- In case of a tie score, the Plant ID score will be used to determine the winner. Should this score also result in a tie, the grassland condition score will be used. If a tie still exists, the team with the highest individual score will determine the winner.
- Final tabulated score cards will not be returned to the contestants, coaches, or schools.

SCORE CARD CLARIFICATION NOTES:

Grassland Condition: Question no. 3, “Matching Livestock & Forage”. The answer to this question must be within ten pounds (10 lbs.) of the final correct answer determined by the judges at the contest site. Question no. 7, “Limestone Rate” answer must be rounded to the nearest tenth.

Wildlife: The wildlife score card is an example only. Questions used for both "Appraisal of Existing Conditions" and "Multiple Choice Questions" may change from year to year.

Soils: Contestants will determine "soil slope" from designated stakes located at or near the "soils" site. Elevations will not be given.

Plant Identification: This part of the contest involves two answers (common name and life cycle) for each of the twenty-five plants. Both answers must be correct for the question to be considered as correct. If the plant falls in both life cycle categories, either one or both can be marked to be considered correct.

RESULTS AND PRIZES:

- Results of the contest will be announced the day of the event.
- The First-place team will represent West Virginia in the Mid-America contest in Missouri.
- Starting in 2008, the second-place team may be offered the opportunity to participate in the Mid-America contest in Missouri.
- A maximum of $500 travel stipend will be provided to the first-place team representing West Virginia at the Mid-America Contest to help cover travel expenses to the contest.
- A maximum of $500 travel stipend will be provided to the second-place team representing West Virginia at the Mid-America Contest to help cover travel expenses to the contest, if the second-place team is offered the opportunity to participate in the Mid-America contest.
- It is the responsibility of the advisor/coach to request stipend and registration fee from the Grassland Committee in a letter of request.
- The advisor will have to send a completed Mid America registration form to WV Grazing Lands Steering Committee Secretary. The Secretary will then process the request and the registration form and fee will be sent to Missouri from the Grassland Contest treasury.
- The Mid-America Contest Registration fee for the 1st place team representing West Virginia will be paid for by the Grassland Evaluation Contest program and it will be up to the WV Grassland Contest Committee on the final decision on the 2nd place team.
- Prizes are as follows:
    - 1st place team – Each student will receive a $500 scholarship
    - 2nd place team – Each student will receive a $250 scholarship
    - High Score Individual will receive a $500 scholarship

Scholarships will be held for a winning student for 2 years after date of his/her high school graduation or 12 months after discharge from his/her first enlistment in the military. Exceptions will only be granted in special circumstances by the WV Grassland Contest Committee. Request for exceptions must be in writing. If the student does not contact the committee, scholarship funding will be reallocated and no longer available for the individual. Scholarship is for any post-secondary education. Students eligible for scholarships and seeking payment must contact the WV Grazing Lands Steering Committee Secretary and provide the following documents:

- Copy of winning certificate
- Copy of acceptance letter
- Copy of tuition receipt
- Address to send check

WV Grazing Lands Steering Committee Secretary will notify the Treasurer to issue the check.

GRASSLAND CONDITION

Profitable grassland management for livestock pasture depends upon the manager's ability to match forage growth and livestock nutritional needs. Every livestock producer must first be a "grass farmer" since ruminant livestock depend directly on the quality and quantity of forage available. Shortages of forage quality or quantity at critical periods of the animal's productive cycle results in loss of production. Livestock production can never reach an economically optimum level on improperly managed pastures. This unit will discuss principles that can be used to match forage growth with animal nutritional needs to develop pasture programs.

USING FORAGES TO FILL GRAZING SEASON

Understanding forage growth is a key to any successful pasture program. No single forage provides adequate year-round grazing, but complimentary combinations of several forages including both cool-season and warm-season forages can provide good quality season-long grazing including winter grazing. Forage selection for a pasture program is sometimes difficult due to the wide variety of forages available. The following section discusses the appraisal of existing conditions in a pasture.

DETERMINING LEGUME PERCENTAGE

Determining the actual percentage of legume present in a pasture by visual estimates can be difficult for the untrained eye. A good rule to use for visually determining the percent of yield from the legume component in a pasture is to estimate the percentage of canopy cover as legume when the pasture canopy is six to eight inches tall and then divide by two to get the approximate season-long dry matter contribution from the legume. For example, if the canopy of white clover in a pasture is estimated to be approximately 30% then the percent legume as dry matter in that pasture would be about 15%. Obviously, a high percentage of canopy cover from the legume is necessary to provide all the advantages attributed to grass-legume mixtures.

APPRAISAL OF EXISTING CONDITIONS

1. WHAT IS THE PASTURE TYPE (% DRY MATTER)?

A. Fescue (>90% Fescue)
B. Mixed cool-season grasses (<10% legume)
C. Cool-season grass dominant (10-25% legume)
D. Cool-season grass / legume (26-60% legume)
E. Legume dominant (>75% legume)
F. Warm-season grass dominant (<40% other species)

A. FESCUE (>90% FESCUE)

Tall Fescue is a major cool-season grass in West Virginia. Fescue pastures have Kentucky 31 as the dominant forage species. Active growth periods of tall fescue occur in spring and fall. Fescue pastures need nitrogen fertilization to produce good forage yields. Soil test fertilizer recommendations for cool-season grass pasture should be followed to achieve

desired yield levels. Besides providing forage in spring and fall, tall fescue is often managed for winter pasture. Fall growth of tall fescue is allowed to accumulate and grazing is deferred until winter. This practice is called stockpiling and works well in fall because the accumulated growth tends to remain high in nutritive quality and does not become mature as it does in spring. Tall fescue tolerates freezing weather better than most other cool-season grasses, so it is preferred for fall stockpiled pasture.

Many tall fescue pastures are infected with the fescue endophyte, which cause fescue toxicosis in grazing animals. Fescue toxicosis is caused by a toxin produced by an endophytic fungus that grows inside the plant. Animals grazing fescue pastures that are infected with the endophytic fungus can show symptoms of lameness, heat stress, lower weight gains, low milk production, and low conception rates all of which reduce farm profitability. Grazing management can often offset the fescue endophyte problem on a farm. If the fescue is kept vegetative, the fescue toxin does not seem to be as prevalent. Incorporation of legumes also seems to help dilute the toxicity of the fungus. Endophyte-free fescues are also available. Fescue pastures usually have low value for wildlife due to the density of the foliage at ground level.

B. MIXED COOL-SEASON GRASSES (<10% LEGUMES)

Mixed cool-season grass pastures consist of a mix of cool-season grass forages that may or may not include tall fescue. This category can also include pure stands of other cool-season grasses besides tall fescue. Perennial cool-season grasses adapted to West Virginia include Kentucky bluegrass, orchardgrass, perennial ryegrass, redtop, tall fescue, and timothy. These grasses can be found in either pure stands, in mixtures with other cool-season grasses or in combination with legumes. Mixed cool-season grass stands should receive nitrogen fertilization. The low percentage (10%) of legumes is considered insignificant nutritionally. Soil test fertilizer recommendations for cool-season pasture should be followed to achieve desired yield levels. Cool-season grasses are not often seeded in mixtures with warm-season grasses in the same field because this combination requires very careful management to maintain the mixture.

Cool-season grasses grow best during spring and fall but are usually dormant or unproductive during hot summer months. From one half to two thirds of the annual growth of cool-season grasses occur in the spring and up to one third occurs in the fall. Forage quality is very high when new growth begins in spring and declines with increasing growth as the plants become mature and produce seed. Fall regrowth of cool-season grasses also has very good forage quality, however forage quality does not decline during the fall growth phase as in spring because plants remain vegetative during this time of the year. Cold weather, snow, or ice can cause forage quality to decline during winter months.

C. COOL-SEASON GRASS DOMINANT (10 TO 25 % LEGUME OR OTHER GRASSES)

Cool-season grass dominant pastures generally do not need nitrogen in the spring but may respond well to nitrogen in the fall. These pastures can include fescue and/or a mix of cool-season or warm-season grasses along with a moderate percentage of legumes. Legume percentages in this range will improve the nutritional value of a pasture and will help offset the effects of the fescue endophyte in cattle but are not high enough to eliminate the need for nitrogen fertilization under high animal stocking rates. Soil test fertilizer recommendations for cool-season grass should be followed to achieve desired yield levels. However, if the goal of

the landowner is to increase the percentage of legume in the pastures, then soil test fertilizer recommendations for clover/grass pasture should be followed to encourage legume growth. The legume component also helps extend the active spring growth period of the pasture into early summer. Other grasses including warm-season grasses or weedy grasses may be present at levels less than 25% of the pasture mix.

D. COOL-SEASON GRASS/LEGUME (26 TO 60% LEGUME)

Legumes are commonly grown in combination with cool-season grasses to improve nutritional quality of the pasture. Legumes are highly palatable and nutritious to livestock. Legumes generally have higher nutritive quality at any given growth stage than grasses. Legumes also help improve forage quality of a pasture when the companion grasses in a mixture become more mature than desired. Forage quality of grass/legume mixtures is excellent and livestock grazing this mixture should have few symptoms from fescue endophyte. Grass/legume pastures show little or no response to nitrogen fertilization because the nitrogen supplied by the legume through nitrogen fixation is high enough to support the growth of the grass and legume. Legumes need higher soil fertility levels than grasses. Soil test fertilizer recommendations for clover/grass pasture should be followed to maintain production in this mixture. Grass/legume pastures also have more value to wildlife than fescue, mixed cool-season, or cool-season dominant pastures.

E. LEGUME DOMINANT (>75% LEGUME)

Fields with this high percentage of legume are more typical of hayfields than of grazed pastures, but legume dominant fields used for pasture will have the same benefits as listed for grass/legume pastures. Legumes can be used for pasture in spring, summer, or fall, but require careful management to maintain adequate stands. Legumes also help offset the effects of fescue toxicosis when mixed in fields of endophyte infected tall fescue. Soil test fertilizer recommendations for clover/grass pasture should be followed to maintain production in this mixture.

Legumes adapted to West Virginia include alfalfa, lespedeza, red and white clover, and birdsfoot trefoil. Red and white clovers grow in spring, early summer, and fall. Alfalfa and birdsfoot trefoil grow from spring through summer and fall. Annual lespedeza grows in the summer and dies at frost. All of these are perennial plants except for annual lespedeza and red clover.

F. WARM-SEASON GRASS DOMINANT (<40% OTHER SPECIES)

Warm-season grasses grow best in the summer months but grow very little in spring and fall. Warm-season grasses provide good quality, actively growing forage during the hot summer months when cool-season grasses and many legumes are dormant or unproductive. Warm-season grasses should be used when cool-season forage availability is low in summer or when very high summer forage production is needed. A combination of warm-season and cool-season grass pastures will provide a constant forage supply over the growing season. Keep in mind that warm and cool-season grasses should be planted in separate pastures for easier management.

Native warm-season grasses in West Virginia include big bluestem, indiangrass, little

bluestem, and switchgrass. These grasses are usually grown in pure stands or in mixtures with other warm-season grasses. They are usually not grown in combination with most introduced legumes or cool-season grasses because the warm-season grasses are not as aggressive as many legumes or cool-season grasses especially in fertilized pastures. The native grasses should not be grazed shorter than eight inches to maintain vigor and regrowth of the plants. Native warm-season grasses respond to moderate fertilizer applications and are much more desirable for wildlife cover than cool-season grasses. Other warm-season grasses such as bermudagrass and Caucasian bluestem respond to high rates of nitrogen fertilizer but have little value as wildlife cover. They are normally only grown in pure stands because they are more aggressive forage plants, they are lower growing than the native grasses, and they must be grazed at much shorter heights than the native grasses in order to maintain forage quality. All of the plants listed above are perennials.

Fertilizer recommendations for warm-season grass pasture should be followed for all warm-season grass pastures except for bermudagrass which has a specific recommendation listed for hay or pasture. Annual grasses, forbs, legumes, and cool-season grasses often become established in a warm-season grass pasture through seed dispersal or improper grazing or feeding management. These invading species should be maintained at less than 40% of the sward so the benefits of the warm-season grass can be realized.

Warm-season grasses should be grazed when they are in the vegetative stage of growth. Fiber levels increase rapidly as the plants mature, reducing forage quality and making warm-season grasses undesirable for stockpiling for later grazing. These grasses usually have a very rapid growth rate and very high production potential. Close attention is required to prevent them from becoming too mature for good forage quality.

2. WHAT IS THE AVERAGE GROWTH STAGE OF THE DOMINANT FORAGE SPECIES?

A. Vegetative—leafy growth, few stems, few-to-no seed heads
B. Boot or bud—stem elongated; top of stem swollen
C. Heading or bloom—seed heads or flowers emerged, green color extends into seed head or seedpod
D. Mature—seed hard, ready to harvest, yellowing below seed head into stem
E. Dormant

The growth stage of the forage is very important in pasture management. As the forage matures the nutritional value and acceptability to grazing animals decline rapidly. Forages should be grazed before they reach maturity since nutritive quality is highest when the forage is vegetative and growing. This stage also corresponds with low plant fiber and high digestibility of the forage. Plants go through specific developmental stages as they mature. For grasses these stages are vegetative, boot, heading or bloom and mature. Most cool-season grasses produce seed only in the spring. Regrowth of cool-season grasses in summer and fall after the seed stems have been removed by grazing or hay harvest is vegetative and leafy with no seed heads. Warm-season grasses can produce seed more than once per year. Legumes go through similar stages of development as the grasses. These stages for legumes are vegetative, bud, bloom and mature. Unlike most grasses, legumes except for annual lespedeza, can flower and produce seed several times during the growing season.

3. WHAT BEST DESCRIBES THE GRAZING PRESSURE OF THE PASTURE?

A. Spot grazed
B. Evenly grazed

Spot Grazed: Spot grazed is actually a form of overgrazing in which spots or patches of a pasture are grazed too frequently. Spot grazing occurs during periods of active forage growth when livestock graze spots in a pasture while allowing other areas of the field to become mature and unpalatable. The re-growth of the grazed forage in spots is often more palatable than the forage left ungrazed so the grazing animals frequently regraze new growth of these spots. Spot grazed fields have uneven forage heights and the forage in the grazed spots may become weak and thin if cattle remain in the field too long. Spot grazing often occurs when livestock density or number in a pasture is too low for the current forage conditions. Frequent pasture rotation will improve the condition of spot grazed pastures.

Evenly Grazed: Evenly grazed pastures, as the description implies, have a generally uniform grazing height, thick stands, good forage vigor, and respond well to good management. These pastures often have a good mix of grasses and/or legumes present. Some spot grazed areas may be present but make up less than 20% of the field.

4. IS WEED OR BRUSH CONTROL NEEDED OTHER THAN BY GRAZING OR SOIL FERTILITY MANAGEMENT?

A. Yes
B. No

Weed and brush control is sometimes necessary to control certain invading species. Many weedy plants can be controlled by good grazing management and proper use of fertilizer. Forage plants growing in pastures that have good soil fertility and are not overgrazed are more competitive and prevent many weeds from becoming established. Other means of control, including mechanical or chemical control, become necessary when woody plants and other undesirable species make up 30% or more of the canopy in a pasture. Mechanical, chemical, or spot treatment of thorny species may be necessary at levels of 10% canopy.

5. WHAT SOIL pH RANGE IS RECOMMENDED FOR THIS SWARD?

A. 4.0 - 4.5
B. 4.6 - 5.0
C. 5.1 - 5.5
D. 5.6 - 6.5
E. 6.6 - 7.0
F. 7.1 - 7.5

Most legumes need a higher soil pH than most grasses. Recommended soil pH levels for forages range from 5.6 to 6.5, but certain crops require higher soil pH within this range. Soil pH is a measure of the acidity or alkalinity of the soil. A pH of 7 is neutral, meaning it is neither acidic nor basic. Low soil pH can have a dramatic impact on forage growth and persistence. The acidity of a soil increases by a factor of 10 for each integer below a pH of 7. For example, a pH of 6 is 10 times more acidic than a pH of 7, a pH of 5 is 100 times more acidic than a pH of 7.

Desired soil pH ranges for crops

Crop	pH
Alfalfa and alfalfa-grass establishment	6.1 - 6.5
Birdsfoot trefoil and birdsfoot trefoil-grass establishment	5.6 - 6.0
Clover and clover-grass establishment	5.6 - 6.0
Cool-season grass establishment and production	5.6 - 6.0
Lespedeza and lespedeza-grass establishment	5.6 - 6.0
Over seeding legumes	5.6 - 6.0
Warm-season grass establishment and production	5.6 - 6.0
Sudan grass and sudan / sorghum crosses	5.6 - 6.0
All row crops	6.1 - 6.5

6. WHAT FERTILIZER RATE IS RECOMMENDED FOR THIS SWARD?

Fertilizer recommendations are given on the West Virginia University soil test results. There are two types of fertilizer recommendations given. One is Crop Sufficiency Rate, and the other is Build to Optimum Rate. Recommendations for pounds of nitrogen, phosphorus, and potash are given for the expected yield for the crop. Scenario will give information to determine which recommendation to use.

7. WHAT LIMESTONE RATE IS RECOMMENDED FOR THIS SWARD?

Limestone recommendations are listed in the West Virginia Soil Test Results. The answer must be rounded to the nearest tenth.

MATCHING LIVESTOCK AND FORAGE

1. WHEN DOES THIS LIVESTOCK HERD HAVE THE HIGHEST FORAGE QUALITY REQUIREMENT?

A. Spring
B. Summer
C. Fall
D. Winter
E. Requirement high year-round

Livestock nutritional requirements change throughout the year as the animals go through different stages of production. Forage quality must be higher for growing animals than for mature animals. Growing animals, such as steers or heifers, need a constant supply of high-quality feed through the season to maintain growth. Shortages in quality will sharply reduce gain and profit. As an animal matures, its nutritional needs change. The forage quality and quantity needed by mature animals also changes with production stage through the year.

A mature beef cow goes through four stages of production each year. Nutritional needs will be different for each of these stages.

STAGE ONE is post calving and lasts 90 days. Since the cow has just had a calf, her nutritional needs are now the highest of the entire year. She is lactating at her highest level, she is undergoing uterine involution, and she must cycle and rebreed within 90 days of calving to stay on a 12-month calving schedule in the herd. Lack of nutrition during this period results in lower milk production and failure to rebreed on time. A cow must rebreed in time to have a calf every 365 days. Failure to do this results in an unprofitable operation due to added costs of maintaining open cows.

STAGE TWO the cow is pregnant and lactating. This stage usually lasts 115 days. Nutritional needs will be dropping slightly during this period. The cow is in the early stages of pregnancy while still nursing her calf. She should be gaining some weight now.

STAGE THREE is mid gestation and lasts about 100 days. The cow has just weaned her calf and she is dry. Her nutritional needs are at the lowest point of the entire year since she only has to maintain herself and the developing fetus. She can get by on much lower quality pasture now than in stage one.

STAGE FOUR is pre-calving. This stage lasts about 60 days and is the second most important period during the year. Seventy to eighty percent of fetal development is occurring. The cow is gaining weight and preparing for lactation. Inadequate nutrition during stage four will often cause weak calves and poor rebreeding success during stage one. Cows need to be in good body condition now. She needs good quality pasture or hay to make sure both herself and the calf will be strong and healthy. First or second calf heifers need higher quality forage than mature cows during all four of these stages since their bodies are still growing, plus they are producing a calf. This makes it very important to feed these animals separately from the mature animals to ensure proper development. Mature bulls also need good quality feed during the breeding season but can get by on lower quality forages other times of the year.

A cow herd has its highest forage quality requirement during stage one, which is calving and rebreeding. This stage usually occurs in spring and fall in West Virginia. Herds that have no set calving season or those that calve year-round need high forage quality year-round to support the cows calving at any given time. Year-round calving is not recommended. Calving seasons of 90 days or less are recommended to optimize forage production, breeding and marketing.

2. DOES THE GIVEN SYSTEM'S GROWTH CYCLE MATCH THE SEASONAL PEAK NUTRITIONAL NEEDS OF THIS LIVESTOCK HERD UNDER PRESENT MANAGEMENT?

A. Yes
B. No

Now that you know some basic concepts of forage production and changes in livestock nutritional needs, you still face the challenge of matching these production schedules together. A good manager relies on his ability to combine the production of forage and livestock along with the environment into an economically and biologically sound program.

Springtime is the period when forage is abundant, and the weather is favorable for calf survival and rapid growth. Most pastures in West Virginia are made up of cool-season forage species. A spring calving program matches the cool-season grass seasonal growth pattern rather well. The cow's greatest nutritional needs are between calving and rebreeding. The growth and quality of a cool-season grass is also high at this time. Forage production and quality drop off in summer along with a slight drop in nutritional requirement by the cow. Adding a warm-season grass or other summer forage to a cool-season grass program fills the summer forage deficit and maintains livestock production until the cool-season grass begins growing again in fall.

Summer calving is not recommended in West Virginia. The reason for this is not entirely related to forage production since warm-season forages are available and of high enough quality to maintain adequate nutrition. The primary reason not to have a summer calving season is due to weather. In summer, high temperatures and humidity reduce breeding activity and conception rates. Research has shown much lower conception rates in cattle breeding during hot weather because of higher embryonic mortality. The number of calves weaned per cow exposed to the bull has much greater impact on profitability than any other single factor. If a calf is never conceived, it cannot be weaned.

Fall calving works well in West Virginia since the combination of forage quality and cooler temperatures are again favorable for high conception rates in cows. Cool-season grasses produce about one third of yearly production in the fall. The quality of this fall growth is very good. Cows calving in September will have adequate nutrition on poorly managed fall pastures. Rebreeding will take place after the cows have been flushed with high quality fall pastures. Warm-season pastures can improve a fall calving program by increasing the nutrition of the cow during Stage 4, which occurs during July and August for a fall calving herd. This improves milk production, calf vigor, and rebreeding success. Warm-season pastures also work well if fall born calves are kept until they are yearlings before they are sold. The calves are weaned in spring and put on high-quality spring pasture. In early summer the calves are rotated to warm-season pastures to maintain good weight gains until they are sold later that summer or in the fall.

Winter calving is not recommended in West Virginia. The reason for this is due to adverse weather conditions for calving and not matching forage production with peak nutritional demands.

Management of forage resources through the wintertime may be the most cost-effective practice a producer can use. Stockpiling of forages, especially tall fescue, grazing crop residues, and planting winter annual forages can drastically reduce a producer's winter feed cost when compared to hay and/or supplements. Research has shown that with proper management and utilization the quality of stockpiled tall fescue and winter annual forages can meet the needs of most beef animals including lactating cows.

3. HOW MANY POUNDS OF FORAGE DRY MATTER DOES THIS HERD NEED TO CONSUME PER DAY DURING EACH OF THESE SEASONS?

	Lbs. DM needed
Spring	_____
Summer	_____
Fall	_____
Winter	_____

CALCULATING FORAGE DRY MATTER INTAKE REQUIREMENTS

Although cattle need certain forage quality at specific stages of production, they also need adequate quantity. Estimating the total forage need is not difficult but will require some calculation. The pasture stocking rate and hay supply can both be estimated in advance if animal needs, and forage production is known.

Forage requirements vary not only with the animal's stage of production, but also by body size. Large animals need more feed to maintain themselves than do smaller animals. The following table gives guidelines for estimating forage Dry Matter Intake (DMI) by certain classes of animals. These figures are given as a percent of body weight (BW) to account for the difference in forage requirement due to body size. **NOTE: Notice that the percentage of forage DMI changes for each stage of production as already discussed in question 1 of this section.**

Approximate Daily Forage DMI Requirements

Animal	Daily forage DMI (% BW)
Dry beef cow	2%
Lactating beef cow (avg. milk production)	2.5%
Lactating beef cow (superior milk)	3%
Bull (during breeding season)	2.5%
Bull (not during breeding season)	2%
Growing steers and heifers	3%

The following example illustrates how to calculate forage DMI requirements.

Example: Calculate the daily forage DM needs of this herd during the spring grazing period.

Spring-calving beef herd.
30 cows - lactating (avg. production) (avg. wt. = 1,100 lbs.)
1 bull - 2,000 lbs.
10 heifers - avg. wt. = 750 lbs.

Solution: 30 lactating cows X 1,100 lbs. = 33,000 lbs.
1 breeding bull X 2,000 lbs. = 2,000 lbs.
10 heifers X 750 lbs. = 7,500 lbs.

The cows are lactating, so their requirement is 2.5% of their BW per day. During the breeding season the bull still needs 2.5% of BW also. The growing heifers need 3% BW per day.

33,000	X	0.025	=825 lbs. per day for cows
2,000	X	0.025	= 50 lbs. per day for bull
7,500	X	0.03	= 225 lbs. per day for heifers
			1,100 lbs. forage dry matter needed per day

Example: Calculate the daily forage dry matter requirement for the same herd if the cows are dry in STAGE 3.

Solution: The herd needs less forage because the cows are dry, and their nutrition and DM requirements are lower. The heifers are still growing so they still need 3 % of their BW per day. The cows and bull can calculate at 2%.

30 dry cows (1,100 lbs. avg. wt.) = 33,000 lbs.
1 bull (2,000 lbs.) = 2,000 lbs.
10 heifers (750 lbs. avg. wt.) = 7,500 lbs.

33,000	X	0.02	= 660 lbs. per day for cows
2,000	X	0.02	= 40 lbs. per day for bull
7,500	X	0.03	= 225 lbs. per day for heifers
			925 lbs. forage DM needed per day for this herd

4. IS FORAGE AVAILABILTY ADEQUATE FOR THIS HERD IN EACH OF THESE SEASONS?

Spring (100 days)
_____ Adequate
_____ Not adequate

Summer (100 days)
_____ Adequate
_____ Not adequate

Fall (100 days)
_____ Adequate
_____ Not Adequate

Winter (65 days)
_____ Adequate
_____ Not Adequate

CALCULATING FORAGE DRY MATTER REQUIREMENTS FOR A SPECIFIC SEASON

To calculate the forage DMI requirements for a specific period use the following calculation:

(lbs. dry matter needed per day) X (number of days in the season)

Example: What is the forage DMI requirement for this same herd during the spring (100 days)? This is a spring calving herd.

Solution: Since the herd is spring calving, the cows will be in STAGE ONE. They are lactating and preparing to rebreed. Their requirements will be 2.5% of BW per day.
The bull will be working during this time, so his need is 2.5% of BW per day.
The heifers will be bred this spring, so their need is 3% of BW per day.

The total daily forage DMI need is 1,100 lbs.

1100 lbs. /day X 100 days = 110,000 lbs. forage DMI needed for spring season

CALCULATING ACTUAL FORAGE AVAILABILITY REQUIRED FOR DIFFERENT GRAZING MANAGEMENT SYSTEMS

To determine if forage availability is adequate for the herd, you must also consider the harvest efficiency of the grazing system. No harvest system is 100% efficient, especially grazing animals. In a pasture system animal utilization of forage is between 30 and 65 percent of what is actually grown. In continuous grazing systems cattle are allowed to continually graze a pasture with no restrictions on rotation. Much of what is produced is wasted. Only 30 to 35 percent of the total forage produced is actually eaten by livestock. The other 65 to 70 percent is trampled, soiled by mud, manure, and urine, or used as bedding areas.

As grazing management restricts the grazing habits of the animals, forage utilization increases. When management-intensive grazing (MIG) is used, forage utilization can be as high as 65 percent of the forage produced. This level of utilization can only be achieved with a multiple paddock system with frequent pasture rotations of 3 days or less.

The following gives a guideline for calculating the actual amount of forage dry matter production needed in a pasture to carry the same herd during the spring season.

Example: Same herd as used previously. Calculate the amount of forage DM needed for this herd for the spring grazing period for continuous and management-intensive grazing systems.

Solution: The daily DMI was calculated to be 1,100 lbs. and the total spring season DMI was 110,000 lbs. Forage utilization in the continuous grazing pasture management system is only about 35 percent. This means that forage DM availability needs to be almost three times the amount the herd will actually eat per day.

$$\frac{\text{110,000 lbs. DMI}}{0.35} = \text{314,285 lbs. forage DM needed for that season}$$

In an intensive grazing management system, forage utilization is about 65 percent. Therefore, actual forage DM needed is only about 1.5 times as much as what is actually eaten.

$$\frac{110{,}000 \text{ lbs. DMI}}{0.65} = 169{,}230 \text{ lbs. of forage DM needed for that season}$$

It becomes quite clear that by using good grazing management a producer can harvest almost twice the forage with little extra cost except for fencing materials. The added utilization of forage and extra livestock gain per acre can often pay that cost very quickly.

PASTURE IMPROVEMENT

The answers to questions 3, 4, 5 in this pasture improvement section are based on the choice for question 2.

1. WHAT CHANGES SHOULD BE MADE IN LIVESTOCK MANAGEMENT?

A. Continue present management
B. Reduce livestock numbers
C. Change calving season to a different time of the year
D. Shorten calving season to a period < 90 days.
E. Provide higher quality pasture
F. Switch to a management-intensive rotational grazing system

Continue present management: Use this option when the livestock management practices match with the landowner's goals and forage management.

Reduce livestock numbers: Use this option when the livestock numbers exceed the carrying capacity of the farm even when calculated for a different grazing management system. Calculating the forage requirement using the utilization percentage for management-intensive grazing may allow the farmer to keep the herd at its current size if livestock numbers are too high for a continuous grazing system.
NOTE: The goals stated by the landowner may also dictate reducing livestock numbers regardless of the carrying capacity for the farm, but this will be specifically stated for the contest.

Change calving season to a different time of the year: Spring or fall calving is recommended for West Virginia conditions. Summer calving should be avoided due to the potential of low cow conception rates caused by hot weather.

Shorten calving season to a period of <90 days: Use this option when the calving season is spread out over more than one season for that single herd or when year-round calving is being practiced.

Provide higher quality pastures: This option should be chosen when the farm scenario states that the farmer has problems with low weight gains, low conception rates and/or low weaning weights or when fescue endophyte is a problem.

Switch to a management intensive rotational grazing system: Switching to a rotational grazing system may improve forage availability if the carrying capacity of the farm is exceeded under continuous grazing management. Management intensive grazing also reduces problems with spot grazing in pastures. This option should be chosen when there is a shortage of forage in more than one season.

2. WHAT TYPE OF ADDITIONAL FORAGE IS NEEDED TO IMPROVE THIS FORAGEPROGRAM?

A. Cool-season grasses
B. Warm-season grasses
C. Legumes
D. No additional forages needed - use existing pastures

Additional forages should be chosen based upon information given in the farm scenario and the forage availability calculations. The options listed above can be used as shown in the following situations, however information given in the farm scenario will be specific enough so that only one will be the best answer.

Examples: Cool-season grasses can be used when forage production is not adequate in spring and fall but is adequate for summer. Warm-season grasses can be added to the system when summer forage production is not adequate. Adding legumes can be selected when the scenario identifies a forage quality problem, fescue endophyte problem or to improve summer forage production. If the scenario already has legumes included in pastures, then selecting warm-season grasses would be appropriate to fill shortages in summer forage production. If the system is functioning well, choose answer D. No additional forages needed - use existing pasture.

3. HOW SHOULD THIS ADDITIONAL FORAGE BE PLANTED?

A. Plant on a clean, firm seedbed
B. No-till plant in a killed sod
C. Over seed or interseed in a closely grazed sod
D. No additional forages needed - use existing pasture

Plant on a clean, firm seedbed: Planting a stand of forages is best done on a clean tilled, firm seedbed when conditions allow. This allows better weed control, fertilizer and lime incorporation, and better seed to soil contact. This option should be chosen when field renovation is desired, and lime and fertilizer need to be incorporated into the soil.

No-till plant in a killed sod: No-till planting into a killed sod should be chosen when soil erosion could be a hazard if the field is plowed or if the field is too rocky to be plowed. No-till planting allows the seed to be planted by a no-till drill directly into a sod that has been killed by herbicides. This option should be chosen for fields to be renovated having over a 5% slope.

Over seed or interseed into a closely grazed sod: This option should be chosen when adding legumes to a grass pasture to improve forage quality. Over seeding is done during the winter months so that freezing and thawing of the soil will cover the legume seed. Legumes can also be interseeded with a no-till drill into the existing live sod.

No additional forages needed - use existing pasture: Choose the option for fields with adequate stands of desired forage and which require no additional forage species.

4. WHAT FERTILZER RATE IS NEEDED FOR THIS FORAGE?

Fertilizer recommendations should be selected from the soil test that corresponds with the crop chosen in question 2. If you chose the "establish a new forage" in question 2 you must also choose a fertilizer recommendation for establishment of that forage. If you choose to continue with the present forage, use a recommendation for pasture production of that forage.

5. WHAT LIMESTONE RATE, IN TONS PER ACRE, IS NEEDED FOR THIS FORAGE?

Limestone recommendations should be selected from the soil test that corresponds with the crop chosen in question 2. The amount of limestone needed in tons per acre should be calculated using the same method as in question 7 of the "appraisal of existing conditions" section.

Grassland Evaluation Contest Sample Scenario

Pasture Scenario:

The farmer has a 120-acre cow/calf operation. He has a fall calving cow herd. He would like to wean his calves the beginning of spring and graze them out through the spring and sell at the beginning of summer. He has been using continuous grazing but would consider using management intensive grazing if it will help him meet his goals. He needs to harvest and store 25 tons of hay from spring season to feed in the winter in addition to stockpiled tall fescue. Harvesting and feeding losses have been calculated for the hay.

Current Situation:

* 30 cows weighing 1100 pounds with superior milking ability
* 1 bull weighing 2000 pounds
* Fall calving herd
* 90% calf crop
* Continuous grazing
* He wants to wean all calves at the beginning of spring and graze them out through the spring, sell at the beginning of summer. All calves will be sold at this time.
* Average weaning weight in the spring is 450 pounds.
* He plans to graze them for 100 days and sell them at 600 pounds.
* Their average daily gain would be 1.5 pounds.
* Calculate the average weight for the 100 days period for figuring forage consumption by season.
* Use only whole numbers for calculating.

Forage Production:

Pasture	Acres	Spring	Summer	Fall	Winter
Fescue/legume	60	231,000	100,800	117,600	
Orchard/alfalfa	40	169,600	92,800	57,600	
Fescue	20	59,900	5,800		
Minus hay harvested		-76,923			65,000
TOTALS	120	383,577	199,400	175,200	65,000

Hay available to feed: 50,000 lbs.

Matching Livestock and Forage

1. When does this livestock herd have the highest forage quality requirement? The answer is “E year-round. This is a fall calving herd with calves weaned and backgrounded through spring. The highest forage quality requirement occurs between calving and rebreeding for the cows and in the spring for the calves.

2. Does this pasture's growth cycle match the seasonal peak nutritional needs of this livestock herd under present management? The answer is “A - Yes”. This pasture contains a mix of fescue, orchardgrass, legume mixtures and alfalfa. This provides actively growing plants throughout the growing season.

3. How many pounds of forage dry matter does this herd need to consume per day in: (see calculations next page)

4. Is forage availability adequate for this herd in: Forage availability is adequate in spring and winter with continuous grazing. See calculations next page.

Pasture improvement

1. What changes should be made in livestock management? The answer is “F – switch to a management intensive rotational grazing system. By switching to MIG forage supplies meet animal demand in all seasons.

2. What type of additional forage is needed to improve this forage program? The answer is “D - No additional forages needed - use existing pasture”. Since forage was short in summer, fall and winter any shift in forage species would create a larger deficit in the other seasons. Management intensive grazing will correct the situation in all seasons.

3. How should this forage be planted? The answer is “D - No additional forages needed - use existing pasture” since no additional forages are needed.

4. What fertilizer rate is recommended for this forage? The answer is the same as for Question 6 existing conditions.

5. What limestone rate is recommended for this forage in tons per acre? The answer is the same as for Question 7 in the Appraisal of Existing Conditions.

Pasture Scenario Calculations:

Animal Liveweight
30 cows @ 1100 lbs. = 33000 lbs.
1 bull @ 2000 lbs. = 2000 lbs.
27 calves @ 525 lbs. = 14175 lbs. (Spring)

Calf Number:
30 X .90 = 27

Calf Avg. Weight:
450 + .5 (150) = 525

Forage Consumption:

Spring
Cows (dry) = 33,000 x .02 = 660
Bull = 2,000 x .02 = 40
Calves = 14,175 x .03 = 425
1125

Summer
Cows (dry) = 33,000 x .02 = 660
Bull = 2,000 x .02 = 40
700

Fall
Cows (lactating) = 33,000 x .03 = 990
Bull (breeding) = 2,000 x .025 = 50
1040

Winter
Cows (lact) = 33,000 x .03 = 990
Bull = 2,000 x .02 = 40
1030

Total forage required based on % utilization (.35 cont. .65 MIG)

Spring

1125/.35 = 3214 x 100 = 321,400
1125/.65 = 1731 x 100 = 173,100

Summer

700/.35 = 2000 x 100 = 200,000
700/.65 = 1077 x 100 = 107,700

Fall

1040/.35 = 2971 x 100 = 297,100
1040/.65 = 1600 x 100 = 160,000

Winter

1030 daily needs x 65 = 66,950 herd requirements for the season

65,000 standing x .35 (cont. grazing) = 22,750 + 50,000 hay = 72,750
65,000 standing x .65 (MIG) = 42,250 + 50,000 hay = 92,250

EXAMPLE SCORECARD

GRASSLAND EVALUATION CONTEST

GRASSLAND CONDITION

TEAM NAME:_____ **STUDENT NAME** _____ **SCORE:** _____ **Points: 100**

APPRAISAL OF EXISTING CONDITIONS
(5 points each)

_____1. What is the pasture type?
- A. Fescue (>90% fescue)
- B. Mixed cool-season grasses (<10% legumes)
- C. Cool-season grass dominant (10 to 25% legume or other grasses)
- D. Cool-season Grass / legume (26 to 60% legume)
- E. Legume dominant (>75% legume)
- F. Warm-season grass dominant (<40% other species)

_____2. What is the average growth stage of the dominant forage type?
- A. Vegetative
- B. Boot or bud
- C. Heading or bloom
- D. Mature
- E. Dormant

_____3. What best describes the condition of the pasture sward?
- A. Spot grazed
- B. Evenly grazed

_____4. Is weed or brush control needed other than by grazing or soil fertility management?
- A. Yes
- B. No

_____5. What soil pH range is recommended for this sward?
- A. 4.0 - 4.5
- B. 4.6 - 5.0
- C. 5.1 - 5.5
- D. 5.6 - 6.5
- E. 6.6 - 7.0
- F. 7.1 - 7.5

6. What fertilizer option is recommended for this pasture?

7. What limestone rate is recommended for this pasture in tons per acre?

MATCHING LIVESTOCK AND FORAGE
(4 points for each answer space)

E 1. When does this livestock herd have the highest forage quality requirement?
- A. Spring
- B. Summer
- C. Fall
- D. Winter
- E. Requirement high year-round

A 2. Does the system's growth cycle match the seasonal peak nutritional needs of this livestock herd under present management?
- A. Yes
- B. No

3. How many pounds of forage dry matter does this herd need to consume per day in:

1125 lbs. in spring (4 pts.)
700 lbs. in summer (4 pts.)
1040 lbs. in fall (4 pts.)
1030 lbs. in winter (4 pts.)

4. Is forage availability adequate for this herd in:

Spring - 100 days (4 pts.)
X Adequate
____ Not adequate

Summer - 100 days (4 pts.)
____ Adequate
X Not adequate

Fall - 100 days (4 pts.)
____ Adequate
X Not adequate

Winter - 65 days (4 pts.)
X Adequate
____ Not adequate

SEE REVERSE SIDE

Revised December 2023

EXAMPLE SCORECARD

PASTURE IMPROVEMENT

(Answers to questions 3, 4, and 5 for this section are based on the choice for question Number 2)

(5 points each)

F **1. What change should be made in livestock management?**

A. Continue present management
B. Reduce livestock numbers
C. Change calving season to a different time of year
D. Shorten calving season a period of <90 days
E. Provide higher quality pasture
F. Switch to a management-intensive rotational grazing system

D **2. What type of additional forage is needed to improve this forage program?**

A. Cool-season grass
B. Warm-season grass
C. Legumes
D. No additional forages needed – use existing pasture

D **3. How should this forage be planted?**

A. Plant on clean, firm seedbed
B. No-till plant in a killed sod
C. Overseed or interseed in a closely grazed sod
D. No additional forages needed – use existing pasture

4. What fertilizer option is recommended for this forage?

5. What limestone rate is recommended for this forage in tons per acre?

GRASSLAND CONDITION

TEAM NAME: _____ STUDENT NAME: _____ SCORE: _____ POINTS: 100

APPRAISAL OF EXISTING CONDITIONS

(5 points each)

_____ **1.** What is the pasture type by percent dry matter?

A. Fescue (>90% fescue)
B. Cool-season grasses (<10% legumes)
C. Cool-season grasses (10-25% legumes or other grasses)
D. Cool-season grasses (26-60% legume)
E. Legumes dominant (>75% legume)
F. Warm-season grasses (<40% other species)

_____ **2.** What is the average growth stage of the dominant forage species?

A. Vegetative
B. Boot or bud
C. Heading or bloom
D. Mature
E. Dormant

_____ **3.** What best describes the condition of the pasture sward?

A. Spot grazed
B. Evenly grazed

_____ **4.** Is weed or brush control needed other than by grazing or soil fertility management?

A. Yes
B. No

_____ **5.** What soil pH range is recommended for this sward?

A. 4.0 - 4.5
B. 4.6 - 5.0
C. 5.1 - 5.5
D. 5.6 - 6.5
E. 6.6 - 7.0
F. 7.1 - 7.5

6. What fertilizer option is recommended for this pasture?

_____ N (Lbs/Ac) _____ P_2O_5 (Lbs/Ac) _____ K_2O (Lbs/Ac)

7. What limestone rate is recommended for this pasture in tons per acre?

_____Tons/Ac

MATCHING LIVESTOCK AND FORAGE

(4 points for each answer space)

_____ **1.** When does this livestock herd have the highest forage quality requirement?

A. Spring
B. Summer
C. Fall
D. Winter
E. Requirement high year round

_____ **2.** Does this pasture's growth cycle match the seasonal peak nutritional needs of this livestock herd under present management?

A. Yes
B. No

3. How many pounds of forage dry matter does this herd need to consume per day in:

_____ lbs. in spring (4 pts.) _____ lbs. in summer (4 pts.)

_____ lbs. in fall (4 pts.) _____ lbs. in winter (4 pts.)

4. Is forage availability adequate for this herd in:

Spring - 100 days (4 pts.)
_____ Adequate
_____ Not Adequate

Summer - 100 days (4 pts.)
_____ Adequate
_____ Not Adequate

Fall - 100 days (4 pts.)
_____ Adequate
_____ Not Adequate

Winter - 65 days (4 pts.)
_____ Adequate
_____ Not Adequate

COMPLETE QUESTIONS ON REVERSE SIDE

Revised December 2023

PASTURE IMPROVEMENT

(Answers to questions 3, 4 and 5 for this section are based on the choice for question Number 2)

(5 points each)

_____ 1. What change should be made in livestock management?
- A. Continue present management
- B. Reduce livestock numbers
- C. Change calving season to a different time of year
- D. Shorten calving season to a period of < 90 days
- E. Provide higher quality pasture
- F. Switch to a management-intensive rotational grazing system

_____ 2. What type of additional forage is needed to improve this forage program?
- A. Cool-season grass
- B. Warm-season grass
- C. Legumes
- D. No additional forages needed - use existing pasture

_____ 3. How should this forage be planted?
- A. Plant on clean, firm seedbed
- B. No-till plant in killed sod
- C. Overseed or interseed in a closely grazed sod
- D. No additional forages needed - use existing pasture

4. What fertilizer option is recommended for this forage?

_____ N (Lbs/Ac) _____ P_2O_5 (Lbs/Ac) _____ K_2O (Lbs/Ac)

5. What limestone rate is recommended for this forage in tons per acre?

_____Tons/Ac

WILDLIFE HABITAT

Habitat is the resources and conditions present in an area that allow a given organism to occur there, including survival and reproduction. Each wildlife species has its own unique habitat. Grasslands are a vital component in the life cycle of some West Virginia wildlife. There are roughly 1 million acres of grass-dominated cover types ("low vegetation", "hay/pasture", and "mine grass" cover types) scattered throughout West Virginia according to the Natural Resource Analysis Center (NRAC) at West Virginia University. These grasslands provide food and cover for a variety of wildlife species. Most wildlife prefer a mosaic of vegetative communities to meet their daily and seasonal requirements for survival. Grassland (pasture or hayfield) is only one component of that mosaic but provides elements such as nesting cover, food and forage, or loafing areas for a variety of species.

Since livestock are usually confined to grasslands by fences, their forage needs must be supplied within a given area. Wildlife are not confined by fences and will seek out food and cover as required. Wildlife are able to move back and forth through different habitat types found in a location and rarely stays in the same component for long periods of time. However, they require that these habitat components be located close together for safety of movement. Pastures and hayfields that are isolated from other habitat components are of little value. Woody cover for protection, idle fields for nesting, and weed seed and crop residues for food are all important components that must be located close to a grassland. A few of the other components are described below.

Plant varieties and densities needed depend upon the species of animals that use the area. The number of seed-producing plants in a grassland will impact its value to species such as some rodents and songbirds, because they require seeds in their diet. Generally, the more kinds of seed- producing plants there are, the more value the field will have for a variety of species. In addition, rabbits and many small mammals consume the vegetative parts of grasses, legumes, and other broad-leaved plants. If these plants are removed by overgrazing or late season haying, the number of animals that the area can support (wildlife carrying capacity) may decrease.

If properly managed, grasslands can also provide cover or protection for nesting, roosting, or breeding. Songbirds such as bobolinks, meadowlarks, and several types of sparrows build their nest on the ground, raise their young, and feed exclusively within grasslands. Rabbits, bobwhite quail, and turkey also nest in grasslands but prefer areas near woods or shrubby cover.

Notes: Northern bobwhite quail have been nearly eliminated from West Virginia. It is unknown how many breeding individuals remain in the state because any birds encountered could be released captive-raised individuals. Songbirds are used as examples and discussed in this document because they occur throughout the state, frequently use grasslands for a variety of life functions, and are good overall indicators of grassland health. However, management for grassland birds is difficult and complex. Because grasslands depend on disturbance to persist, habitat that is suitable for a species one year may be unsuitable the following year. Moreover, each grassland species has unique habitat requirements, and management that favors one species may preclude others.

Wild herbaceous plants are the vegetative growth consisting of native or introduced perennial grasses and broad-leaved weeds or forbs that are generally established naturally. Some examples are goldenrod, joe-pye weed, ironweed, plantain, and ragweed. Domestic grasses and legumes can also provide food sources in the form of vegetative browse or the macroinvertebrates (insects) these plants attract. Examples of domestic grasses and legumes are bluegrass, timothy, alfalfa, clover and orchardgrass.

Shrub cover (brush) consists of woody plants, usually with multiple stems that arise from a common base or dense early successional forest. These plants are generally less than fifteen feet tall at maturity. When they grow close together to form a thicket, they provide escape cover for a variety of animals such as grouse and rabbits. These areas are browse for deer and the dense branches provide nesting and protected perch areas for many songbirds. Shrub cover may also consist of either evergreen or young coniferous trees and shrubs that provide mainly cover and some browse and seed. After coniferous trees become large and naturally prune and thin themselves, the value drastically decreases. Some examples are young white pine and Virginia pine, rhododendron and even some evergreen ornamentals. Deciduous shrubby cover may consist of species such as viburnums, blueberry, blackberry and rose. They typically produce fruits, buds, or foliage that wildlife eat.

Woodland generally consists of perennial, woody-stemmed tree species that reach a height of over twenty feet. This element typically includes deciduous and mature coniferous trees and vines that produce food browse and cover for wildlife. West Virginia is approximately 80% covered by woodland. A diverse age and composition of plant species within these areas are important and usually desirable to provide habitat for the highest number of wildlife species. Some examples of our native kinds of trees are oaks, cherry, birches, maples, poplar, and beech. These areas should always be protected from grazing.

Due to the topography of West Virginia, many "seeps" or springs frequently surface in grassland areas used as pasture and hayland. These are very common in all parts of the state near the bases of hills or in small draws along slopes. While these areas are usually small and relatively dry most of the year, they do support water-loving plants (wetland plants) and the sheer number of these areas throughout the state makes them worth mentioning. Making up this group are wild herbaceous and woody plants that grow on moist to wet sites but do not include submerged or floating plants. They produce food and cover for upland wildlife even though they are wetland species. For example, sparrows use cattail and rushes for winter cover, while deer feed on willow and dogwood. Wild turkeys use spring seeps as a source of surface water during the spring and fall. Desirable wetland plants include smartweeds, cattails, bur-reeds, barnyard grass, rushes, and sedges. Water depth and fluctuation control the establishment and growth of most wetland plants and is usually the limiting factor controlling the species and composition of wetland plants.

Cool-season Grasses

Those grasses that grow best during the cool spring and fall of the year are aptly called cool-season grasses. These grasses begin their growth early in the spring when the soil temperature reaches about 40° F. Their growth slows during the warmest part of summer when the soil temperature nears 80° F and resumes as the soil cools in the fall. Cool-season grasses have been popular with farmers because they provide forage for a large portion of the year, are very easy to establish and respond quickly and noticeably to fertilization. Some examples of cool-season grasses are tall fescue, Kentucky bluegrass, bromegrass, timothy and orchard grass.

Cool-season grasses are usually grazed to about 2 to 4 inches in height. Grazing below this height will result in lower production, may increase soil erosion, and reduce wildlife use. Even taller heights of cool-season grasses provide minimal benefit to most wildlife because of their habit of growing densely and in a monoculture. These grasses are normally at their peak quality and ready for cutting for hay during the peak nesting period for many ground nesting birds which in West Virginia ranges for March 15 to July 15.

A Word about Tall Fescue

West Virginia farmers use tall fescue because it is quite easy to establish, a good grass to prevent soil erosion and it tolerates a wide variety of conditions such as heavy grazing, a wide range of pH and climate. However, the attributes that make it attractive to farmers can have problematic implications for wildlife. Fescue readily invades fields and can quickly eliminate native grasses and forbs by out-competing them. In addition, its bulky thatch and residue remains on the ground if ungrazed or not harvested. This prevents movement of smaller animals and makes foraging and nesting difficult and a dangerous venture at best. cool-seasonTall fescue may be the least desirable of our cool-season grasses when it comes to wildlife habitat. Depending on the management scheme, intensively grazed or frequently mowed fescue dominated grasslands offer little or no cover for wildlife and are an overall poor habitat for grassland dwelling species.

Tall fescue has been found to cause some health problems in livestock when it's infected with an endophyte fungus. It has been suggested that fescue may even harm animals such as cottontail rabbits by causing damage to the lining of the stomach and intestine.

Warm-season Grasses

Those grasses that grow best when the weather is hot and the soil temperature high are called warm-season grasses. These grasses begin growing when the soil temperature is above 50° F and continue to grow during the warmest months of the year until the soil temperature reaches nearly 90° F. Although warm-season grasses have a shorter growing season, they make more efficient use of water and nutrients than do other grasses.

Warm-season grasses are not only good insurance against drought and summer forage shortages, but they also are excellent for many wildlife species. Fields of these grasses may provide food and shelter for migrating warbles, thrushes, sparrows, and larks in autumn. Many hawks and owls, such as kestrels and barn owl search grasslands for food throughout the winter months.

The "structure" or the way any grass grows is important to wildlife. The tall, stiff, upright stems and elevated leaves of most warm-season grasses can reduce the negative effects of weather as it affects smaller warm-blooded animals. The plants can soften the impact of raindrops and modify both humidity and transpiration extremes when compared to cool-season grasses. These traits can provide a more favorable breeding condition for ground nesting birds and mammals.

Native warm-season grasses such as Indiangrass, switchgrass and big bluestem grow in clumps. Open areas between clumps permit young birds and small mammals to move freely as they search for insects and seeds. The clumps also allow nests to be built under the tufts of leaves. This lets adult birds come and go easily without delay or detection by enemies that search for the nests. Rodents and small birds can climb into the clump to escape drowning rains. Warm-season grasses are essential to management of bobwhite quail in West Virginia since these grasses form a more attractive habitat at ground level than do other grasses. Bunch grasses often have the habit of forming an overhead canopy of leaves which gives these birds at ground level some measure of protection from overhead predation. Young turkey poults that live on a diet of insects and few seeds also heavily use them. The growth of various broadleaf plants and the presence of many kinds of insects and spiders, make ideal growing conditions for young quail, turkey, and songbirds that are just leaving the nests in search of food. In winter months and under proper management, these grasses are often taller which allows them to bend and fold under the weight of snows. This situation tends to form openings and provides winter cover for a variety of animals. Deer and

groundhogs find food and shelter in all fields but don't prefer native warm-season grasses if other suitable forage is present.

Mowing of warm-season grasses should be avoided in general once they have become established, but especially during the peak ground-nesting season. Essentially, no harvesting should be performed prior to July 15 or August 1 in the highest elevations. When managing warm-season grasses in a pasture situation, rotational grazing should always be used. Grasses should only be grazed to a maximum of 12 inches or no more than ½ of the above ground height. This height insures that ample amounts of cover, insects, and seeds are available for wildlife and it keeps the grass healthy. Some examples of the grasses that are used in grazing systems are big bluestem, Indiangrass, side-oats grama, little bluestem, and switchgrass.

Historically these grasses have existed with and are adapted to fire. In the tall grass prairies of the mid- west, fires started by prescribed burning, lightning strikes, or sparks from trains served to reinvigorate the prairie. In earlier time, native peoples used fire for many purposes, including to manage grasslands for hunting. Whatever the reason, wildlife managers continue to use fire to manage warm-season grasses. Prescribed burning (intentional burning of stands during specific times of the year) is the most common method of management throughout much of the country. This method is still the best way to increase productivity of warm-season grasses by removing thatch or residue from prior growth, reducing invasion of woody species, and stimulating forb growth within a stand. **In West Virginia it is extremely dangerous and difficult to attempt to manage warm-season grasses with fire due to the relatively small areas of grass, extreme slope, and large amounts of woodland throughout the state to which fire may escape.** Untrained individuals should not attempt this method of management.

FACTORS THAT AFFECT THE VALUE OF GRASSLANDS FOR WILDLIFE

Different species of wildlife are attracted to grasslands for different reasons. Some animals may seek nesting sites, while others may use them mainly for foraging or cover. Various factors determine the amount and type of wildlife that use any particular grassland. These factors include the grassland type, grassland composition by percent cover, the management and grassland size.

Grassland Type

Each species of grass has its own growth characteristics. Some grasses have low growing habits and form a dense mat of plant matter and roots known as a "sod". Examples of this type of grass include smooth brome, Kentucky bluegrass and Bermuda grass. Sod-forming grasses have a very high stem density at ground level and are spread primarily through rhizomes. This fact makes them less attractive to ground nesting birds and smaller animals, since they are usually not able to move through the sod. Some grasses may grow either as a bunch grass or sod forming grass depending on the environmental conditions. Switchgrass is often thought of as a true bunchgrass, but in reality, it is a sod forming grass that has varying growth characteristics. In midwestern prairies and bottomland sites it can develop long rhizomes that interlace to form a thick dense sod. Frequent disturbance helps keep this characteristic in check.

Cool-season grasses are the most common grasses found in West Virginia due to widespread planting for agriculture and climate. Wildlife can use these areas of cool-season grasses including the dense

sod forming types for a variety of life activities. However, it is important to keep in mind that diverse structure and composition is needed.

As a general rule, most of the warm-season stands that exist in West Virginia are relatively small. The warm-season species are usually intermingled within existing stands of cool-season grasses and rarely occur in large pure stands. Some warm-season grasses do not form solid pure stands at all and tend to be more opportunistic such as broomsedge or purple-top grass. The patchy distribution of these species can play an important role in providing grassland with diverse structure and composition.

Another warm-season bunchgrass that grows naturally throughout West Virginia is Indiangrass *(Sorghastrum nutans).* This handsome grass occurs in every county of West Virginia but is most common in the western part of the state where it may occur in somewhat larger stands. Other warm-season grasses that may be encountered in the Mountain State include big bluestem, little bluestem and gamagrass.

Switchgrass *(Panicum virgatum)* has become a staple of wildlife management for upland game birds like quail. Many varieties of the grass have been developed to try to improve specific qualities about it. Varieties were propagated to improve forage quality for livestock (`Cave-in-Rock') or for reclamation purposes ('Blackwell'). In fact, one of the most common varieties used for wildlife (`Shelter') was developed in West Virginia.

Grassland Composition

Grasses are the main plant component of a grassland; but some wild herbaceous plants and legumes are vital ingredients in their overall makeup giving them more productivity for wildlife and livestock. The broad leaf plants that produce seed are very important to those animals that depend upon seed for their existence. For example, the bobwhite quail is an early successional edge dwelling species. However, one of the staple foods during late summer and fall months is ragweed seed, a common plant found throughout the grasslands of West Virginia that produces vast quantities of seed.

Legume composition within a grassland is also important to wildlife just as it is to livestock. Red and white clovers, alfalfa, and other legumes play an important role in the food sources of wildlife and fix nitrogen in the soil making it available to companion plants. They provide high amounts of nutritional proteins to small mammals such as cottontail rabbits that feed on the vegetative parts of these plants, especially clovers. Estimating the amounts of legumes in a grassland in important in determining management strategies for wildlife. The necessary amount of legumes present in a grassland vary considerably by species. For animals such as the cottontail rabbit, a very high legume to grass ratio would be beneficial. While many species of songbirds would not require as many legumes, some species, such as ruffed grouse, even obtain most of their water requirements from the succulent growth of legumes.

Flowering plants and legumes are also important to butterflies and other insects that must be present to help pollinate the flowers and insure seed production. Broad leaf plants provide a food source for insect larvae, some of which specialize on one or a few species of plant, such as the ragweed flower moth or the ragweed borer moth. Larger animals may prey upon these insects, or they may provide the necessary proteins for young hatchling whose diet consists almost exclusively of insects. Roughly 85% of a juvenile bobwhite's diet, for example, consists of insects and other animal matter. The chicks feed almost exclusively on insects during the first two weeks of their life.

The height (or vertical structure) of the grassland is also important. Since many different animals use different grasses and forbs for different reasons, it is logical that varying heights of grassland components would be more beneficial than uniform stands of a single height. Birds such as the Northern harrier prefer tall grasses, while robins, horned larks and grasshopper sparrows prefer significantly shorter grasses. In fact, all grassland songbirds respond strongly to structural features (height and density) of the vegetation. The habitats preferred by grassland bird species range from low, sparse plant cover to tall, dense vegetation and each species has its own unique requirements.

Grassland Management

Grassland management practices are usually directed toward the maximum production of grasses and forbs; they can be done with a timing and intensity that are wildlife friendly and productive agriculturally. The timing and intensity of harvesting grass is probably the most critical of all the factors that can affect the value of a grassland for both wildlife and livestock and they are also usually the easiest to manipulate. Actively farmed grasslands are usually either cut for hay or used as pasture for livestock.

The management of grasslands to produce both livestock forage and wildlife food and cover is a compatible use of the land. However, it is extremely difficult to have wildlife management and livestock forage production as equal primary objectives. In reality there are frequently trade-offs in either production or habitat and compromises must be made to things such as livestock carrying capacity, amount of acceptable habitat disturbances, production of livestock or forage, and the quality of that forage after delayed harvest. Managers must be aware of potential compromises and take them into consideration when developing grassland and wildlife management plans.

Hay

Hayfields offer significantly different characteristics than pasture fields in West Virginia. For the most part, hayfields tend to be less disturbed for a longer duration than pasture fields and generally have greater heights of vegetation for longer periods. In terms of quality, farmers often concentrate their nutrient management (fertilizers) on hayfields, which often yields better forage. These areas are often located in more level areas with better soils and are often times located near or adjacent to streams (riparian zones).

When the grassland is cut for hay, the effect is almost immediate and may even result in direct mortality. Both the food and cover are removed, causing wildlife to either move to adjacent areas or be exposed to predators. Often time the best quality hay is harvested at the peak times when food, cover, and nesting are the most critical. Hayfields mowed before July 15 provide poor habitat for nesting birds and/or may serve as a "sink" or ecological trap by attracting birds to nest in areas only to have their nests destroyed from harvesting activities. Studies showed that about 25% of the annual productivity of hayfield- nesting bobolinks was destroyed by hay cropping on an area during a two-year period. Savannah sparrows that were nesting in idle (unmowed) hayfields in Canada also lost about 80% of their nesting productivity once they were mowed.

There are several management strategies that could be utilized to alleviate the destruction of nesting habitat. One method could be to leave the outer thirty feet of the hay field standing or cut it at some later date. Another method is to mow no more than 1/3 of an entire stand in any given

year. Mowing could take place in 2–4-year cycles and where possible, mow in strips to maintain some structural diversity. Mowed strips should be rotated across the field. Cool-season grasses should be mown no shorter than 4 inches and native warm-season grasses no shorter than 8 inches. Mowing should be performed in the spring (March - April) prior to nesting season or after July 15 to encourage vegetative diversity without impacting ground nesting activities or fall food sources. Haying of warm-season grasses, unlike cool-season grasses and alfalfa, usually occurs after the peak of the nesting season.

Care should be taken when mowing strips in grasslands. Since most grasslands in the state are relatively small, the strip widths of standing vegetation are often narrow. This may lead to increased predation rates for some animals. These small patches of grasslands become attractive to ground nesting birds, and other wildlife, but also become easy focal points for predators leading to the loss of reproductive success. Several explanations have been given for why predation rates are elevated in stripcover. One explanation is that predators may be more abundant in strip-cover habitats and use strip cover as a travel lane. Another explanation is that the efficiency at which predators may hunt could be greater in strip cover because it has essentially a one-dimensional configuration and predators forage more intensively there. As a general rule, standing strips of vegetation should be greater than 50 feet in width.

Grazing

Grazing as opposed to haying, removes the vegetation over a longer period of time. Livestock may be utilized to manipulate plant composition and succession. This is beneficial to maintaining the quality of herbaceous cover and controlling woody vegetation. In some instances, this method may provide the most benefits with the least amount of impacts. However, this technique should be performed in accordance with a grazing plan and wildlife as the primary objective.

Grazing practices that will improve forage production generally also benefit wildlife. Legume introduction, proper grazing heights as well as proper grazing dates will improve production as well as wildlife habitat. The rate of removal of forage is determined mainly by how many head of livestock are placed on the grazing unit (stocking rate) and how long they are allowed to graze (grazing period).

Once nesting is initiated, grazing will not usually interfere with incubation unless too much cover is removed, or the stock density is so high that it causes nest trampling. If stock density is very high as in some rotational grazing systems, there must be sufficient residue for nest initiation and time for nest building, egg laying, and incubation before animals return to the paddock. This requires a minimum of 35 days, nearly matching the optimum preferred rest period for native warm-season grasses of 42 to 49 days. A minimum of 8-10 inches of growth should be present in the fall in order for plants to build root reserves for wintering and initiating spring growth. Warm-seasons probably should not be grazed 30 days prior to the first killing frost. This residual growth is excellent winter roosting cover and nesting the following spring. Vegetation heights during the nesting season and through the winter months are critical elements of a grassland management plan.

There are mainly two types of grazing in the state. The first type is continuous grazing. Continuous grazing allows livestock in one grazing unit to graze selectively for a long period of time. This is probably the most common method of grazing in West Virginia due to the average size farm,

management expense and topography. With proper grazing height management and stocking densities this method can be beneficial to wildlife, livestock, the soil, and plant resources.

If managed poorly, continuous grazing may result in the near elimination of the most palatable plants and allows the introduction and spread of plants that are not as favorable to livestock or beneficial to wildlife. Poor management of continuously grazed systems often results in reduced forage production and elimination of wildlife cover and food. Overstocked livestock movement within an area can also destroy nests and nesting habitat. Years of continuous overgrazing will produce less forage over time and if over-grazed for long durations will drastically change the composition of a grassland.

The second method, rotational grazing, may be as simple as switching livestock between 2 grazing units or pastures periodically. Whereas "Management Intensive Grazing", may require movement of livestock every 1-3 days through elaborate fencing and water networks. This system usually requires more management on the part of the operator, since smaller grazing units (paddocks) are involved.

Rotational grazing provides succulent forage for cattle, while allowing some areas to grow undisturbed. While resting, these undisturbed units serve as wildlife habitat.

Overall, rotational grazing is a better grassland management choice in terms of wildlife. When grasses are rested or the grazing unit is left idle between grazing periods, the vigor of the plants increases, giving them a chance to grow and multiply. This usually results in increased forage, increased livestock production and improved wildlife food and cover.

Grassland Size

In the grassland-wildlife world bigger is not necessarily better. As with most other habitat components, different species require and use varying size grasslands. For example, larger grasslands have less value for cottontail rabbits and bobwhite quail. These species are considered edge dwelling species. Species such as turkey prefer to nest in grass when it is near a wooded or brushy area. They also tend to utilize the "edge" of a grassland where it joins woodlands, old fields, and croplands. This transition zone is known as an ecotone or an area where two or more habitat types come together. Although rabbits and quail can fully utilize a grassland of twenty acres, they tend to not use the interior of a very large grassland unless some form of supplemental cover is provided. Rabbits require brushy, escape cover to survive the pressure of predators such as hawks, owls, and foxes. While quail can utilize the interior of large, open grasslands, they, too, are most often found along the edges.

Grassland birds require a certain amount of habitat to be present usually in larger contiguous patches. Minimum habitat size varies greatly among species and can also vary geographically. Climate and topography may also influence the minimum size requirement. West Virginia is approximately 80% forested and grassland components are relatively small in acreage compared to the grasslands of the prairie states. Therefore, the size of the grassland needed to attract individuals of a given species in West Virginia may be comparatively smaller for the same species in the mid-west.

A good rule for all species concerning size may be to maximize the interconnectedness of grassland habitat patches while managing for the best quality of the area as a whole.

A Word about Edge

Although edge is a necessary component for some species (e.g., quail and rabbit), it may have negative effects as well. The presence of woody vegetation, although attractive to woodland-edge birds, may adversely affect grassland species. This is illustrated by the propensity of some grassland birds (e.g., bobolinks, Henslow's and grasshopper sparrows) to avoid wooded edge habitats and may even be a detriment to many species. For example, the Brown-headed cowbird *(Molothrus ater) is* a brood parasitic bird that lays its eggs in the nests of other birds. These host birds then raise the young cowbirds as if they were their own and results in lowered reproductive success for the host birds. For this reason, the Brown-headed cowbird has been blamed for the decline of many songbird species. Cowbird parasitism seems to increase with the amount of edge that exists. Edge also may serve as travel lanes and allow predators to move easily from area to area. Studies also have reported that the proximity to wooded edge was more important than grassland size in determining nesting success. Predation and parasitism rates are often greater as nesting is near an edge. The presence of woody vegetation in or near grassland influences the overall habitat suitability for grassland birds.

References and Suggested Reading

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Grassland Evaluation Contest: Wildlife Habitat Section Sample Test

TEAM NAME_____ STUDENT NAME_____ SCORE_____/100

NOTE THAT THE REAL TEST TYPICALLY HAS 20 QUESTIONS

APPRAISAL BASED ON EXISTING CONDITIONS WITHIN THE WILDLIFE PLOT

_____ 1. Which of the following is most dominant in terms of canopy coverage?
a. Vetch
b. Fescue
c. Indiangrass
d. Rush
e. Multiflora rose
f. Sycamore

_____ 2. What is an ecotone?
a. The transitional zone where one cover type ends and another begins.
b. A climax plant community identified by the combination of dominant species present.
c. An aggregation of organisms within a specified area.
d. The interacting system of a biological community and its non-living environment.

_____ 3. Assuming the wildlife plot was currently being hayed two times per year, which practice would be the LEAST beneficial for cottontails if implemented?
a. Shrub planting to widen the riparian area.
b. Hay only during March to July.
c. Increase the amount of legumes.
d. Increase the amount of warm season grasses.

_____ 4. The number of species within a defined area is positively correlated with the number of unique ecotones in an area. If we placed a new 50’ x 50’ wildlife plot on the other side of the fence, how would the number of species in the new wildlife plot compare to the current wildlife plot?
a. Higher
b. Lower
c. Equal

_____ 5. Which biennial plant can you find within the wildlife plot?
a. Goldenrod
b. Fescue
c. Queen Anne’s Lace
d. Japanese Honeysuckle

GENERAL WILDLIFE QUESTIONS (5 points each)

_____ 6. Similar to livestock, Eastern Cottontail may avoid and could be harmed when feeding on tall fescue infected by the _____ called *Neotyphodium coenophialum*.

a. Endophyte fungus
b. Parasite
c. Endoplasm
d. Neophyte

_____ 7. What is the peak nesting period for ground-nesting birds in West Virginia?

a. March 15 – July 15
b. May 1 – June 30
c. July 15 – March 15
d. May 1 – July 31

_____ 8. How many acres are considered to be grass-dominated cover types in West Virginia?

a. 100,000
b. 1,000,000
c. 90,000
d. 9,000,000

_____ 9. Many Grasshopper Sparrows migrate into West Virginia and nest in hayfields. When they arrive in late April and early May, the birds are attracted to the high-quality food, cover, and ground-nesting sites. However, many of these hayfields are cut before July 15, causing nest failure. This is an example of what concept?

a. Ecological trap
b. Carrying capacity
c. Migratory connectivity
d. Edge effect

_____ 10. Which statement is most accurate regarding grassland management for wildlife?

a. Most managers can maximize both livestock forage production and wildlife habitat on the same land.
b. Livestock forage production and wildlife habitat are incompatible objectives on the same land.
c. Compromises are usually made to livestock forage production and wildlife habitat when both are objectives on the same land.

SOIL EVALUATION

The soil evaluation portion of this Grassland Evaluation Contest was designed to teach the students how to use the Soil Survey report in making wise land-use decisions. All of the soils information needed to complete the Soils Scorecard is given in the detailed soil series description and tables in the Soil Survey report. Soil Survey information can also be found on the Web Soil Survey. https:// websoilsurvey.nrcs.usda.gov. The following is an example of how to use the Soil Survey report to complete the soil evaluation section of the Grassland Evaluation Contest.

General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas. To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section General Soil Map Units for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

SOILS INFORMATION

The **Summary of Tables** show which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

SOIL EVALUATION

1. Surface texture Soil texture refers to the percentage by weight of sand, silt, and clay in a soil. Depending on how much sand, silt, and clay are present, the soils are given names like sandy loam, clay loam, or silty clay loam. Texture is an important soil property because it is closely related to many aspects of soil behavior. The ease of tilling and plant root development within the soil are both influenced by soil texture. Texture affects the amount of air and water a soil will hold and the rate of water movement through the soil. Plant nutrient supplies are also related to soil texture. Tiny silt and clay particles provide more mineral nutrients to plants than large sand grains. Sandy soils require a high level of management to improve their productivity; they require more fertilizer and more frequent irrigation or rain than other soils. This answer is found in the description of the surface horizon. Some soils may contain multiple A horizons. This question refers to the first or top horizons.

2. Rock Fragments content of surface layer (The topmost A Horizon) The surface layer is taken into account with this question. Soil texture in relation to the content of rock fragments greatly affects the plant growth through limiting available water holding capacity. This also affects bearing capacity of the soil for heavy traffic areas and locations for water and feeding areas. The rock fragment content of the surface layer also dictates the seeding and harvesting methods and ease of tillage. The rock fragments content in the horizons below the topmost horizon is taken into account with the available water holding capacity and therefore will not be included in this answer. The rock fragment content of the surface layer is found in the description of the topmost A horizon. The amount is recorded as a modifier to the soil texture and also listed with the percentage of each kind of rock later in the description.

3. Slope (between 50' stakes in field) Slope affects the use and management of the soil. It is directly related to the soil erosion hazard, and it influences a farmer's choice of crops and conservation practice. Slope refers to the steepness of the land surface. Slope is measured in percent calculated as the amount of vertical change in elevation over some fixed horizontal distance. In this case the slope is estimated between two stakes at or near the fifty-by-fifty-foot plot.

4. Depth of soil (or zone) limiting rooting depth. Restrictive layers are slowly permeable, and water tends to build up above them. They also restrict roots from penetrating through them. Because these layers are so slowly permeable, water does tend to build up above them, creating perched water tables. Perched water tables are temporary, and their presence is usually indicated by gray colors or mottling just above and in the upper part of the restrictive layer. These soils tend to be more susceptible to drought due to the lower available water holding capacity. Limiting layers include fragipans or bedrock. Fragipans are denoted with an x in the horizon lettering (some examples include: Btx, Ex, etc.). Bedrock will be denoted as a Cr for soft or weathered bedrock or R for hard bedrock such as limestone, sandstone, or dolomite.

5. Drainage class. Drainage class refers to the frequency and duration of periods of saturation or particle saturation during soil formation. Drainage class affects the adaptation of forages to the soil. See chart on page 44. Answer found on soil interpretation sheet.

6. Depth of topsoil layers (all the A Horizons) The surface layers are usually denoted with an Ap or A. The depth of these horizons indicates the soil quality and productivity in the plant root zone. The deeper the topsoil the more productive the soil usually is.

7. Permeability of most limiting layer or to 60 inches. Permeability refers to water movement through the soil, specifically the rate at which a saturated soil transmits water. This figure should come from the permeability chart on the soil interpretation sheet. Each horizon has its permeability listed. The slowest permeability (In/Hr range) above bedrock (Cr or R horizons) should be used (the most limiting layer).

8. Available water capacity to most limiting layer (fragipan or bedrock) or to 60 inches. Available water capacity (AWC) is the potential of a soil to hold water in a form available to plants. Since the soil provides the only reservoir of water from which plants can draw, the size or volume of the reservoir is one of the most important properties of the soil. Soils that have a high AWC have a greater potential to be productive than soils with a low AWC. Figure the available water capacity from the chart on the soil interpretation sheet. Each layer has the range given. Average the range and multiply by the inches in the horizon. If the last horizon extends beyond 60 inches, only calculate to sixty inches. Add all horizon figures together to 60 inches or to the top of the root limiting layer to arrive at the answer. See page 45 for an example calculation.

9. Land capability class Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops and the way they respond to management. The numerals indicate progressively greater limitations and narrower choices for practical use. Answer is found on the soil interpretation sheet under Land Capability Classification.

10. Major factors, if any, that keep area out of Class I In class I there are no subclasses because the soils of this class have few limitations. Soil limitations are indicated by the letters e,w,s. "e" indicates erosion potential, "w" indicates wetness and/or flooding, and "s" indicates shallow, stony, or droughty soils. Answer is found on the soil interpretation sheet under Land Capability Classification

FORAGE ADAPTATION

Determine which forages are adapted to the site according to the chart in the Study Guide page 44.

EXAMPLE PROBLEM: Soils Scorecard

The following is an example problem. The soil series description was taken from the Braxton County Soil Survey. The correct answers have been marked on the following scorecard.

GuE - Gilpin-Upshur silt loams, 25 to 35 percent slopes

This map unit consists of moderately deep and deep, well drained soils on hillsides, benches, and narrow ridgetops in the central and western parts of the county. The hillsides and benches are commonly dissected by drainageways, and land slips occur in places. The soils in this complex are so intermingled that it was not practical to map them separately at the scale selected for mapping. The map unit is about 35 percent Gilpin silt loam, 35 percent Upshur silt loam, and 30 percent other soils.

Typically, the surface layer of the Gilpin soil is very dark grayish brown silt loam about 1 inch thick underlain by 2 inches of dark brown silt loam. The subsoil extends to a depth of 24 inches. The upper 4 inches is yellowish brown silt loam. The lower 17 inches is strong brown channery silty clay loam. The substratum is strong brown channery silt loam that extends to interbedded sandstone and shale at a depth of 31 inches.

The surface layer of the Upshur soil is typically dark brown silt loam about 2 inches thick. The subsoil extends to a depth of 30 inches. The upper 3 inches is reddish brown silty clay loam. The next 9 inches is red clay. The next 12 inches is weak red clay, and the lower 4 inches is weak red silty clay. The substratum is weak red very channery silty clay loam that extends to red and olive shale at a depth of 43 inches.

Included with these soils in mapping are a few small areas of the well-drained Lily and Vandalia soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils where stones cover as much as 3 percent of the surface, areas of rock outcrops, areas of soils that slope 15 to 25 percent or more than 35 percent, and areas of soils where more than 75 percent of the topsoil has been eroded. Included soils make up about 30 percent of this map unit.

The available water capacity is moderate in the Gilpin soil and moderate or high in the Upshur soil. Permeability in the subsoil is moderate in the Gilpin soil and slow in the Upshur soil. Runoff is very rapid for both soils. Natural fertility is moderate in the Gilpin soil and moderate or high in the Upshur soil. In unlimed areas, the Gilpin soil is extremely acid to strongly acid. In unlimed areas, the Upshur soil is very strongly acid or strongly acid in the surface layer and strongly acid to mildly alkaline in the subsoil and substratum. The depth to bedrock ranges from 20 to 40 inches in the Gilpin soil and from 40 to 60 inches in the Upshur soil. The Upshur soil has high shrink-swell potential in the subsoil and is highly susceptible to land slips.

Most of these soils are used for woodland. Some areas are used for pasture. The soils in this map unit are not suited to cultivated crops or hay, but are suited to pasture. The severe erosion hazard in unvegetated areas and overgrazing of pasture are major management concerns. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soils are reasonably firm are major pasture management needs.

The Gilpin and Upshur soils have moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, scarlet oak, Virginia pine, and yellow poplar. Erosion control, the equipment limitation, and plant competition are major management concerns. On the Upshur soil, during wet seasons poor traction and low soil strength restrict the use of equipment. The Upshur soil is highly susceptible to slippage. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks can help control erosion.

Slope and depth to bedrock are the main limitations of the Gilpin soil as site for dwellings and septic tank absorption fields. Slope, slow permeability, high shrink-swell in the subsoil, and slippage are the main limitations of the Upshur soil. These soils are not suited to most urban uses. Selecting alternate sites of soils with fewer limitations is needed. If vegetation on these soils is disturbed, establishing plant cover on unvegetated areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is Vle.

Gilpin Series

The Gilpin series consists of moderately deep, well drained soils formed in acid material weathered from interbedded siltstone, shale, and sandstone. Gilpin soils are on ridgetops, benches, and side slopes throughout the county. Slope ranges from 8 to 70 percent.

Gilpin soils are on the landscape with the well-drained Lily, Myra, Pineville, Upshur, and Vandalia soils and Udorthents and the moderately well drained Buchanan soils. Gilpin soils have less sand in the Bt horizon than Lily soils and less clay in the Bt horizon than Upshur and Vandalia soils. Gilpin soils are better drained than Buchanan soils. They have fewer rock fragments in the control section than Myra soils and Udorthents. Gilpin soils are not as deep as Pineville, Upshur, Vandalia, and Myra soils and Udorthents.

Typical pedon of Gilpin silt loam, in an area of Gilpin-Upshur silt loams, 35 to 70 percent slopes; about 0.5 mile east of the confluence of Barbecue Run with Knawl's Creek; 15 feet north of Knawl's Creek Road in a wooded area; Orlando topographic quadrangle; lat. 38 degrees 49 minutes 40 seconds N. and long. 80 degrees 32 minutes 11 seconds W.

Oi - 4 inches to 1 inch; hardwood leaf litter.

Oe - 1 inch to 0; moderately decomposed organic material.

A - 0 to 1 inch; very dark grayish brown (10YR 3/2) silt loam; moderate fine and medium granular structure; friable; many coarse roots; about 5 percent rock fragments; very strongly acid abrupt wavy boundary.

E - 1 to 3 inches; dark brown (10YR 4/3) silt loam; moderate fine and medium granular structure; friable; many coarse roots; about 5 percent rock fragments; very strongly acid; abrupt wavy boundary.

BE - 3 to 7 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many coarse roots; about 5 percent rock fragment; very strongly acid; clear wavy boundary.

Bt - 7 to 24 inches; strong brown (7.5YR 5/6) channery silty clay loam; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; many coarse roots; about 15 percent rock fragments; very strongly acid; clear wavy boundary.

C - 24 to 31 inches; strong brown (7.5YR 5/6) channery silt loam; massive; friable; few coarse roots; about 30 percent rock fragments; very strongly acid; clear wavy boundary.

R - 31 inches; interbedded sandstone and shale.

The solum thickness ranges from 18 to 30 inches. The depth to bedrock ranges from 20 to 40 inches. Rock fragments of shale, siltstone, and sandstone range, by volume, from 5 to 25 in individual horizons of the solum and from 30 to 65 percent in the C horizon. Unlimed soils are extremely acid to strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The E horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. Texture of the fine earth material is silt loam or loam.

The BE horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 4 to 6. Texture of the fine earth material is silt loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 4 to 6. Texture of the fine earth material is silt loam, or silty clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 4 to 6. Texture of the fine earth material is loam, silt loam, or silty clay loam.

TABLE 16 – PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors –T" apply to the entire profile. Entries under "Organic matter "apply only to the surface layer. Absence of an entry indicated that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion Factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
AgB----------	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.22	3.6-5.5	Low------	0.32	4	1-4
Allegheny	7-43	18-35	1.20-1.50	0.6-2.0	0.13-0.18	3.6-5.5	Low------	0.28		
	43-65	10-35	1.20-1.40	0.6-2.0	0.08-0.17	3.6-5.5	Low------	0.28		
BuE----------	0-4	10-27	1.20-1.40	0.6-2.0	0.11-0.16	3.6-5.5	Low------	0.24	3	---
Buchanan	4-25	18-30	1.30-1.60	0.6-2.0	0.10-0.16	3.6-5.5	Low------	0.24		
	25-65	18-35	1.40-1.70	0.06-0.2	0.06-0.10	3.6-5.5	Low------	0.17		
Cg----------	0-8	10-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low------	0.32	5	2-4
Chagrin	8-35	18-30	1.20-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low------	0.32		
	35-65	5-25	1.20-1.40	0.6-2.0	0.08-0.20	5.6-7.3	Low------	0.32		
Ch, Cp----------	0-12	7-18	1.20-1.40	2.0-6.0	0.11-0.18	5.1-6.5	Low------	0.24	4	.5-4
Chavies	12-36	7-18	1.20-1.40	2.0-6.0	0.11-0.20	5.1-6.5	Low------	0.24		
	36-65	7-18	1.30-1.50	2.0-6.0	0.08-0.18	4.5-6.0	Low------	0.24		
Cr----------	0-6	5-15	1.20-1.40	2.0-6.0	0.07-0.15	4.5-5.5	Low------	0.17	3	1-5
Craigsville	6-35	5-15	1.30-1.60	2.0-6.0	0.06-0.15	4.5-5.5	Low------	0.17		
	35-65	5-10	1.35-1.55	>6.0	0.04-0.09	4.5-5.5	Low------	0.17		
GaF----------	0-3	15-27	1.20-1.40	.06-2.0	0.08-0.14	3.6-5.5	Low------	0.24	3	.5-4
Gilpin	3-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low------	.024		
	24-31	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low------	.024		
	31	---	---	---	---	---	---	---		
GlC* ----------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low------	0.32	3	.5-4
Gilpin	3-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low------	0.24		
	24-31	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low------	0.24		
	31	---	---	---	---	---	--	--	--	
Lily----------	0-6	7-27	1.20-1.40	0.6-6.0	0.13-0.18	3.6-5.5	Low------	0.28	2	.5-4
	6-23	18-35	1..25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low------	0.28		
	23-27	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low------	0.17		
	27	---	---	---	---	---	----	---		
GlD*, GlE*: ---	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low-------	0.32	3	.5-4
Gilpin	3-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-------	0.24		
	24-31	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-------	0.24		
	31	---	---	---	---	---	---	---		
Lily----------	0-6	7-27	1.20-1.40	0.6-6.0	0.13-0.18	3.6-5.5	Low-------	0.28	2	.5-4
	6-23	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low-------	0.28		
	23-27	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low-------	0.17		
	27	---	---	---	---	---	---	---		
GuC*, GuD*, --	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low-------	0.32	3	.5-4
GuE*, GuF*	3-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-------	0.24		
Gilpin	24-31	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-------	0.24		
	31	---	---	---	---	---	---	---		

FORAGE ADAPTATION BY SOIL DRAINAGE CLASS

	Very Poorly Drained	Poorly Drained	Somewhat Poorly Drained	Mod. Well Drained	Well Drained	Somewhat Excess Drained	Excess Drained
Alfalfa				X	X	X	
Annual Lespedeza				X	X	X	X
Birdsfoot Trefoil			X	X	X	X	
Red Clover			X	X	X	X	
White or Ladino Clover			X	X	X		
Bromegrass			X	X	X		
Big Bluestem			X	X	X	X	
Tall Fescue		X	X	X	X	X	X
Indiangrass			X	X	X	X	X
Orchardgrass				X	X	X	
Switchgrass		X	X	X	X	X	X
Timothy			X	X	X	X	
Caucasian Bluestem				X	X	X	X
Bermudagrass			X	X	X	X	X
Little Bluestem				X	X	X	X
Kentucky Bluegrass			X	X	X	X	X
Reed Canarygrass	X	X	X	X	X	X	

EXAMPLE SCORECARD

SCORECARD A -- ANSWER SHEET

SOIL INTERPRETATION

TEAM NAME: _____ STUDENT NAME: _____ SCORE: _____ POINTS: 100

C **1.** Surface Texture
- A. Loam
- B. Sandy loam
- C. Silt loam
- D. Clay loam

A 2. Content of rock fragments in surface layer (The A Horizon)
- A. 0 to 5%
- B. 5 to 20%

D 3. Slope (between 50' stakes in field)
- A. 3 to 8%, gently sloping
- B. 8 to 15%, moderately sloping
- C. 15 to 25%, strongly sloping
- D. 25 to 35 %, steep
- E. 35 to 70%, very steep

C 4. Depth of soil
- A. 0 to 10 inches, very shallow
- B. 10 to 20 inches, shallow
- C. 20 to 40 inches, moderately deep
- D. 40 to 60 inches, deep
- E. greater than 60 inches, very deep

E 5. Drainage class
- A. Very poorly drained
- B. Poorly drained
- C. Somewhat poorly drained
- D. Moderately well drained
- E. Well drained

B 6. Depth of surface layer (The A Horizon)
- A. 5 inches
- B. 1 inch
- C. 9 inches
- D. 10 inches

F 7. Land capability class
- A. Class 1
- B. Class 2
- C. Class 3
- D. Class 4
- E. Class 5
- F. Class 6
- G. Class 7

A 8. Land Capability Subclass
- A. e = erosion
- B. s = stoniness
- C. w = wetness and/or flooding

A 9. Flood Hazard
- A. None
- B. Frequent
- C. Occasional
- D. Rare

C 10 AWC Class (calculate to 40 inch depth)
- A. Very low (0 - 2.5 inches)
- B. Low (2.5 - 3.2 inches)
- C. Moderate (3.2 to 5.2 inches)
- D. High (>5.2 inches)

(.12 + .18) ÷ 2 = .15 x 3" = .45
(.12 + .16) ÷ 2 = .14 x 21" = 2.94
(.08 + .12) ÷ 2 + .1 x 7" = .70
4.09" available water

FORAGE ADAPTATION

	FORAGE	Adapted	Not Adapted
1.	Timothy	√	
2.	Orchardgrass	√	
3.	Tall Fescue	√	
4.	Red Clover	√	
5.	Annual Lespedeza	√	
6.	White Clover	√	
7.	Reed Canarygrass	√	
8.	Birdsfoot Trefoil	√	
9.	Bromegrass	√	
10.	Alfalfa	√	

EXAMPLE SCORECARD

SOIL INTERPRETATION

TEAM NAME: _____ STUDENT NAME: _____ SCORE: _____ POINTS: 100

_____ **1.** Surface Texture
- A. Loam
- B. Sandy loam
- C. Silt loam
- D. Clay loam

_____ 2. Content of rock fragments in surface layer (The A Horizon)
- A. 0 to 5%
- B. 5 to 20%

_____ 3. Slope (between 50' stakes in field)
- A. 3 to 8%, gently sloping
- B. 8 to 15%, moderately sloping
- C. 15 to 25%, strongly sloping
- D. 25 to 35 %, steep
- E. 35 to 70%, very steep

_____ 4. Depth of soil
- A. 0 to 10 inches, very shallow
- B. 10 to 20 inches, shallow
- C. 20 to 40 inches, moderately deep
- D. 40 to 60 inches, deep
- E. greater than 60 inches, very deep

_____ 5. Drainage class
- A. Very poorly drained
- B. Poorly drained
- C. Somewhat poorly drained
- D. Moderately well drained
- E. Well drained

_____ 6. Depth of surface layer (The A Horizon) is ?_____inches

_____ 7. Land capability class
- A. Class 1
- B. Class 2
- C. Class 3
- D. Class 4
- E. Class 5
- F. Class 6
- G. Class 7

_____ 8. Land Capability Subclass
- A. e = erosion
- B. s = stoniness
- C. w = wetness and/or flooding

_____ 9. Flood Hazard
- A. None
- B. Frequent
- C. Occasional
- D. Rare

_____ 10. AWC Class (calculate to 40 inch depth)
- A. Very low (0 - 2.5 inches)
- B. Low (2.5 - 3.2 inches)
- C. Moderate (3.2 to 5.2 inches)
- D. High (>5.2 inches)

FORAGE ADAPTATION

	FORAGE	Adapted	Not Adapted
1.	Timothy		
2.	Orchardgrass		
3.	Tall Fescue		
4.	Red Clover		
5.	Annual Lespedeza		
6.	White Clover		
7.	Reed Canarygrass		
8.	Birdsfoot Trefoil		
9.	Bromegrass		
10.	Alfalfa		

PLANT IDENTIFICATION

Nearly every phase of grassland management is intimately associated with a knowledge of the plants, their requirements, life history, and forage value. Wildlife species as well as domestic livestock are generally a product of the plants they eat. Proper grazing capacity of grasslands, periods and degrees of use, and class of livestock to which a particular pasture is best suited are determined largely by the character and composition of the vegetation and the life habits and values of the plants themselves. Persons unfamiliar with plants or vegetative cover are usually unable to interpret signs of overgrazing in a pasture situation. In addition, since plants are the basic units of wildlife habitat (food and cover), it becomes increasingly important for a landowner to be able to identify the plants in order to overcome any limiting factors.

Livestock allowed to graze uncontrolled, will select those plants, which are most succulent and nutritious. This constant pressure may not allow time for regrowth and may result in certain plants being eliminated. Other plants, which are seldom grazed, may tend to increase in number or invade a pasture reducing its forage production (see Glossary: increasers, decreasers and invaders). In order for a landowner to make proper management decisions in response to these principles, he must first be able to identify the plants involved.

The following list of grasses, forbs, legumes, and woody plants are only a few of the plants that might be encountered in a grassland situation. In order for a landowner to either control or encourage a certain plant, it is important that he know its life cycle, i.e., whether it is an annual, biennial or perennial (see Glossary).

The list includes only common names; however, the student is encouraged to collect the individual plants and to further identify them as to their proper scientific name. Scientific names remain the same throughout the world, whereas the common names may vary even in a local area. Many books are available which can be used to key these plants to a scientific name.

PLANT ID

TEAM NAME:_____ STUDENT NAME:_____ SCORE:_____ POINTS: 100

(Write the number of the plant in the space before its name **AND** under its proper life cycle designation; **NOTE:** Ann = Annual, Bie/Per = Biennial or Perennial)

(Ann) (Bie/Per)

******GRASS AND GRASSLIKE******

_____ _____ Barnyard Grass
_____ _____ Bermuda Grass
_____ _____ Bluegrass (Kentucky)
_____ _____ Bluestem, big
_____ _____ Bluestem, little
_____ _____ Bromegrass
_____ _____ Broomsedge
_____ _____ Crabgrass
_____ _____ Downy Chess (downy brome, cheat grass)
_____ _____ Eastern Gamagrass
_____ _____ Fescue (tall)
_____ _____ Foxtail (giant, green & yellow)
_____ _____ Indiangrass
_____ _____ Johnsongrass
_____ _____ Orchardgrass
_____ _____ Purple Top
_____ _____ Reed Canary Grass
_____ _____ Ryegrass, Annual
_____ _____ Sedges
_____ _____ Switchgrass
_____ _____ Timothy

******LEGUMES******

_____ _____ Alfalfa
_____ _____ Birdsfoot Trefoil
_____ _____ Clover, (little hop)
_____ _____ Clover, Red
_____ _____ Clover, Sweet
_____ _____ Clover, White
_____ _____ Lespedeza, Sericea
_____ _____ Partridge Pea
_____ _____ Tick Trefoil (beggar tick)
_____ _____ Vetch, Hairy

(Ann) (Bie/Per)

******FORBS******

_____ _____ Bull Nettle (horsenettle)
_____ _____ Chicory, Common
_____ _____ Cinquefoil
_____ _____ Cocklebur, Common
_____ _____ Curly Dock
_____ _____ Daisy Fleabane
_____ _____ Dandelion
_____ _____ Goldenrod
_____ _____ Hemp Dogbane
_____ _____ Horseweed
_____ _____ Ironweed
_____ _____ Lambsquarter
_____ _____ Milkweed, Common
_____ _____ Mullein
_____ _____ Pigweed
_____ _____ Plantain
_____ _____ Pokeweed
_____ _____ Queen Anne's Lace
_____ _____ Ragweed, Common
_____ _____ Smartweed
_____ _____ Spotted Knapweed
_____ _____ Thistle
_____ _____ Wild Onion

******WOODY PLANTS******

_____ _____ Autumn Olive
_____ _____ Black Cherry
_____ _____ Blackberry
_____ _____ Coralberry (buckbrush)
_____ _____ Dewberry
_____ _____ Dogwood
_____ _____ Elm
_____ _____ Grape
_____ _____ Greenbriar
_____ _____ Hawthorn
_____ _____ Hickory
_____ _____ Honeysuckle (Bush or Japanese)

(Ann) (Bie/Per)

_____ _____ Locust (black or honey)
_____ _____ Oak, black or white
_____ _____ Persimmon
_____ _____ Red Cedar (juniper)
_____ _____ Rose (multiflora or wild)
_____ _____ Sassafras
_____ _____ Sumac
_____ _____ Walnut
_____ _____ Wild Plum
_____ _____ Willow

PLANT ID

TEAM NAME:_____ STUDENT NAME:_____ SCORE:_____ POINTS: 100

(Write the number of the plant in the space before its name **AND** under its proper life cycle designation; **NOTE:** Ann = Annual, Bie/Per = Biennial or Perennial)

(Ann)	(Bie/Per)	****GRASS AND GRASSLIKE****
x		Barnyard Grass
	x	Bermuda Grass
	x	Bluegrass (Kentucky)
	x	Bluestem, big
	x	Bluestem, little
	x	Bromegrass
	x	Broomsedge
x		Crabgrass
x		Downy Chess (downy brome, cheat grass)
	x	Eastern Gamagrass
	x	Fescue (tall)
x		Foxtail (giant, green & yellow)
	x	Indiangrass
	x	Johnsongrass
	x	Orchardgrass
	x	Purple Top
	x	Reed Canary Grass
x		Ryegrass, Annual
x	x	Sedges
	x	Switchgrass
	x	Timothy

(Ann)	(Bie/Per)	****FORBS****
	x	Bull Nettle (horsenettle)
	x	Chicory, Common
	x	Cinquefoil
x		Cocklebur, Common
	x	Curly Dock
x		Daisy Fleabane
	x	Dandelion
	x	Goldenrod
	x	Hemp Dogbane
x		Horseweed
	x	Ironweed
x		Lambsquarter
	x	Milkweed, Common
	x	Mullein
x		Pigweed
x	x	Plantain
	x	Pokeweed
	x	Queen Anne's Lace
x		Ragweed, Common
x	x	Smartweed
	x	Spotted Knapweed
	x	Thistle
	x	Wild Onion

		****LEGUMES****
	x	Alfalfa
	x	Birdsfoot Trefoil
x		Clover, (little hop)
	x	Clover, Red
x	x	Clover, Sweet
	x	Clover, White
	x	Lespedeza, Sericea
x	x	Partridge Pea
	x	Tick Trefoil (beggar tick)
x		Vetch, Hairy

		****WOODY PLANTS****	(Ann)	(Bie/Per)	
	x	Autumn Olive			
	x	Black Cherry			
	x	Blackberry		x	Locust (black or honey)
	x	Coralberry (buckbrush)		x	Oak, black or white
	x	Dewberry		x	Persimmon
	x	Dogwood		x	Red Cedar (juniper)
	x	Elm		x	Rose (multiflora or wild)
	x	Grape		x	Sassafras
	x	Greenbriar		x	Sumac
	x	Hawthorn		x	Walnut
	x	Hickory		x	Wild Plum
	x	Honeysuckle (Bush or Japanese)		x	Willow

IDENTIFYING CHARACTERISTICS

Orchardgrass - Pale green color with prominent ligule.

Smooth Bromegrass - In the middle of each leaf blade there is a wrinkle resembling a ‘W’.

Timothy - Seed heads are cylindrical. Bulb or corm just below soil surface.

Tall Fescue - Leaves smooth on the underside and ribbed on the upper side. Leaf edges rough to the touch.

Reed Canarygrass - Large membranous ligule, pointed, often described as papery.

Kentucky Bluegrass - Heads are pyramidal. Leaves are uniform width and boat shaped or keeled at the tips.

Redtop - Leaves are narrow and sharp. Prominent ligule. Heads are pyramidal and reddish in color at maturity.

Switch-grass - White patch of hair at the point where the leaf blade attaches to the stem.

Little Bluestem - Reddish cast in mature stages. Seed has bent awn at maturity.

Big Bluestem - Silky hairs widely dispersed on upper leaf surface. Seed head resembles a turkey foot.

Indian-grass - "Rifle-sight" ligule at the point where the leaf attaches to the stem.

Quackgrass - Prominent auricle or "eagle claw" at the point where the leaf attaches to the stem. Prolific rhizomes.

Alfalfa - Leaf edge serrated about 1/2 way around. Purple flower.

A GLOSSARY OF SELECTED TERMS FOR CONSERVATION AND RESOURCE USE.

Acid Soil: Soil with a pH value less than 7.0; for most practical purposes, a soil with a pH value less than 6.6. The term is usually applied to the surface layer or to the root zone unless specified otherwise.

Agricultural land: All land devoted to crop of livestock production, e.g., farmstead, drainage and irrigation ditches, ponds, cropland, and grazing land on farms.

Animal unit: A measurement of livestock numbers based on the equivalent of a mature cow (approximately 1,000 pounds live weight); roughly, one cow, 1.4 yearling cattle, one horse, one mule, five sheep, five swine, or six goats. Abbr. A.U.

Annual food plot: A small area of land planted to a mixture of annual plants which produce an abundance of small seeds as supplemental food for wild animals; the crop is not harvested but is left standing in the field.

Annual Plant: A plant that completes its life cycle and dies in one year or less.

Association: A climax plant community identified by the combination of dominant species present.

Available forage: Forage that is accessible for animal consumption. The standing dry matter yield of forage in a paddock or grazing unit. May be measure from desired grazing height.

Available water: The portion of water in a soil that can be absorbed by plant roots.

Backgrounding: Practice of raising a beef animal from weaning until placement in the feedlot. Backgrounding may either take place on pasture of with stored feed.

Biennial plant: A plant that requires two years to complete its life cycle.

Biomass: The amount of living matter in a given unit of the environment.

Border, Field (wildlife management): a strip of herbaceous or woody vegetation, usually low growing and at least thirty feet wide, established along the edges of fields, woodlands, or streams. Ideally, there would be cover elements of shrub and/ or escape, and the herbaceous cover should be open at ground level with at least 25% bare ground present and overhead (6-18") cover.

Brood Habitat (Brooding Habitat): Cover used by young birds to forage for insects and other invertebrates. Characterized by abundant annual plants (especially broadleaves) with a leafy canopy, relatively open, scattered stems in the understory, and abundant bare ground for ease of movement. Species diversity tends to be high. These same annual plants also produce abundant seeds for fall and winter food. In the eastern United States, this cover type occurs for one to two years following a disturbance (disking, burning, etc.)

Browse (n): Refers to the nutritious buds or tips of branches of shrubs, vines, saplings, and forbs that are selected for food by "browsing" wildlife such as deer.

Brush pile: a small stack of cut branches, shrubs, and other woody vegetation, and open at ground level which serves as protective cover for small wild animals.

Bunchgrass: Grass with growth forms that are clumped or tufted, rather than single-stemmed, sod-forming.

Canopy: Amount of ground shaded by plant foliage, whether herbaceous or woody.

Carrying capacity: The maximum population that a given ecosystem can support indefinitely.

Community: An aggregation of organisms within a specified area Conservation: 1. The wise use of natural resource. (The criteria for "wise use" can be the original concept of conservation by Pinchot: "greatest good for the greatest number in the long run.") 2. "A state of harmony between man and the land." …Aldo Leopold.

Consumable forage: The average annual dry matter forage requirements for an animal unit X the number of available animal units.

Continuous grazing: Livestock have access to unit year-round. Unit has no allocated periods of rest.

Cool-season plant: A plant that makes it major growth during the cool portion of the year. For example, cool-season grasses grow when the soil temperature is just above 32 degrees (F) and nearly stops growth when the soil temperature is above 78 degrees (F).

Cover: Vegetation or other material used by wild animals for nesting, rearing of young, resting, escape from predators, or protection from adverse weather conditions.

Covey: A small flock or number of birds together, often functioning somewhat as a unit; the term is chiefly applied to partridges (including quail).

Deciduous plant: A plant that sheds all its leaves every year at a certain season (usually autumn).

Decreaser plant species: The plant species of original vegetation that will generally decrease in relative amount with continued overuse; commonly termed decreasers.

Deferred grazing: The discontinuance of livestock grazing on an area for a specified period of time during the growing season to promote plant reproduction, establishment of new plants or restoration of vigor in old plants.

Degradation: 1. To wear down by erosion, especially through stream action. 2. To be contaminated by salts, chemicals, or other pollutants before being returned to the environment after being used by man. Density: In biology, the number of organisms per area unit at a given time.

Diversity: The variety of species within a given association of organisms. Areas of high diversity are characterized by a great variety of species; usually relatively few individual s represent any one species. Areas with low diversity are characterized by few species; relatively large numbers of individuals represent each species. Diversity enhances ecosystem stability.

Dominant (ecology): A species which by its activity, behavior, or number has considerable influence or control upon the conditions of existence of associated species; a species which “controls” its habitat and food web.

Downed Tree Structure: Woody cover created by placing several large, well branched trees side by side so tops intertwine. The area needs to be free of sod forming grasses and open at ground level beneath the branches.

Dry matter forage: Vegetative material suitable for forage that has been dried to remove all moisture.

Ecology: The study of interrelationships of organisms to one another and to their environment.

Ecosystem: A contraction for ‘ecological system;” the interacting system of a biological community and its non-living environment. Edge or ecotone (wildlife): The transitional zone where one cover type ends and another begins. The junction zone may have considerable linear extent but is narrower than the adjoining community areas themselves.

Endangered species (native): A species of native fish, wildlife or plant threatened with extinction because its habitat is threatened with destruction, drastic modification, or severe curtailment; or because of over-exploitation, disease, predation, or other factors. Its survival requires assistance.

Endemic species: An organism or species that is restricted to a relatively small geographic area or to an unusual or rare type of habitat.

Energy (or food) pyramid: The passage of energy as food from one trophic level to another. Since about 80 to 90 percent of the energy in each transfer is lost as waste heat, the resulting shape of the energy levels is that of a pyramid.

Escape Cover: Cover that affords prey species protection from mammalian and avian predators. For

quail, adequate escape cover is considered to be a patch of thick shrubby cover (e.g., plum, dogwood, blackberry) 1500 sq. ft. or more in size. It must have many intertwined branches and an open, sod-free understory. Also suitable are densely branched downed trees (without a sod 83 understory). Bulldozed piles typically are too tightly packed and full of dirt that attracts predators searching for den sites.

Exotic: An organism or species that is not native to the region in which it is found.

Field border: Minimum 30' border created by fencing or immediately adjacent and protected to the field in question. It must have cover elements of shrub and/ or escape, and the herbaceous cover must be open at ground level with at least 25% bare ground present and overhead (6-18") cover.

Food web (food cycle): All of the interconnecting food chains in a community.

Forage inventory: A compilation of the carrying capacity in animal units and animal unit months for all management units with a farm being evaluated. The carrying capacity of each management unit is the sum of carrying capacities of the pasture units it contains. The carrying capacity of each management unit is determined by dividing land area by the stocking rate (AC/AU).

Forage Production: The total amount of dry matter produced per unit of area on an annual basis.

Forb: An herbaceous plant which is not a grass, sedge, or rush. A broadleaf flowering plant. Forest: A plant association predominantly of trees and other woody vegetation. Community dominated by trees forming a closed canopy with a multilayered and dense understory of shade tolerant subcanopy trees, shrubs, vines, ferns, and herbs.

Glade: Open, rocky barren areas dominated by drought-adapted forbs, warm-season grasses, and specialized fauna. They are relatively small, often isolated native grasslands that occur on hilltops and south facing slopes, where thin, dry soils and dry harsh desert like summer conditions harbor unique natural communities of plants and animals.

Grass: A member of the botanical family Gramineae, characterized by bladelike, narrow leaves arranged on the culm or stem (jointed) in two ranks, flowers in spikelets, and seedlike fruit, e.g., wheat, oats, sorghum, fescue, big bluestem, etc.

Grassland: Land on which the existing plant cover is dominated by grasses and other herbaceous (non-woody) plants (forbs).

Grazing: The eating of any kind of standing vegetation, except browse, by domestic livestock or wild animals.

Grazing capacity: The maximum stocking rate possible without inducing damage to vegetation or related resources.

Grazing land: Land used regularly for grazing. The term is not confined to land suitable only for grazing. Cropland and pasture used in connection with a system of farm crop rotation are usually not included.

Grazing cell: A parcel of land subdivided into paddocks and grazed rotationally.

Grazing period: The length of time that livestock are present on a particular paddock during a particular grazing cycle.

Grazing season: The portion of the year that livestock graze, or are permitted to graze, on a given range or pasture. It is sometimes called a grazing period.

Grazing system: A specialization of grazing management, which defines systematically recurring periods of grazing and deferment for two or more management units.

Grazing unit: An area of rangeland or pastureland, public or private that is grazed as an entity.

Habitat: The environment in which the life needs of an organism, population, or community are supplied.

Hayland: Land used primarily for the production of hay from long-term stands of adapted forage plants.

Herb: Any flowering plant except those developing persistent woody bases and stems above ground.

Herbaceous: Referring to a plant that is not woody. Herbaceous vegetation dies back to the root each year (perennials & biennials) or dies altogether (annuals).

Herd: A group of animals, especially cattle or big game, collectively considered as a unit.

Home range: The total area traversed by a wild animal engaged in feeding, breeding, loafing, and seeking refuge during its life cycle. Hybrid: An organism resulting from a cross between parents of different species, subspecies, or cultivar.

Idle Area (wildlife): An unused patch at least 30 feet wide and ¼ ac, consisting of one or more cover types. Increaser plant species (increasers): Plant species of the original plant community that generally increase in relative amounts, at least for a time, under continued use. The particular species will vary due to location, kind of site, kind of grazing animals, season of use, and other environmental influences.

Indicator species: Any species (plant or animal) that by its presence, its frequency, or its vigor indicates any particular property of the site. Indigenous: An organism born, growing, or produced naturally in a region or country; native.

Intake: The mass of forage dry matter consumed by the grazing animal per day. Usually expressed as a percent of bodyweight or pounds per day.

Intensive grazing management: Grazing management where a grazing unit is subdivided into subunits (paddocks) with grazing periods typically less than five days. Usually involves an increase in stocking rates, forage utilization, labor, and results in increased production per unit area or per animal. Preferred term is “Management intensive Grazing” because it is management and not necessarily grazing that is intensified.

Intensive rotational management: Synonymous with “intensive grazing management”.

Interspersion (wildlife): The distribution of diverse cover types and plant species in a limited area. The degree to which environmental types are intermingled or interspaced on a landscape. A measurement of system unit location or relationship. It is the intermixing of units of different habitat types.

Invader plant species (invaders): Plant species that were absent in undisturbed portions of the original plant community but will invade under disturbance or continued overuse.

Key management species: 1. Those forage species whose use serves as an indicator of the degree of use of associated species. 2. Those species on which management of a specific unit is based. Landscape: All the natural features, such as fields, hills, forests, and water that distinguish one part of the earth’s surface from another part; usually that portion of land or territory which the eye can comprehend in a single view, including all of its natural characteristics.

Land Use plan: A composite of information, ideas, policies, programs, and activities related to existing and potential uses of land within a given area; such describes the recommended location and intensity of development for both public and private land uses such as residential, commercial, industrial, recreational, and agricultural. Legume: A plant capable of removing nitrogen from the air and adding it to the soil by way of its root system. Important for forage production to dilute the effects of endophyte infected fescue.

Life cycle: The stages through which an organism passes during its existence.

Limiting factor: A factor whose absence, deficiency, or excessive concentration exerts some restraining influence upon a population through incompatibility with species requirements or

tolerance. The parameter or item in an animal's habitat that outweighs all others in limiting productivity.

Livestock: Domestic animals produced or kept primarily for farm, ranch, or market purposes; livestock includes beef and dairy cattle, hogs, sheep, goats, and horses.

Management unit: An area of land that has distinct boundaries, usually fenced, so that it may be managed separately from other units, i.e., fields, paddocks, pastures.

Monoculture: the raising of crops of a single species, generally even-aged.

Multiple use: The use of land for more than one purpose, e.g., grazing of livestock, wildlife production, recreation, watershed, and timber production. Multiple use is not necessarily the combination of uses that will yield the highest economic return or greatest unit output.

Native species: A species that is a part of an area's original fauna or flora.

Natural resources: The air, land, soil, water, plants, animals, minerals, sources of energy, and other persons upon which and whom man depends on for his necessities, needs, and wants.

Natural revegetation: The natural re-establishment of plants; the propagation of new plants over an area by natural processes.

Niche: The functional role of an organism or population in its community. Each component has a certain function or role in the scheme of "nature".

Nitrogen fixation: The conversion of elemental nitrogen to organic combinations or to forms readily usable in biological processes. The conversion is normally carried out by bacteria living symbiotically in legumes, or by free-living soil bacteria.

Nitrogen-fixing plant: A plant that can assimilate and fix, with the aid of bacteria living in the root nodules, the free nitrogen of the atmosphere. Legumes with the associated rhizobium bacteria in the root nodules are the most important nitrogen-fixing plants.

Nutrients: Those elements of compounds essential to growth and development of living things: carbon, oxygen, nitrogen, potassium, phosphorus, etc.

Optimum yield: The maximum sustained yield of any harvestable crop.

Organism: Any living thing.

Overstocking: The placing of a number of animals on a given area that will result in overuse at the end of the planned grazing period.

Paddock: A subdivision of land within a grazing cell (can be temporary or permanent).

Palatability: The plant characteristics or conditions that stimulate a selective response by animals.

Pan: A horizon or lay in soil that is strongly compacted, indurated, or very high in clay content. Parent material (soils): The unconsolidated, more of less chemically weathered mineral or organic matter from which the solum of soils has developed by pedogenic processes. The C horizon may or may not consist of materials similar to those from which the A and B horizons developed.

Pasture: an area devoted to the production of forage, introduced or native, which is harvested by grazing. In most countries, "pasture" refers only to a planted grass sward.

Pasture improvement: Any practice of grazing, burning, mowing, fertilizing, liming, seeding, scattering droppings, contour furrowing, or other methods of management designed to improve vegetation for grazing purposes.

Pasture management: The application of practices to keep pasture plants growing actively over as long a period as possible so that they will provide palatable feed of high nutritive value.

Patch-Burn Graze: A technique that manages habitats and forage in a complementary manner. Under

this type of management, fire and grazers interact to create a patchwork of habitat structures and densities. Fire is used on only part of the pasture (typically 1/3) to produce lush new growth that attracts the grazing animals. Unburned portions, being less palatable, are afforded long rest periods to rebuild roots and vertical structure. The following year, a previously unburned portion is fired, shifting grazing pressure to this new patch, and allowing last year's heavily utilized patch to rest and recover. In essence, on a given acre, this technique results in one year heavy use followed by two or more years of rest. In this manner, grassland wildlife benefit by having multiple habitat types (nesting, brooding, roosting) provided within close proximity to one another. Pastures under PBG management need only perimeter fences (grazers are free to roam the entire unit, but mostly stay in the present year's burned unit). Pastures are stocked based on the size of the entire pasture, not just the present year's burned patch. To date this technique has only been used on native warm-season pastures and prairies.

Perennial plant: A plant that normally lives three or more years. Permanent pasture: Grazing land occupied by perennial pasture plants or by self-seeding plant, usually both, which remains unplowed for many years.

Pesticide: Any substance or chemical applied to kill or control weeds, insects, algae, rodents, and other undesirable pests.

pH: A numerical measure of acidity or hydrogen ion activity. A pH value of 7.0 is neutral, pH values below 7.0 are acid; pH values above 7.0 are alkaline.

Photosynthesis: The food making process in green plants. Sunlight is used to convert water and carbon dioxide into carbohydrates and oxygen, in the presence of chlorophyll.

Pollution: The condition caused by the presence in the environment of substances of such character, and in such quantities, that the quality of the environment is impaired or rendered offensive to life. 88

Population: A group of organisms of the same kind.

PPM (parts per million): The ratio of the numbers of parts of a substance in air or a liquid to one million.

Prairie: A tract of level to hilly land that has a dominance of grasses and forbs, a scarcity of shrubs, and is treeless. The natural plant community consists of various mixtures of tall, mid, and short growing native species, respectively known as true prairie, mixed prairie, and shortgrass prairie. Native grasslands in Missouri dominated by warm-season grasses and perennial herbs with very few trees (<10 percent cover)

Prescribed Burning: The deliberate use of fire as a tool under conditions by which the area to be burned, the intensity of heat, and the rate of spread are controlled so as to achieve predetermined, professionally recommended objective for silviculture, wildlife management, grazing, fire-hazard reduction, etc.

Primary productivity: The rate at which organic matter is stored by photosynthetic and chemosynthetic activity of producer organisms (autotrophs); e.g., grams per day.

Reproductive potential: The maximum rate of increase in number of individuals of a species or population under the most optimum conditions, in contrast to actual reproduction obtained under existing conditions

Residual: The amount of forage remaining after a grazing period. Expressed as mass of dry matter per acre or as height from ground level. Not synonymous with residue.

Residue: Dead, decaying plant material present on the soil surface.

Rest period: The length of time between two consecutive grazing periods on a particular paddock.

Riparian land: Land situated along the bank of a stream or other body of water

Roost: The place, or the support upon which, birds rest—especially at night.

Roosting Cover: For quail, roosting habitat is characterized by vegetation 1-3 feet tall, consisting primarily of herbaceous species. Roosting habitat is typically relatively open at ground level, with abundant bare ground and little dense overhead obstruction that might hinder birds from escaping a predator.

Root zone: The part of the soil that is penetrated, by plant roots. Rotation grazing: A system of pasture utilization during which short periods of heavy stocking are followed by periods of rest for plant recovery during the same season.

Roughage: A feed, such as hay, with high fiber content and low total digestible nutrients.

Runoff (hydraulics): That portion of precipitation on a drainage area that is discharged from the area in stream channels

Savanna: Grasslands interspersed with open-grown, widely spaced, orchard-like scattered trees, or groupings of trees. Savannas are generally dominated by prairie species and herbs.

Seasonal grazing: Grazing restricted to a specific season. Selective grazing: The tendency for grazing animals to graze certain plants in preference to others.

Severe grazing: Grazing intensity which exceeds the growth rate of a plant but is only harmful to the plant if the intensity continues for several seasons so the plant can't complete either its reproductive or carbohydrate storage cycles. The plant can't maintain or replace itself.

Shrubs (Shrubby Cover): Relatively short (1-15') woody vegetation with multiple stems and dense, intertwined branches. Usable shrubby cover will not have a dense sod understory.

Slope: The degree of deviation of a surface from the horizontal, measured in a numerical ratio, percent, or degrees. Expressed as a ratio or percentage, the first number is the vertical distance (rise), and the second is the horizontal distance (run), as 2:1 or 200 percent. Expressed in degrees, it is the angle of the slope from the horizontal plane with a 90-degree slope being vertical (maximum), and 45 degrees being a 1:1 slope.

Soil: The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of plants.

Soil classification: The systematic arrangement of soils into groups or categories on the basis of their characteristics. Soil loss tolerance (T): The maximum average annual soil loss (expressed in tons per acre per year) that should be permitted on a given soil.

Soil survey: A general term for the systematic examination of soils in the field and in laboratories: their description and classification; the mapping of kinds of soil; the interpretation of soils according to their adaptability for various crops, grasses, and trees; their behavior under use or treatment for plant production or for other purposes; and their productivity under different management systems. Species (both singular and plural): A natural population or group of populations that transmit specific characteristics from parent to offspring. They are reproductively isolated from other population with which they might breed.

Species diversity: The ratio of the number of species in a community to the number of individuals in each species. (Low diversity occurs when there are few species, but many individuals in each species.) Standing crop: 1. The total biomass of an area at a given time. 2. The quantity of a given species at a given times.

Stocker: A beef animal in the period between weaning and feedlot placement

Stocking: The release of wildlife species that have been captured, or propagated in captivity, into a suitable habitat.

Stocking rate: The number of animals, animal units, or total animal liveweight assigned to a grazing unit for an extended period of time. Usually expressed on a per acre basis.

Structure: The vertical and horizontal arrangement of herbaceous and woody vegetation.

Succession: The stages through which an ecosystem passes from less complex to more complex, i.e., from bare ground to oak hickory forest in MO. Sustained yield: A condition in which the rate of utilization or consumption of a resource does not exceed the rate of recovery or production.

Sward: Grass covered soil.

Temporary pasture: A pasture, usually consisting of annual plants, intended to provide grazing for only a short period.

Tillage: The operation of implements through the soil to prepare seedbeds and root beds, control unwanted vegetation, aerate the soil, and cause faster breakdown or organic matter.

Transect: A cross section of an area used as a sample for recording, mapping, or studying vegetation and its use. A transect may be a series of plots, a belt, strip, or line, depending on why it is being used.

Undergrazing: An intensity of grazing in which the available forage is not fully utilized.

Vegetation: The sum total of plants that cover an area; plants in general

Vegetation type: A plant community with distinguishable characteristics.

Warm-season plant: A plant that completes most of its growth during the warm portion of the year, generally late spring and summer. For example, warm-season grasses start growth when the soil temperature reaches 55 degrees (F) and nearly stops growing when it reaches 90 degrees (F).

Water penetration: The depth to which irrigation water or precipitation penetrates soil before the rate of downward movement becomes negligible.

Watershed: The land area that drains toward a natural surface water system.

Wildlife: Undomesticated animals, considered collectively

Wildlife management: The technique of producing sustained annual crops of wildlife.

Woodland: Natural communities with an overstory of trees ranging from 30 to 100% canopy closure with a sparse understory or (midstory) and a ground layer rich in forbs and graminoids. The ground layer has patchy to dense cover all growing season as opposed to forests where ground layer cover peaks in spring. (This does not refer to scattered trees in a pasture or hayfield.)

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ATTACHMENT A – BLANK SCORECARDS

GRASSLAND CONDITION

TEAM NAME: _____ STUDENT NAME: _____ SCORE: _____ POINTS: 100

APPRAISAL OF EXISTING CONDITIONS

(5 points each)

_____ **1.** What is the pasture type by percent dry matter?

A. Fescue (>90% fescue)
B. Cool-season grasses (<10% legumes)
C. Cool-season grasses (10-25% legumes or other grasses)
D. Cool-season grasses (26-60% legume)
E. Legumes dominant (>75% legume)
F. Warm-season grasses (<40% other species)

_____ **2.** What is the average growth stage of the dominant forage species?

A. Vegetative
B. Boot or bud
C. Heading or bloom
D. Mature
E. Dormant

_____ **3.** What best describes the condition of the pasture sward?

A. Spot grazed
B. Evenly grazed

_____ **4.** Is weed or brush control needed other than by grazing or soil fertility management?

A. Yes
B. No

_____ **5.** What soil pH range is recommended for this sward?

A. 4.0 - 4.5
B. 4.6 - 5.0
C. 5.1 - 5.5
D. 5.6 - 6.5
E. 6.6 - 7.0
F. 7.1 - 7.5

6. What fertilizer option is recommended for this pasture?

_____ N (Lbs/Ac) _____ P_2O_5 (Lbs/Ac) _____ K_2O (Lbs/Ac)

7. What limestone rate is recommended for this pasture in tons per acre?

_____Tons/Ac

MATCHING LIVESTOCK AND FORAGE

(4 points for each answer space)

_____ **1.** When does this livestock herd have the highest forage quality requirement?

A. Spring
B. Summer
C. Fall
D. Winter
E. Requirement high year round

_____ **2.** Does this pasture's growth cycle match the seasonal peak nutritional needs of this livestock herd under present management?

A. Yes
B. No

3. How many pounds of forage dry matter does this herd need to consume per day in:

_____ lbs. in spring (4 pts.) _____ lbs. in summer (4 pts.)

_____ lbs. in fall (4 pts.) _____ lbs. in winter (4 pts.)

4. Is forage availability adequate for this herd in:

Spring - 100 days (4 pts.)
_____ Adequate
_____ Not Adequate

Summer - 100 days (4 pts.)
_____ Adequate
_____ Not Adequate

Fall - 100 days (4 pts.)
_____ Adequate
_____ Not Adequate

Winter - 65 days (4 pts.)
_____ Adequate
_____ Not Adequate

COMPLETE QUESTIONS ON REVERSE SIDE

PASTURE IMPROVEMENT

(Answers to questions 3, 4 and 5 for this section are based on the choice for question Number 2)

(5 points each)

_____ 1. What change should be made in livestock management?
- A. Continue present management
- B. Reduce livestock numbers
- C. Change calving season to a different time of year
- D. Shorten calving season to a period of < 90 days
- E. Provide higher quality pasture
- F. Switch to a management-intensive rotational grazing system

_____ 2. What type of additional forage is needed to improve this forage program?
- A. Cool-season grass
- B. Warm-season grass
- C. Legumes
- D. No additional forages needed - use existing pasture

_____ 3. How should this forage be planted?
- A. Plant on clean, firm seedbed
- B. No-till plant in killed sod
- C. Overseed or interseed in a closely grazed sod
- D. No additional forages needed - use existing pasture

4. What fertilizer option is recommended for this forage?

_____ N (Lbs/Ac) _____ P_2O_5 (Lbs/Ac) _____ K_2O (Lbs/Ac)

5. What limestone rate is recommended for this forage in tons per acre?

_____Tons/Ac

PLANT ID

(Write the number of the plant in the space before its name **AND** under its proper life cycle designation; **NOTE:** Ann = Annual, Bie/Per = Biennial or Perennial)

****GRASS AND GRASSLIKE****

(Ann)	(Bie/Per)	
		Barnyard Grass
		Bermuda Grass
		Bluegrass (Kentucky)
		Bluestem, big
		Bluestem, little
		Bromegrass
		Broomsedge
		Crabgrass
		Downy Chess (downy brome, cheat grass)
		Eastern Gamagrass
		Fescue (tall)
		Foxtail (giant, green & yellow)
		Indiangrass
		Johnsongrass
		Orchardgrass
		Purple Top
		Reed Canary Grass
		Ryegrass, Annual
		Sedges
		Switchgrass
		Timothy

****LEGUMES****

		Alfalfa
		Birdsfoot Trefoil
		Clover, (little hop)
		Clover, Red
		Clover, Sweet
		Clover, White
		Lespedeza, Sericea
		Partridge Pea
		Tick Trefoil (beggar tick)
		Vetch, Hairy

****FORBS****

(Ann)	(Bie/Per)	
		Bull Nettle (horsenettle)
		Chicory, Common
		Cinquefoil
		Cocklebur, Common
		Curly Dock
		Daisy Fleabane
		Dandelion
		Goldenrod
		Hemp Dogbane
		Horseweed
		Ironweed
		Lambsquarter
		Milkweed, Common
		Mullein
		Pigweed
		Plantain
		Pokeweed
		Queen Anne's Lace
		Ragweed, Common
		Smartweed
		Spotted Knapweed
		Thistle
		Wild Onion

****WOODY PLANTS****

(Ann)	(Bie/Per)	
		Autumn Olive
		Black Cherry
		Blackberry
		Coralberry (buckbrush)
		Dewberry
		Dogwood
		Elm
		Grape
		Greenbriar
		Hawthorn
		Hickory
		Honeysuckle (Bush or Japanese)
		Locust (black or honey)
		Oak, black or white
		Persimmon
		Red Cedar (juniper)
		Rose (multiflora or wild)
		Sassafras
		Sumac
		Walnut
		Wild Plum
		Willow

Revised December 2023

EXAMPLE SCORECARD

SOIL INTERPRETATION

TEAM NAME: _____ STUDENT NAME: _____ SCORE: _____ POINTS: 100

_____ **1.** Surface Texture
- A. Loam
- B. Sandy loam
- C. Silt loam
- D. Clay loam

_____ 2. Content of rock fragments in surface layer (The A Horizon)
- A. 0 to 5%
- B. 5 to 20%

_____ 3. Slope (between 50' stakes in field)
- A. 3 to 8%, gently sloping
- B. 8 to 15%, moderately sloping
- C. 15 to 25%, strongly sloping
- D. 25 to 35 %, steep
- E. 35 to 70%, very steep

_____ 4. Depth of soil
- A. 0 to 10 inches, very shallow
- B. 10 to 20 inches, shallow
- C. 20 to 40 inches, moderately deep
- D. 40 to 60 inches, deep
- E. greater than 60 inches, very deep

_____ 5. Drainage class
- A. Very poorly drained
- B. Poorly drained
- C. Somewhat poorly drained
- D. Moderately well drained
- E. Well drained

_____ 6. Depth of surface layer (The A Horizon) is ? _____ inches

_____ 7. Land capability class
- A. Class 1
- B. Class 2
- C. Class 3
- D. Class 4
- E. Class 5
- F. Class 6
- G. Class 7

_____ 8. Land Capability Subclass
- A. e = erosion
- B. s = stoniness
- C. w = wetness and/or flooding

_____ 9. Flood Hazard
- A. None
- B. Frequent
- C. Occasional
- D. Rare

_____ 10. AWC Class (calculate to 40 inch depth)
- A. Very low (0 - 2.5 inches)
- B. Low (2.5 - 3.2 inches)
- C. Moderate (3.2 to 5.2 inches)
- D. High (>5.2 inches)

FORAGE ADAPTATION

FORAGE	Adapted	Not Adapted
1. Timothy		
2. Orchardgrass		
3. Tall Fescue		
4. Red Clover		
5. Annual Lespedeza		
6. White Clover		
7. Reed Canarygrass		
8. Birdsfoot Trefoil		
9. Bromegrass		
10. Alfalfa		