PENNSYLVANIA GRASSLAND EVALUATION CONTEST

Study Guide

Sponsored By:

Penn's Corner Resource Conservation & Development (RC&D) Council

Penn's Corner Resource Conservation & Development (RC&D) Council, in cooperation with the USDA Natural Resources Conservation Service and the PA Forage and Grassland Council sponsor the Pennsylvania Grassland Evaluation Contest. Many natural resource professionals have contributed to this contest, which started in Missouri in 1991.

This third edition of the contest study guide was originally developed by: the Missouri Forage and Grassland Council and was adapted for use in Pennsylvania.

Revised: October 2012
May 2022
August 2023

Table of Contents

Introduction

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

NOTE TO INSTRUCTORS: See section "Suggested References" for additional sources of information use with this Contest Guide.

Contest Layout

The judging site will be a typical pasture or area used for livestock grazing. Within the pasture area, a 50 by 50-foot plot will be marked-off with flags. Participants will not be allowed to walk into or touch plants within this plot. This area will be used by the participants to answer certain parts of the Wildlife and Pasture Evaluation Score Cards. Additional flags or stakes at or near this site will also be used to determine the percent of slope as required on the Soils Score Card. Additional areas may be designated by the Contest Officials as needed.

A "**scenario with a landowner's goals for livestock and wildlife production**" will be provided at the Contest site. Appropriate soil survey information, aerial photos, maps, score cards 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 each Score card.

Plants marked for the Plant Identification portion of the Contest will be marked in the field or they may be displayed as mounted specimens. Depending upon the plants available, certain plants may be temporarily "transplanted" to the site for purposes of identification. Participants will not be allowed to touch the plants marked for plant identification purposes.

Grassland Condition

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

Many problems in 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 based on sound agricultural practices compatible with the landowners 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 Management scorecard with wildlife production only as a secondary goal.

Wildlife Habitat

To increase wildlife numbers you must provide adequate food and permanent cover the year round. Wildlife numbers cannot increase if food or cover is continually grazed and trampled by livestock throughout the year, especially in winter. When scoring the Wildlife Habitat scorecard, consider wildlife improvement as the primary goal for the field with livestock production only as a secondary goal. Management decisions may differ between the two uses. Certain portions of the Wildlife Score Card will be answered by referring to the 50 X 50 foot plot as outlined above.

Soil Interpretation

Soil properties strongly influence both forage selection and field management. Soil surveys published by the Natural Resources Conservation Service are a basic tool 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 soils slope will be determined using the site that is identified with flags or stakes. The percent of slope equals the change (in feet) of elevation over a horizontal distance times 100. Example – An elevation change of 15 feet occurs in a horizontal distance of 50 feet.

15 over (divided by) 50 times (multiplied by) 100 = 30% slope

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.

***** CONTEST RULES *****

The "GRASSLAND EVALUATION CONTEST GUIDE" will provide details as to how the GRASSLAND EVALUATION CONTEST is to be set up and conducted at the contest site. All contestants should familiarize themselves with this information along with these "CONTEST RULES". (revised annually)

<u>GENERAL</u>:

1. A contest team will be made up of a maximum of four (4) and a minimum of three (3) FFA or 4-H students either currently enrolled at the high school level or have graduated at the end of the school year prior to the Mid-America Contest.

2. Scholarships will be awarded to 1st and 2nd place team members as well as the high scoring individual and plaques will be presented to the top three teams.

1st place team members will receive $500 each.
2nd place team members will receive $250 each.
The high scoring individual will receive $500.

<u>RULES DURING COMPETITION</u>:

1. Contestants will be allowed twenty-five (25) minutes to complete each of the four (4) segments of the contest with three (3) minutes to move between sites. The four segments include: 1) Grassland Condition, 2) Plant Identification, 3) Soils, and 4) Wildlife. Total contest time is approximately two (2) hours.

2. New score cards will be provided at the beginning of each section.

3. Cards will not be turned in to group leaders until the final horn for that section has sounded.

4. Each card must have the individual's name, team name, and identification number (assigned on day of contest) in order to be accepted.

5. Judges will announce any new information that is necessary to complete the contest.

6. Judges decisions will be final concerning any questions involving the contest.

7. Contestants may use non-programmable calculators. Each participant should bring pencils, clip board, and wear appropriate outdoor clothing (boots, rain gear, etc.)

8. Contestants will <u>not be allowed to:</u>

1. Talk to anyone during the contest or use printed materials for reference other than those provided by contest section leaders
2. Touch plants used for the plant identification
3. Leave the contest site during the contest except for emergencies.
4. Step into or touch plants within the 50 X 50 ft. plot

9. Contestants will be supplied maps and/or aerial photos, showing only the direction of north, at both the Wildlife and the Soils judging sites. Judges will inform contestants of the direction of north (either verbally or with signs). All maps and aerial photos will be collected at each site.

SCORING RULES AND GUIDELINES:

1. The winning team will be determined by adding together the highest three (3) team member's scores.

2. In case of a tie for the winning team, the Plant I.D. total team scores will be used to determine the winner. Should this score also result in a tie, the total team Grassland Evaluation Score will be used followed by the Wildlife and Soils score in the event of another tie. If all four sections are a tie, the team with the highest scoring individual will be declared the winner.

3. Graded score cards will not be returned, but a computer summary sheet of scores will be provided to each team.

4. The highest scoring team will become the STATE CHAMPION TEAM.

5. The State winner will represent PA in the Mid-America Contest held in Missouri. In the event that the first place team cannot compete in the Mid-America Contest, the second place team will serve as alternate.

6. State winning team members will be eligible to compete the following year.

SCORE CARD NOTES FOR CLARIFICATION:

1. Plant Identification: This part of the contest involves two answers for each of the twenty plants. Both answers must be correct for the question to be considered correct.

2. Grassland Condition: Question #3, "MATCHING LIVESTOCK AND FORAGE" –

3. Soils: Slope determination. Contestants will determine "soil slope" from designated stakes located at or near the "soils" site. Refer to the Soil Interpretation section (page 3) for details on the procedure to use to determine slope.

The Registration Form is located on the Southwest Project Website under the Grassland Evaluation Contest.

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 means loss of production. Livestock production can never reach an economically optimum level on improperly managed pasture. 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 and some winter grazing as well (Figure 1). 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.

Appraisal of Existing Conditions

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)

Fescue (>90% fescue) Tall fescue is the major cool-season grass planted in Pennsylvania. Fescue pastures have tall fescue as the dominant forage species (>90%) with only scattered plants of other forages present. 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 the 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 foliage 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 causes fescue toxicosis in grazing animals. Fescue toxicosis is caused by a toxin produced by an endophytic fungus that grows inside the fescue 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. The fescue endophyte problem on a farm can often be offset by planting new pastures of endophyte free fescuevarieties or by incorporating legumes into existing infected pastures. Fescue pastures usually have low values for wildlife due to the density of the foliage at ground level.

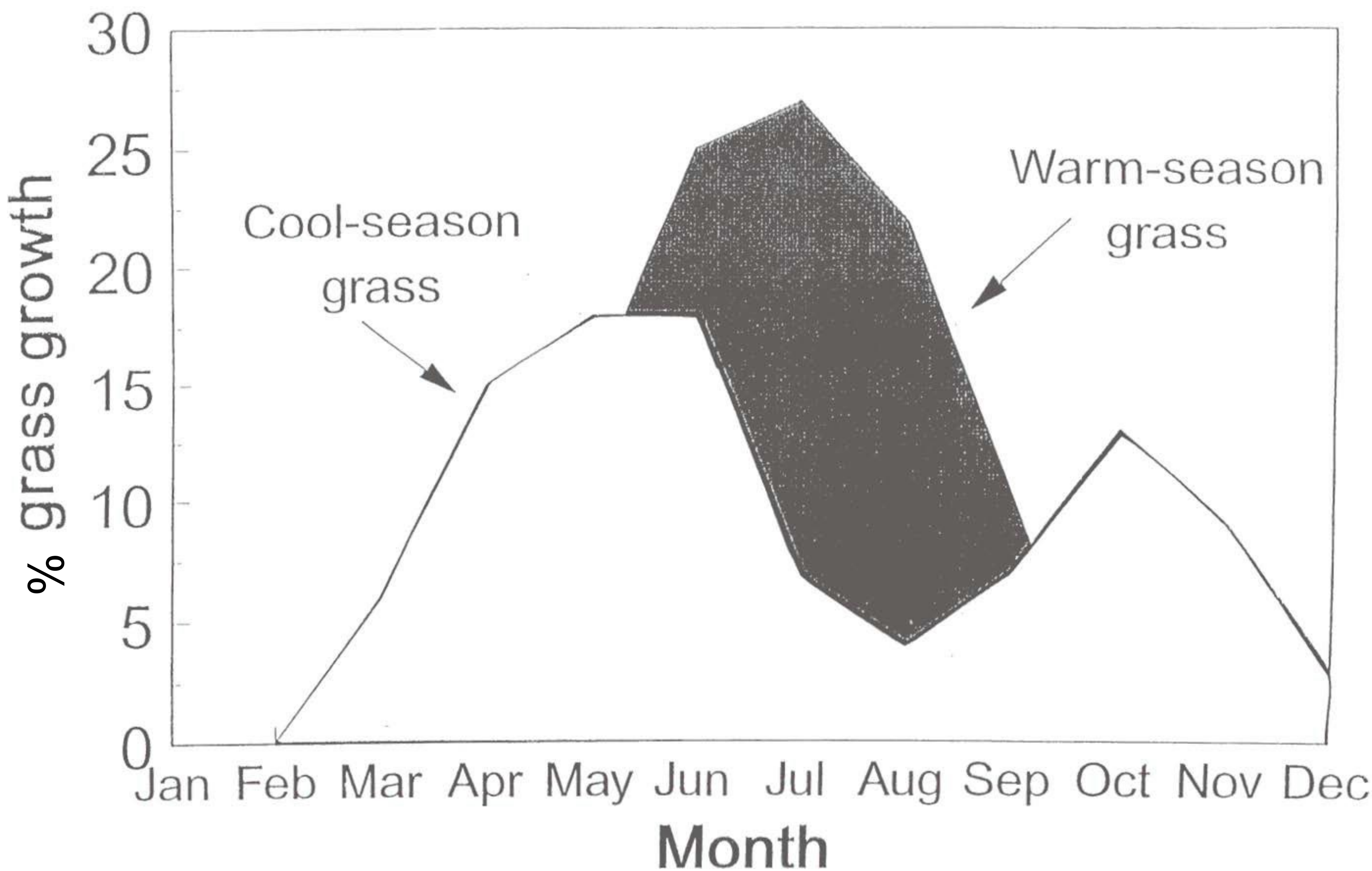


Figure 1. Complimentary growth patterns of cool-season and warm-season grasses

Mixed cool-season grasses (<10% legumes) Mixed cool-season grass pastures consist of a mix of cool-season grass forages that mayor 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 Pennsylvania include Kentucky bluegrass, orchardgrass, perennial ryegrass, redtop, reed canarygrass, smooth bromegrass, tall fescue, and timothy. These grasses are commonly grown in pure stands, in mixtures with other cool-season grasses, or in combination with legumes. Mixed cool-season pastures should receive nitrogen fertilization and the low percentage of legume (10%) is considered nutritionally non-significant. Soil test fertilizer recommendations for cool-season grass 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 (Figure 2). From one-half to two-thirds of the annual growth of cool-season grasses occurs in the spring and up to one-third of the annual growth occurs during 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 year. Cold weather, snow, or ice can cause forage quality to decline during winter.

Cool-season grass dominant (10 to 25% legume or other grasses) Cool-season grass dominant pastures generally needs no nitrogen fertilizer in spring, but may respond well to nitrogen fertilizer in fall. These pastures can include fescue and/or a mix of cool-season or warm-season grasses along with a moderate percentage of legumes (10 to 25%). Legume percentages in this range will improve the nutritional value of a pasture and will help offset the effects of the fescue endophyte on 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 pasture, 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 grass may be present at levels less than 25% of the pasture mix.

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 both 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.

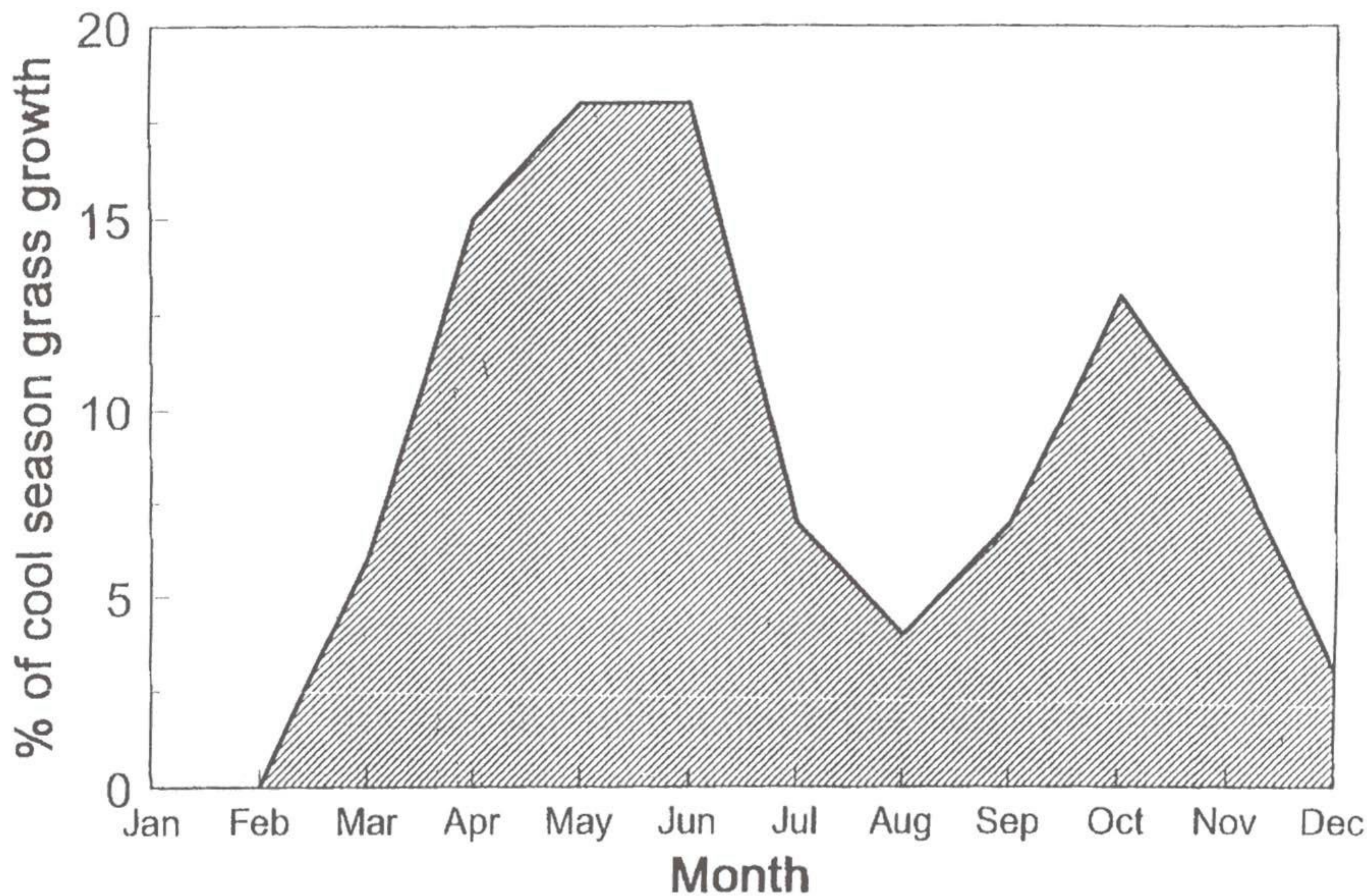


Figure 2. Seasonal growth of cool-season grasses

Legume dominant (>75% **legume)** Fields with this high percentage of legume (>75%) are more typical of hay fields 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.

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.

Legumes adapted to Pennsylvania include alfalfa, annual lespedeza (Kobe or Korean), birdsfoot trefoil, red clover, and white or ladino clover. Red and white clover grow in spring, early summer, and fall. Alfalfa and birds foot trefoil grow from spring through summer and fall. Annual lespedeza grows in summer and dies at frost. All of these are perennial plants: except for and annual lespedeza and red clover.

Warm-season grass dominant «40% other species) Warm-season grasses grow best during the summer months but grow very little in spring or fall (Fig. I). Warm-season grasses provide good quality, actively growing forage during the hot summer when cool-season grasses and many legumes are dormant or unproductive. Warm-season grasses should be used when 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 adapted to Pennsylvania 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 native 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. Introduced or non-native warm-season grasses include bermudagrass (south Pennsylvania only) and caucasian bluestem. Caucasian bluestem and bermudagrass are normally only grown in pure stands because hey 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.

The native warm-season grasses respond to moderate fertilizer applications and are much more desirable for wildlife cover than introduced warm-season grasses or most cool-season grasses. Introduced warm-season grasses such as bermudagrass and caucasian bluestem respond to high rates of nitrogen fertilizer, but have little value as wildlife cover. 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
B. Boot or bud
C. Heading or bloom
D. Mature
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. Fiber levels increase as the plants mature decreasing 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 seed. 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 seedheads. 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, mature seed. 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-grazing is actually a form of over-grazing 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 regrowth of the grazed forage in spots is often more palatable than the forage left ungrazed so the grazing animals frequently re-graze 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.

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, becomes necessary when woody plants and other undesirable species make up 30% or more of the canopy in a pasture. Mechanically, chemically or spot treatment of thorny species maybe necessary at levels of 10% canopy.

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. 4.5-5.0
B. 5.1-5.5
C. 5.6-6.0
D. 6.1-6.5
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 in Pennsylvania range from 6.0 to 7.0. Specific pH ranges for forages grown in Pennsylvania can be found Penn State University “Agronomy Fact Sheets” for individual forage species.

Soil pH is a measure of the acidity or alkalinity of the soil. A pH less than 7.0 (neutral) indicates an acid soil. The soil pH is a general indicator of whether agriculture lime is needed to reduce the acidity.

Most Pennsylvania soils are acidic, however heavy applications of limestone can increase the soil pH to basic or alkaline levels. A pH of 7.0 is neutral- meaning it is neither acidic or basic. Low soil pH can have a dramatic impact on forage growth and persistence.

A good liming program is based on a soil test that determines the degree of soil acidity and the correct amount of liming material need to neutralize that acidity. Limestone recommendations are made based on the pH goal and the amount of exchangeable acidity measured by the soil test. The pH goal varies with the crop. If the pH is at or above the pH goal, no limestone is recommended. If the pH is below the goal than a recommendation will be made to adjust the pH. The recommendations are given as pounds of calcium carbonate equivalent (CCE) per acre.

6. What is the fertilizer rate (lbs. each nutrient per acre) recommended for this pasture?

Fertilizer recommendations for a specific forage crop are shown in the "Recommendations" section of the Penn State soil test report. The recommendations on the soil test report are made for a three year sequence of crops. These recommendations are made based on the soil test results and on the information provided by the farmer such as crop to be grown, expected yield, crop rotation and plow depth. The pounds of nitrogen (N), phosphate (P_2O_5), and potash (K_2O) needed to reach the expected yield for each crop are shown on the soil test report under “Plant Nutrients”. Refer to the sample soil test report found on page 17.

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

A good liming program is based on a soil test that determines the degree of soil acidity and the correct amount of liming material need to neutralize that acidity. Limestone recommendations are made based on the pH goal and the amount of exchangeable acidity measured by the soil test. The pH goal varies with the crop. If the pH is at or above the pH goal, no limestone is recommended. If the pH is below the goal, then a recommendation will be made to adjust the pH. The recommendations are given as pounds of calcium carbonate equivalent (CCE) per acre. The soil test report assumes that the limestone material being applied will be 100% CCE in neutralizing power and based on liming an acre furrow slice approximately 7 inches deep. Recommendations are listed on the soil test report under the Recommendations section for Limestone. Refer to the sample soil test report found on page 17.

PENNSTATE

1 8 5 5

(814) 863-0841 Fax (814) 863-4540

Agricultural Analytical Services Laboratory
The Pennsylvania State University
University Park PA 16802

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
JOHN JONES HARMONY LANE SMITHVILLE PA 11111	SAM COOK TOP GROW ENTERPRISE 111 ALFALFA RD SMITHVILLE PA 11111

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
02/20/2001	S00-00003	0044599					

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	6.3				
[2]Phosphorus (P)	40	ppm			
[2]Potassium (K)	330	ppm			
[2]Magnesium (Mg)	50	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: 3000 lb/A for a target pH of 7.0.
Calcium Carbonate equivalent

Magnesium (Mg): 20 lb/A

Limestone containing .7% Mg (1.1 % MgO) will satisfy the magnesium requirement

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Established Alfalfa	6 T/A	0	50	0	*See ST2 for other crop recommendations*

Apply fertilizer after first cutting or, for large recommendations, split after first cutting and in the fall.
Apply 2 lbs boron per acre with the fertilizer.
Very high K can lead to imbalances in forages which can cause serious health problems in animals. (See Back)

Year	Crop	Expected Yield	Nitrogen	Phosphate	Potash	
2	Corn for Grain	100 Bu/A	100	20	0	*See ST2 for other crop recommendations*

A N credit for the previous Established Alfalfa crop should be subtracted from the base N recommendation listed above. Credits based on precent stand of the legume crop are as follows: less than 25 % stand -40 lb/A, 25-50 % stand - 60lb/A, greater than 50 % stand - 80lb/A
Use a starter fertilizer. (See Back)
Very high K may lead to crop production or feed quality problems for the current crop or other crops in the rotation. (See Back)

Year	Crop	Expected Yield	Nitrogen	Phosphate	Potash	
3	Corn for Silage	33 T/A	240	80	0	*See ST2 for other crop recommendations*

Use a starter fertilizer. (See Back)
Very high K can lead to imbalances in forages which can cause serious health problems in animals. (See back)

ADDITIONAL RESULTS:						Optional Tests:		
[2]Calcium (Ca) (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Soluble salts mmhos/cm
2660	2.5	17.0	5.0	2.4	78.1			

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 Extractant, [3]SMP Buffer pH, [4]Summation of Cations

Matching Livestock and Forage

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 (Figure 3). 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 re-breed 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 re-breed on time. A cow must re-breed 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.

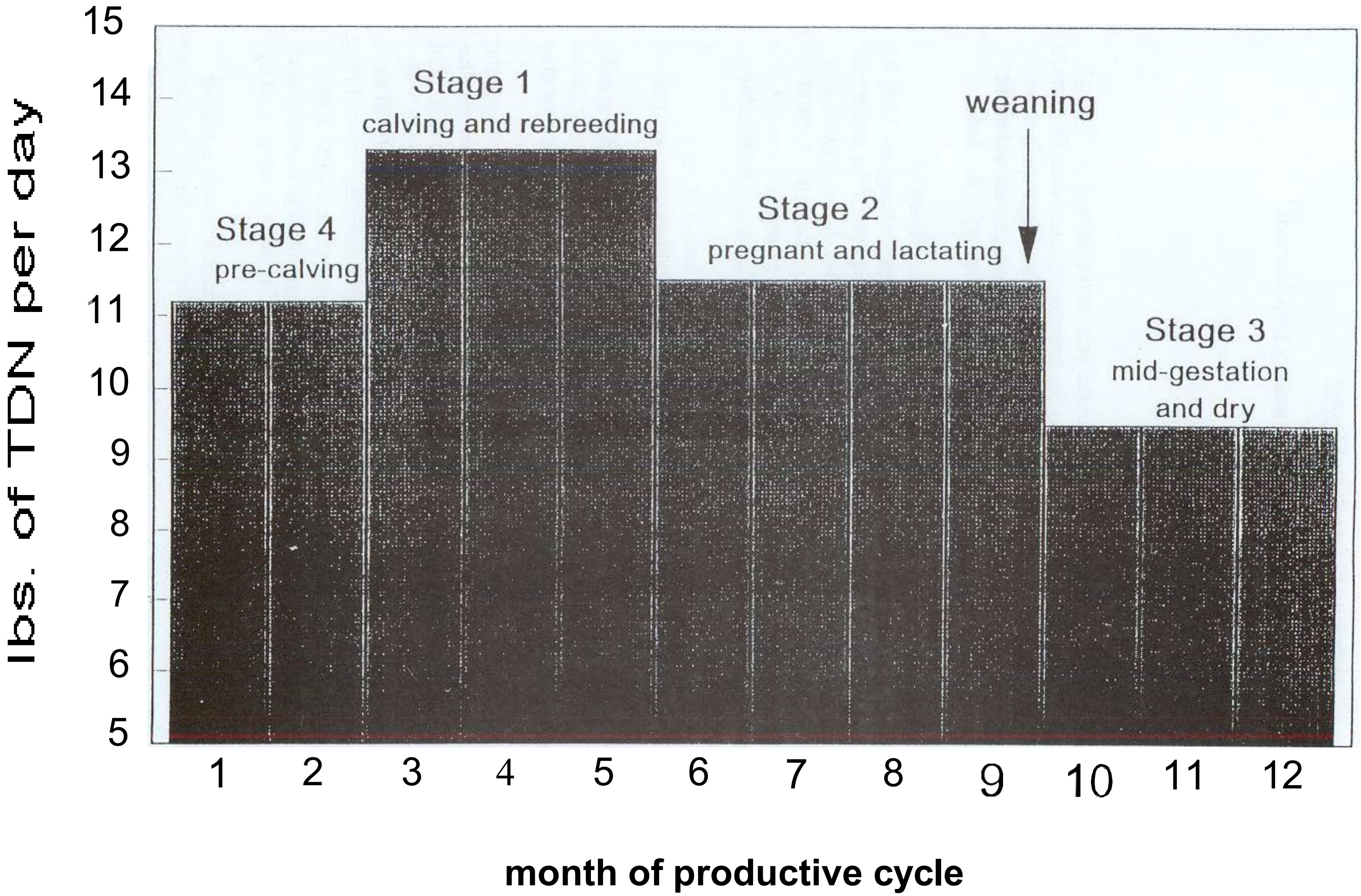
In **Stage Two** the cow is pregnant and lactating. This stage usually lasts 115 days. Nutritional needs will be dropping slightly during this period. The cow is in the early stages of pregnancy while still nursing her calf. She should be gaining some weight now.

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 nutritionally during the year. Seventy to 80 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 re-breeding 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 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 during calving and rebreeding. This stage usually occurs in spring and fall in Pennsylvania. Herds that have not 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.

The above mentioned stages of production are for beef cattle. Sheep and horses follow similar stages of nutritional requirements. The main difference is the that cattle have a 280 day gestation period, sheep have a 145 day gestation period, and horses have a 340 day gestation period. Dairy cattle follow similar stages, but unless the dairy herd is seasonal, each cow in the herd is in a different stage of production because they are calving year-round. Dairy cows need high quality feed during lactation to maintain good milk production.



Source: 1984 NRC requirements for beef cattle

Figure 3. Seasonal total digestible nutrient (TDN) requirement for a spring-calving 1 ,100 lb. beef cow with average milk production

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.

Spring time is the period when forage is abundant and the weather is favorable *for* calf survival and rapid growth. Most pastures in Pennsylvania 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 re-breeding. The growth and quality of a cool-season grass is also high at this time (Figure 2). 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 Pennsylvania. 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 Pennsylvania 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 fall. The quality of this fall growth is ,very good. Cows calving in September will have adequate nutrition on properly managed fall pastures. Re-breeding will take place after the cows have been flushed with high quality fall pasture. Warm-season pastures (warm-season grass, annual lespedeza, alfalfa) can improve a fall calving program by increasing the nutrition level of the cows during STAGE 4, which occurs during July and August *for* a fall calving herd. This improves milk production, calf vigor, and re-breeding success. Warm-season pastures also work well if fall born calves are kept till 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 fall.

Winter calving is not recommended in Pennsylvania. 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. Stock piling forages particularly tall fescue, grazing crop residues, and planting winter annual forages can drastically reduce a producers winter-feed cost when compared to hay and/or supplements. Research has shown that with proper management and utilization the quality of stockpiled tall fescu*e* and winter annual forages can meet the needs of most beef/sheep animals including lactating cows/ewes.

NOTE: Transparencies of Figures 2 and 3 can be overlain to illustrate how to match livestock nutritional needs with seasonal growth of cool-season grasses.

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 For Different Classes of Cattle

Animal	Daily Forage DMI **Requirement (% of BW)**
Dry beef cow	2%
Lactating beef cow (avg. milk prod.)	2.5%
Lactating beef cow (Superior milk prod.)	3.0%
Bull (during breeding season)	2.5%
Bull (not during breeding season)	2.0%
Growing steers and heifers	3.0%
Ewes-lactating	3.5%
Ewes-maintenance	2.0%
Horses	2.0%
Dry Dairy Cow	1.9%
Dairy Heifer	2.3%
Dairy Cow	2.5%

Example: The following example illustrates how to calculate forage DMI requirements. Calculate the daily forage dry matter needs of this herd during the spring grazing period:

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

Solution: 30 lactating cows X 1100 lbs. = 33,000 lbs.
1 breeding bull X 2000 lbs. = 2,000 lbs.
10 heifers X 750 lbs. = 7,500 lbs.

The cows are lactating so their requirement is 2.5 % of their body weight 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
2,000 X 0.025 = 50
7 500 X 0.03 = 225
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 STATE 3.

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

30 dry cows (1100 lbs. avg. wt)	= 33,000 lbs.
1 bull (2,000 lbs.)	= 2,000 lbs.
10 heifers (750 lb. avg. wt.)	= 7,500 lbs.

3,000 X .02 = 660 lbs. per day for cows
2,000 X .02 = 40 lbs. per day for bull
7,500 X .03 = 225 lbs. per day for heifers
925 lbs. dry matter needed per day for this herd.

4. Is forage availability 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 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 re-breed. 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 B W 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 the 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 the 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 example 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 actual amount of forage DM needed for this herd for the spring grazing period for continuous and management-intensive grazing systems.

Solution: The daily dry matter intake 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 dry matter availability needs to be almost three times the amount the herd will actually eat per day.

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

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

$$\frac{10{,}000 \text{ lbs. DMI}}{0.65} = 169{,}230 \text{ lbs. of forage DM needed for that season}$$

It becomes quite clear that by using good grazing management a producer can harvest almost twice as much 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.

Calculating Paddock Size for Management Intensive Grazing (MIG)

Proper allocation of pasture is probably the biggest uncertainty when using MIG. The size of the pasture depends on the following: 1) the size, number, and type of livestock, 2) the amount of available forage, pasture, and utilization, and 3) the length of the grazing period. The following equation can be used to estimate paddock size.

$$\text{Acres} = \frac{\text{Days on Pasture X Animal Numbers X Animal Weight X \%DMI Requirement}}{\text{Lbs. of forage per acre inch X inches of available forage X \% utilization}}$$

Dairy cows require high quality forage and are generally rotated at least once per day. Dairy heifers, beef cattle, horses, and sheep are able to produce on lower quality forage, therefore they can remain on a particular pasture for longer periods of time.

Animal numbers and animal weights need to be determined. Percent Daily Forage DMI requirements for different classes of livestock were listed earlier in this section.

Pounds of forage per acre inch is the amount of forage (in lbs.) per acre in 1 inch of standing forage. This depends on the forage type and stand density.

Poor stand density	250 lbs/acre inch
Fair stand density	300 lbs/acre inch
Good stand density	350 lbs/acre inch

These numbers are estimates only. If more accurate numbers are required, use a grazing stick or pasture plate.

Inches of available forage is the height of the forage minus the desired stubble height. The desired stubble height for clover/bluegrass pasture is 2 inches, for cool season tall grasses 3 inches, and for warm season grasses 6 inches.

Percent utilization varies based on grazing occupation periods. The following table is a guide:

Days	**%Utilization**
1	80
2	75
3	75
4	70
5	65
6+	60

The key to MIG is pasture recovery or rest periods. The rest period is the time it takes the forage to regrow from the desired stubble height to the desired grazing height. This is very weather dependent. The following table can be used as a guide:

Season	Weather Conditions	Rest Period (Days)
Spring	Cool, Moist	10 – 14
Spring	Warm, Dry	14 – 20
Summer	Hot, Moist	30 – 35
Summer	Hot, Dry	45
Fall	Cool	14 – 20

The following equation can be used to estimate the number of paddocks:

paddocks = rest period (days) / rotation time (days) + 1

The (+1) is because the livestock need to be grazing somewhere while the other paddocks are resting.

Example: 20 beef cows (lactating – average production) weighing 1,000 lbs on bluegrass/
Clover pasture 6 inches in height with fair density and 3 day rotation planned

What is the paddock size and how many paddocks are needed for a 15 day rest period?

Answer: $$\text{Paddock Size} = \frac{3 \text{ days X } 20 \text{ head X } 1000 \text{ lb X } 2.5\%}{300 \text{ lb/inch X } 4 \text{ inches X } 75\%} = 1.7 \text{ Acres}$$

Paddocks = 15 days/3 days + 1 = 6 paddocks

The number of acres needed can be found by multiplying paddock size by # of paddocks.

Example: 1.7 X 6 = 10.2 total acres

Pasture Improvement

The answers to questions 3, 4, and 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 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

Continue present management: Use this option when the livestock management practices matches 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 percentage utilization for management-intensive grazing may allow the farmer to keep the herd at it's 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 of the farm, but this will be specifically stated for the contest.

Change calving season to a different time of year: Spring or fall calving are recommended for Pennsylvania 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 pasture 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 management-intensive rotational grazing system may improve forage availability if the carrying capacity of the farm is exceeded under continuous grazing management. Management-intensive grazing can also reduce problems with spot-grazing in pastures. This option should be chosen when there is a shortage of forage in cool-season as well as warm-season forages.

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

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 forage, 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. Overseed 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 is 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 5% slope.

Overseed or interseed into a closely grazed sod: This option should be chosen when adding legumes to a grass pasture to improve forage quality. Overseeding 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 this option for fields with adequate stands of desired forage and which require no additional forage species.

4. What fertilizer option is recommended for this forage?

Fertilizer recommendations should be selected from the soil test that corresponds with the crop chosen in question 2. If you chose to 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 is recommended for this forage in tons per acre?

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.

WILDLIFE HABITAT

Grasslands provide many kinds of wildlife with food and cover. Meadowlark are open grassland nesters. Rabbits, turkeys and pheasants also nest in grasslands, but prefer areas near woods or shrubby cover. Grasslands also help wildlife by controlling soil erosion.

The grassland can provide some of the food needed by the wildlife that live in and around it. The plant varieties needed depend upon the species of animals that use the area. The number of seed-producing plants in a grassland will determine its value to species such as songbirds, because many songbirds require seeds in their diet. Generally, the more kinds of seed-producing plants there are, the more value the field will have for songbirds. Rabbits, on the other hand, consume the vegetative parts of grasses, legumes and many other broad-leaved plants. If these plants are removed by overgrazing or late haying, the number of animals that the area can support will be reduced.

WILDLIFE COVER IN GRASSLANDS

If properly managed, grasslands can also provide cover or protection for nesting and roosting. Soft cover or herbaceous cover is the vegetative growth consisting of grasses and broad leaved plants. Shrubby cover (brush) consists of woody plants, usually with multiple stems that arise from a common base. These plants are generally less than fifteen feet tall at maturity. When they grow close together to form a thicket, these plants provide escape cover for rabbits and other small animals. These areas also provide browse for deer and the dense branches provide nesting areas for many songbirds. Hard cover (tree/shrub) is perennial, woody-stemmed tree species that reach a height of over twenty feet. Escape cover, where a rabbit can escape predators such as foxes, coyotes and hawks, however, consists of dense brush piles that are often found adjacent to the grassland. The hardcover and escape cover should be protected from grazing.

THREE TYPES OF GRASSLANDS:

1. **Cool-season grasslands** or pastures are dominated by those grasses that grow best during the cool spring and fall of the year. These grasses begin their growth early in the spring when the soil temperature reaches forty degrees (F). Their growth slows during the warmest part of summer when the soil temperature nears eighty degrees and resumes again as the soil cools in the fall. Cool-season grasses have been popular with farmers because they are easy to establish and respond to heavy fertilization. Most of these grasses continue to be productive, but tall fescue has been found to cause some health problems in livestock when it's infected with an endophyte fungus. Some examples of these grasses are fescue, Kentucky bluegrass, bromegrass, timothy and orchard grass.

Cool-season grasses are usually grazed to within two to four inches height. Grazing below this height will result in lower production, increased soil erosion and less wildlife use. These grasses are normally at their peak quality and ready for cutting for hay during the peak nesting period for many ground nesting birds.

2. **Warm-season grasslands** or pastures are dominated by those grasses that grow best when the weather is hot and the soil temperature high, such as south and west facing unshaded sites. These grasses begin growing when the soil is around sixty degrees (F) and continue to grow during the warmest months of the year until the soil temperature reaches nearly ninety degrees (F). Although warm-season grasses have a shorter growing season, they make more efficient use of water and soil nutrients--nitrogen, phosphorus and potassium-- than do other grasses. However, studies have shown that yields, crude protein, estimated net energy, digestibility, and relative feeding values were increased in big bluestem/lndiangrass hay when the grasses were fertilized with nitrogen. The major increases occurred at rates of fifty or one hundred pounds of nitrogen per acre, with fifty pounds per acre giving the greatest return on the dollar invested. (Note: This applies only to new plantings of warm-season grasses and not to remnant native prairies). Some examples of these grasses that are used in grazing systems are big bluestem, Indiangrass, side-oats gramma, little bluestem and switchgrass.

Warm-season native grasses should not be grazed closer than eight inches in height. Since warm-season grasses begin their growth later in the year, they are not ready to be grazed until mid- summer, when most of the ground-nesting wildlife have hatched or produced their brood'). Warm-season grasses should not be fertilized or limed unless they are in excellent condition, since the fertilizer may be used by undesirable weedy plants.

The "structure" or the way the grass grows is important to wildlife. The tall, stiff, upright stems and elevated leaves of most warm-season grasses can effectively reduce both wind speed and wind chill as they effect warm-blooded animals. The plants can soften the impact of rain drops and modify both humidity and transpiration extremes when compared to the cool-season grasses. These traits can provide a more favorable reproduction condition for ground nesting birds and mammals. Studies show that compared to a com field, the ground-level temperature of a native warm-season grass field will be twenty-one degrees (F) cooler and the humidity will be twenty-nine percent higher during mid June. Both environmental conditions are ideal for the production of young birds, whose hatching peak will be around June 15.

Native, warm-season grasses generally allow free movement of animals along travel lanes beneath their protective cover. Rodents and smaller birds are able to climb into the clump to escape drowning rains.

The above ground structure of warm-season grasses allow for the presence of both plant and animal diversity. The growth of various broadleaf plants and the presence of many kinds of insects and spiders, make ideal growing conditions for young songbirds that are just leaving their nests in search of food.

Prescribed burning is a recommended management tool for use with warm-season grasses. Prescribed bums should be completed during the spring of the year. Earlier burns (February to mid March) will encourage the growth of more broad leaves and forbs, while later bums in late March to mid April will encourage the production of the grasses. Late winter bums will help stimulate forbs. As with haying dates, it is important to vary the timing to maintain the diversity and overall health of the warm-season grasses. CAUTION: Use fire with great care. Experienced and certified personnel assist in the planning of prescribed burns.

FACTORS THAT AFFECT THE VALUE OF GRASSLANDS FOR WILDLIFE:

Different species of wildlife are attracted to grasslands for different reasons. Some birds may seek nesting sites, while others may use them mainly for roosting or a place to spend the night. Four factors usually determine the amount of wildlife use that any certain grassland will receive. These factors are the (1) kind or type of grassland, (2) make-up of the: grassland, (3) use of the grassland and the (4) size of the grassland or pasture unit.

1. KIND OR TYPE OF GRASSLAND: Each species of grass has its own growth characteristics. Some grasses have low growing leaves and can grow in dense stands that produce a sod. An example of this type of grass is fescue. Sod-forming grasses have a very high stem density at ground level. This fact makes them less attractive to ground nesting birds, since the young are usually not able to move through the grass sod. Most of the warm-season grasses and a few cool- season grasses form "clumps" as they mature. These bunch grasses form a more attractive habitat, since small animals are able to move between the clumps. In addition, broad leaf plants and legumes are able to grow between the clumps to provide some food and cover.

2. MAKE-UP OF THE GRASSLAND: Grasses are the main plant component of a grassland, but some broad leaf plants and legumes make them more productive for both wildlife and livestock. The broad leaf plants that produce seed are very important to those animals that depend upon seed for their existence. Flowering plants are also important to butterflies and other insects that must be present to help pollinate the flowers to insure the production of seed.

3. USE OF THE GRASSLAND: When and how the grass is harvested, is probably the most critical of all the factors that affect the value of a grassland for both wildlife and livestock. Grasslands are usually either cut for hay or livestock is allowed to graze them for a period of time to harvest the grass.

When the grassland is cut for hay, the effect is almost immediate. Both the food and cover are removed, causing wildlife to either move to adjacent areas or be exposed to predators. In order to help reduce this negative impact, it is recommended that the outer thirty feet of the hay field be left standing or be cut at some later date.

Grazing on the other hand, removes the vegetation over a longer period of time. This rate of removal will be determined mainly by two factors: 1) how many head of livestock are: on the grazing unit (stocking rate) and (2) how long they are allowed to graze (grazing period).

Grazing can be continuous or rotational. Continuous grazing allows livestock in one grazing unit to graze selectively for a long period of time. Often, continuous grazing results in the near elimination of certain choice plants (decreaser plants) and allows the introduction and spread of plants that are not as palatable (increaser plants) to livestock. **Continuous grazing reduces forage production and eliminates wildlife cover and food**. Cattle trampling, also destroys wildlife nests. Years of continuous overgrazing can change a grassland to a brushy area with undesirable plants. Grasses that are continuously grazed will produce less forage each year.

Rotational grazing may be as simple as switching livestock between two grazing units or pastures. "Management Intensive Grazing", on the other hand, can result in a higher production for the grazing herd in terms of "pounds of day gain". In addition, the herd size or stocking density can be drastically increased "pounds of gain per day". This system requires more "management" (management-intensive) on the part of the operator, since smaller grazing units (paddocks) are involved. It is important to note that the proper term is "management-intensive", since it is management and not necessarily grazing that is intensified.

When grasses are "rested" or the grazing unit is left idle between grazing periods, the vigor of the choice plants increases, giving them a chance to grow and multiply. This gradually increases the number of high-quality plants per acre. The result of having more vigorous grasses in the grazing system, will be increased livestock production, improved wildlife food and cover and a reduction in soil erosion which conserves both water and soil nutrients.

4. SIZE OF THE GRASSLAND: Generally speaking, the larger the grassland, the less value it has for cottontail rabbit and other wildlife. Wildlife species tend to utilize the "edge" of the grassland where it joins woodlands, old fields and crop lands. Rabbits require brushy, escape cover to survive the pressure of predators such as hawks, owls, coyotes, fox and bobcats. Grassland management practices are usually directed toward the maximum production of grasses and forbs that discourage the growth of shrubby thickets that rabbits use for cover. Periodic burning of warm-season grasses to increase production, will also remove brushy cover and any brush piles, unless these are specifically protected from fire. Although rabbits and other wildlife can utilize fully a grassland of twenty acres, they tend to not use the interior of grassland units of eighty acres and larger. Large grasslands are more often utilized by meadowlark and similar "open land" wildlife species.

WILDLIFE HABITAT: COTTONTAIL RABBIT & SONGBIRDS

Pennsylvania has some five million acres of grassland. These acres have the potential to produce hay, pasture, and wildlife habitat if properly managed. In addition to livestock forage, grasslands are important to many wildlife species. The meadowlark are open grassland nesters. Species such as rabbit, turkey and pheasant prefer to nest in grass when it is near a wooded or brushy area. The management of grasslands to produce both cattle forage and wildlife food and cover is a compatible use of the land. Since livestock are usually confined to the pasture by fences, the forage needs of these animals must be supplied within this area. Wildlife are not confined by fences and may seek out food and cover as required. A grassland (pasture or hayfield) can become a valuable part of the habitat range, however.

Rabbits are able to move back and forth through different habitat types found on a farm. They rarely stay in the same type for long periods of time, but require that these habitat components be located close together for safety of movement.

Rotational grazing will provide succulent forage for cattle, while allowing some areas to grow undisturbed. While resting, these undisturbed units will serve as wildlife habitat. Vegetation height during the nesting season and through the winter months are critical elements of a grassland management plan.

Pastures and hay fields that are isolated from other habitat components (shrubs and trees) are of little value to wildlife. Woody cover for protection, idle fields for nesting, and weed seed and crop residues for food are all important habitat components that must be located close to the grassland.

Grazing practices that will improve forage production and value will also benefit wildlife. Legume introduction, proper haying and grazing heights as well as proper haying and grazing dates will improve production as well as wildlife habitat. Wildlife prefer clumpy grasses that provide cover from above, but allow easy movement through the grassy vegetation. The warm-season grasses meet these requirements.

Warm-season grasses (big bluestem, Indian grass, switch grass), usually do not grow densely enough to restrict wildlife movement. After nest initiation, 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, generally over 2.5 animals/ac. If stock density is higher than this, as it often is in rotation grazing, 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 the plant to have been able to rebuild root reserves for over wintering and initiating spring growth. This residual is excellent winter roosting cover and for nesting the next spring. Haying of warm-season grasses, unlike cool-season grasses and alfalfa, usually occurs after the peak of the June hatch, sparing the nest and incubating hen.

COTTONTAIL RABBIT -BASIC POINTS CONCERNING MANAGEMENT

Rabbits need well-distributed escape cover (brushpiles), an ample year-round food supply, and a safe place for nesting and development of young. Although rabbits drink during hot, dry spells, they can also obtain what water they need from the succulent plants they eat.

FOOD MANAGEMENT: Rabbits eat plant foods. Bluegrass is nearly a year-round food, although not heavily used during the summer. Sprouting wheat and grain from com and milo are important during fall and winter. Cheat, an annual grass, is an important food during early spring. Good summer foods are white clover, Korean lespedeza and crabgrass. These foods must be of high quality and next to good clover for rabbits (see Green Browse Plot, Chapter ten).

IMPORTANT RABBIT FOOD PLANTS INCLUDE: Crop residues, Asters, Bluegrass, Chess, Cinquefoil, Clovers, Crabgrass, Dandelion, Fall panic grass, Fescue, Fleabanes, Horse nettle, Knotweed, Korean lespedeza, Nodding foxtail, Plantains, Poison ivy, Ragweeds, :Sedges, Smartweeds, Strawberry, Sumacs, Tall thistle, Tick trefoils, Timothy.

COVER MANAGEMENT: Dense, well-distributed protective cover is the most critical element in good rabbit habitat. Brush piles located in the right place bring the quickest response of all the management tools. Rabbits often take over a brush pile the night after construction. Some trees such as locusts will remain alive for several years when "lopped over'" or "hinged". If the top is allowed to remain attached to the stump, the twigs and limbs will provide both food and cover. Place brush piles close to other permanent cover, such as briars, fencerows,
or woods (see Brush pile construction, Chapter ten).

Fencing woodlots, gullies, and pond areas to exclude cattle improves existing cover and allows grass and shrubs to thrive. By protecting fencerows from grazing and by topping some of the larger trees, the resulting growth will be low and dense. Odd or non-agricultural areas allowed to grow sprouts, briars, and brush will provide excellent nesting sites for wildlife. Don't burn brush piles left from clearing. Push them to the edges of the field for cover.

SUMMARY: A rabbit management plan should include as many of the following items as i practical: 1) Dense brush piles--cattle-proof cover, 2) Small grains--oats, wheat, rye, barley, 3) Row crops--com, milo, soybeans, 4) Green browse--clovers, bluegrass, 5)Native warm-season grasses, 6) Weeds--crabgrass, foxtail, ragweed, 7) Fenced woodlots--ungrazed areas.

WILDLIFE MANAGEMENT PRACTICES

Competency/Objective: Appraise a fenced plot of grassland or pasture for its ability to meet the basic needs of wildlife.

Study Questions:

1. Why consider the needs of wildlife in the management of grasslands?
2. What is the plant composition of this grassland?
   What are the dominant grasses?
   What legumes are present?
   What composition is best for rabbit that might use the area?
3. What site conditions are best for warm-season grasses?
4. What other types of wildlife utilize grasslands?
5. How can forage composition affect wildlife use? What percent of the ground is shaded by legumes? How much is ideal for rabbits?
6. How does the kind and availability of cover affect wildlife?
7. How does the size of the grassland affect wildlife use?
8. How does forage harvesting intensity affect wildlife use? What is the grazing pressure within this pasture unit --Heavy, Moderate or Light?
9. Define the term "management-intensive grazing system".
10. Warm-season grasses should not be grazed to a height lower than how many inches?
11. Under a grazing system, can there be a "border" within the fenced area? Remember, a BORDER refers to a minimum of a five (5 ft.) foot wide herbaceous, grass, woody, etc., strips of vegetation between habitat types. If livestock graze from fence row to fence row, can there be a BORDER?
12. Inspect the winter or ESCAPE cover within the fenced area of the pasture. Can you find an area where a rabbit being chased by a predator can escape: being caught?
13. Consider the shrubs and weedy plants that are from six to eighteen inches tall within adjacent areas to the pasture. These "knee-high" plants must be thick enough to allow a rabbit to move undetected by hawks and owls. What percent of this cover is ideal for rabbits?
14. What is the distance to the nearest crop field? Why is this important to rabbits and other wildlife?
15. What percent of this pasture is within 250 feet of dense woody cover or ungrazed woodland? Why is this important to rabbits and other wildlife?

References:

1. "Cottontail Rabbits", Wildlife Notes – 175-4, Pennsylvania Game Commission, Harrisburg, PA.
2. "Owls", Wildlife Notes – 175-8, Pennsylvania Game Commission, Harrisburg, PA.
3. "Raptors", Wildlife Notes – 175-10, Pennsylvania Game Commission, Harrisburg, PA.
4. "Ring-Necked Pheasants", Wildlife Notes – 175-19, Pennsylvania Game Commission, Harrisburg, PA.

SOIL EVALUATION

The soil evaluation portion of this Grassland Evaluation Contest was designed to teach the students how to use the Web Soil Survey reports. All of the soil's information needed to complete the Soils Scorecard is given in the detailed soil survey report available from the web soil survey at **https://websoilsurvey.nrcs.usda.gov/app/**

Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

The following is an example of how to use the Soil Survey report to complete the soil evaluation section of the Grassland Evaluation Contest.

More information on how to use the WSS can be found in appendix A.

EXAMPLE PROBLEM: Soils Scorecard

The following is an example problem. The soil series description was taken from Web Soil Survey.

Huntingdon County, Pennsylvania

CaC—Calvin channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: l5z2
Elevation: 300 to 1,600 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Calvin and similar soils: 80 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calvin

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Red, residuum weathered from shale and siltstone

Typical profile

H1 - 0 to 8 inches: channery silt loam
H2 - 8 to 26 inches: very channery silt loam
H3 - 26 to 40 inches: extremely channery silt loam
H4 - 40 to 44 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F147XY008PA - Shallow Mixed Sedimentary Upland
Hydric soil rating: No

FORAGE ADAPTATION BY SOIL DRAINAGE CLASS

	Very Poorly Drained	Poorly Drained	Some-what Poorly Drained	Mod. Well Drained	Well Drained	Some-what 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 Canary Grass	X	X	X	X	X	X	

Student I.D. NO. : ____________ Student Name: Example Score: ____________ Points: 100

Soil Evaluation

(5 points each)

C 1. Surface Texture

A. Sand
B. Sandy Loam
C. Loam or Silt Loam
D. Clay loam or silty clay loam
E. Clay or silty clay

B 2. Fragment content of the surface layer (The A Horizons)

A. 0< 15% (no coarse fragment modifier)
B. 15-< 35% channery or gravelly
C. 35 - 60% very chanery or gravelly
D. > 60% extremely channery or extermely gravelly

B 3. Slope (between 50' stakes in field)

A. 0-3% nearly level
B. 3-8% gently sloping
C. 8-15% mod. Sloping
D. 15-25% strongly sloping
E. 25-35% steep
F. >35% very steep

(if slope ranges do not match, use the average slope)

B 4. Depth of soil (or zone) limiting rooting depth

A. 40-60+ inch deep or very deep
B. 20 -< 40 inches
C.10 -< 20 inches shallow
D. 0 -< 10 inches very shallow

E 5. Drainage Class

A. Very poorly drained
B. Poorly drained
C. Somewhat poorly drained
D. Moderately well drained
E. Well Drained
F. Somewhat excessively drained
G. Excessively drained

C 6. Depth of surface layer (the A horizon)

A. < 3 inches
B. 3 -< 7 inches
C. 7 - 10 inches
D. > 10+ inches

E 7. Permeability of most limiting layer or to 60 inches

Inches / Hour	Class
A. <0.06	very slow
B. 0.06 -< 0.2	slow
C. 0.20 -< 0.6	moderately slow
D. 0.60 -< 2.0	moderately
E. 2.00 -< 6.0	moderately rapid
F. 6.00 -< 20.0	rapid
G. > 20.0	very rapid

B 8. Available water capacity to most limiting layer (fragipan or bedrock)

A. 0 -< 3 very slow
B. 3 -< 6 low
C. 6 -< 9 moderate
D. 9 - < 12 high
E. 12+ very high

C 9. Land capability class

A. Class I
B. Class II
C. Class III
D. Class IV
E. Class V
F. Class VI
G. Class VII
H. Class VIII

C 10. Major factors, if any, that keep area out of Class I

A. S = stoniness, shallowness, droughtiness
B. W = wetness, and/or flooding
C. E = erosion
D. None

Forage Adaptation

(5 points each)

(Check one space per answer)

Forage	Adapted	Not Adapted
1. Tall Fescue	X	
2. Indiangrass	X	
3. Timothy	X	
4. Red Clover	X	
5. Bromegrass	X	
6. Big Bluestem	X	
7. White or Ladino Clover	X	
8. Orchardgrass	X	
9. Little Bluestem	X	
10. Alfalfa	X	

PLANT IDENTIFICATION

Pennsylvania has over five million acres of grasslands, which are agriculturally, economically and environmentally important to all its residents. These lands are used for either grazing or haying (or both) and the production of these acres will be dictated by how the plants respond under these conditions. Furthermore; every acre has some potential for improved! wildlife habitat. The quality of wildlife habitat depends on two factors: 1) composition of the grassland and 2) how the grassland is managed.

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 re-growth 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 (see Suggested References).

PLANT IDENTIFICATION LIST

STUDENT I.D. NO.______ 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)		(Ann)	(Bie/Per)	
		GRASSES & GRASS-LIKE			***FORBS***
__________	__________	Barnyard Grass	__________	__________	Bull Nettle (horse)
__________	__________	Bermuda Grass	__________	__________	Chicory, Common
__________	__________	Bluegrass (Kentucky)	__________	__________	Cinquefoil
__________	__________	Bluestem, big	__________	__________	Cocklebur, Common
__________	__________	Bluestem, little	__________	__________	Croton
__________	__________	Bromegrass, smooth	__________	__________	Daisy Fleabane
__________	__________	Broomsedge (Broomstraw)	__________	__________	Dandelion
__________	__________	Crabgrass	__________	__________	Goldenrod (prairie)
__________	__________	Downy Chess (downy brome, cheat grass)	__________	__________	Ironweed
__________	__________	Fescue (tall)	__________	__________	Lambsquarter
__________	__________	Foxtail (giant, green & yellow)	__________	__________	Milkweed, Common
__________	__________	Indiangrass	__________	__________	Nightshade, Black
__________	__________	Johnsongrass	__________	__________	Pigweed
__________	__________	Orchardgrass	__________	__________	Plantain
__________	__________	Purple Top	__________	__________	Queen Anne's Lace (Wild Carrot)
__________	__________	Reed Canary Grass	__________	__________	Ragweed (Common, Giant, Lanceleaf)
__________	__________	Ryegrass, annual	__________	__________	Smartweed
__________	__________	Ryegrass, perennial	__________	__________	Thistle (Tall, Musk, Bull)
__________	__________	Quackgrass	__________	__________	Three-seeded Mercury
__________	__________	Sedges	__________	__________	Velvetleaf
__________	__________	Switchgrass	__________	__________	Yarrow, Common
__________	__________	Timothy			***WOODY PLANTS***
		LEGUMES	__________	__________	Blackberry
__________	__________	Alfalfa	__________	__________	Black Cherry
__________	__________	Birdsfoot Trefoil	__________	__________	Coralberry (buckbrush)
__________	__________	Black Medic	__________	__________	Dewberry
__________	__________	Clover, White	__________	__________	Elm
__________	__________	Clover, Red	__________	__________	Grape
__________	__________	Clover, Sweet	__________	__________	Hawthorn
__________	__________	Clover (little hop)	__________	__________	Hickory
__________	__________	Clover, Kura	__________	__________	Locust (black or honey)
__________	__________	Illinois Bundleflower	__________	__________	Oak, black or white
__________	__________	Lespedeza (Korean, Common)	__________	__________	Osage Orange (hedge apple, hedge)
__________	__________	Lespedeza, Sericea	__________	__________	Persimmon
__________	__________	Lespedeza, Slender	__________	__________	Poison Ivy
__________	__________	Partridge Pea	__________	__________	Red Cedar (juniper)
__________	__________	Tick Trefoil (beggar tick)	__________	__________	Rose (multiflora or wild)
__________	__________	Crown Vetch	__________	__________	Sassafras
__________	__________	Milk Vetch	__________	__________	Sumac
__________	__________	Hairy Vetch	__________	__________	Wild Plum

<u>PLANT IDENTIFICATION LIST</u>

STUDENT I.D. NO.______ STUDENT NAME ____________________________________ SCORE ___________ **POINTS: 100**

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

(Ann)	(Bie/Per)	
		<u>GRASSES & GRASS-LIKE</u>
X		Barnyard Grass
	X	Bermuda Grass
	X	Bluegrass (Kentucky)
	X	Bluestem, big
	X	Bluestem, little
	X	Bromegrass, smooth
	X	Broomsedge (Broomstraw)
X		Crabgrass
X		Downy Chess (downy brome, cheat grass)
	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	Ryegrass, perennial
	X	Quackgrass
X	X	Sedges
	X	Switchgrass
	X	Timothy
		LEGUMES
	X	Alfalfa
	X	Birdsfoot Trefoil
	X	Black Medic
	X	Clover, White
	X	Clover, Red
	X	Clover, Sweet
X		Clover (little hop)
	X	Clover, Kura
	X	Illinois Bundleflower
X		Lespedeza (Korean, Common)
	X	Lespedeza, Sericea
	X	Lespedeza, Slender
X	X	Partridge Pea
	X	Tick Trefoil (beggar tick)
	X	Crown Vetch
	X	Milk Vetch
X		Hairy Vetch

(Ann)	(Bie/Per)	
		FORBS
	X	Bull Nettle (horse)
	X	Chicory, Common
	X	Cinquefoil
X		Cocklebur, Common
X		Croton
X		Daisy Fleabane
	X	Dandelion
	X	Goldenrod (prairie)
	X	Ironweed
X		Lambsquarter
	X	Milkweed, Common
X		Nightshade, Black
X		Pigweed
X	X	Plantain
	X	Queen Anne's Lace (Wild Carrot)
X		Ragweed (Common, Giant, Lanceleaf)
X	X	Smartweed
	X	Thistle (Tall, Musk, Bull)
X		Three-seeded Mercury
X		Velvetleaf
	X	Yarrow, Common
		WOODY PLANTS
	X	Blackberry
	X	Black Cherry
	X	Coralberry (buckbrush)
	X	Dewberry
	X	Elm
	X	Grape
	X	Hawthorn
	X	Hickory
	X	Locust (black or honey)
	X	Oak, black or white
	X	Osage Orange (hedge apple, hedge)
	X	Persimmon
	X	Poison Ivy
	X	Red Cedar (juniper)
	X	Rose (multiflora or wild)
	X	Sassafras
	X	Sumac
	X	Wild Plum

GLOSSARY OF SELECTED TERMS FOR CONSERVATION AND RESOURCE USE.

A

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 or livestock production; e.g.. farmstead, drainage and irrigation ditches, ponds, cropland, and grazing land on farms.

agricultural use: The use of any tract of land for the production of animal or vegetable life; uses include, but are not limited to, the pasturing, grazing, and watering of livestock and the cropping, cultivation, and harvesting of plants.

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 measured from desired grazing height and available water: The portion of water in a soil that can be absorbed by plant roots.

B

backgrounding: Practice of raising a beef animal from weaning until placement in the feedlot. Backgrounding may either take place on pasture or 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 (wildlife management): A strip of herbaceous or woody vegetation. usually low-growing and more than five feet wide, established along the edges of fields, woodlands, or streams.

brush pile: A small stack of cut branches, shrubs, and other woody vegetation which serves as protective cover for small wild animals.

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.

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

C

canopy: The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.

carrying capacity: The maximum population that a given ecosystem can support indefinitely. clutch: the total number of bird or reptile eggs laid in one nesting.

community: An aggregation of organisms within a specified area.

conservation: 1) The wise use of natural resources. (The criteria for "wise use" can be the original concept of conservation by Pinchot: "greatest good for 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: The grazing by domestic livestock of a specific area throughout the grazing season; not necessarily synonymous with year-long grazing.

controlled burning: The deliberate use of fire so as to restrict the burning to a predetermined area and intensity.

controlled grazing: Grazing management designed to improve utilization of forage by allocating pasture in subunits with grazing periods typically less than five days.

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

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)

D

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 a area for a specified period of time during the growing season to promote plant reproduction, establishment of new plants, or restoration of vigor by 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 individuals represent any other species. Areas with low diversity are characterized by few species; often 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.

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

E

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.

edge effect: The influence of two or more adjoining communities upon the composition and density of populations within the bordering area.

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.

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

F

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 within 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: Total amount of dry matter produced per unit of area on an annual basis.

forb: A 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.

G

game animal: An animal sought for its fur, feathers, flesh, or trophy value and which is considered to possess those sporting qualities that enhance the hunt or angling experience.

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.

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 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.

green browse: Herbaceous plants, which are planted specifically for grazing (or browsing) by wildlife, especially geese.

H

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.

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.

I

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 plant: Any plant 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 grazing: Synonymous with "intensive grazing management".

interspersion (wildlife): The distribution of heterogeneous 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 relationships. 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.

K

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.

L

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, program, and activities related to existing and potential uses of land within a given area; such describes the recommended locationand intensity of development for both public and private land uses such as residential, commercial, industrial, recreational, and agricultural.

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.

M

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.

N

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

0

odd area (wildlife): A small area of land. such as a fence corner or an irregularly shaped area that may be used to produce wildlife habitat.

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

organism: Any living thing.

overgrazing: An intensity of grazing so heavy that it impairs future forage production and causes degradation (deterioration) through damage to plants, soil, or both.

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.

P

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 layer in soil that is strongly compacted, indurated or very high in clay content.

parent material (soils): The unconsolidated more or less chemically weathered mineral or organic matter from which the solum of soils has developed by pedogenic processes. The C horizon mayor may not consist of materials similar to those from which the A and 8 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 a period as possible so that they will provide palatable feed of high nutritive value

perennial plant: A plant that normally lives three or more years.

permanent pasture: Grazing land occupied by perennial pasture plants or by self-seeding plants, 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 manufacture by plants of carbohydrates and oxygen from carbon dioxide and water in the presence of chlorophyll using sunlight as an energy source.

plant succession: The vegetation development whereby an area becomes successively occupied by different plant communities, each of higher ecological order, progressing toward the "climax" vegetation.

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.

population: A group of organisms of the same kind

ppm (parts per million): The ratio of the number 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.

prescribed burning: The deliberate use of fire under conditions by which the intensity of heat and the rate of spread are controlled.

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

R

reproductive potential: The maximum rate of increase in numbers 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: Then 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.

root zone: The part of the soil that is penetrated, or can be 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 the precipitation on a drainage area that is discharged from the area in stream channels.

S

seasonal grazing: Grazing restricted to a specific season.

selective grazing: The tendency for grazing animals to graze certain plants in preference to others.

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: 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 populations 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 time.

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 live weight assigned to a grazing unit for an extended period of time, usually expressed on a per acre basis.

succession: The progressive development of vegetation toward its highest ecological expression, the climax; the replacement of one plant community by another.

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.

T

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 of organic matter.

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

U

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

V

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

vegetation type: A plant community with distinguishable characteristics.

W

warm-season plant: A plant that completes most of its growth during the warm portion of the year-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. (More precisely given point on such a system.)

wildlife: Undomesticated animals. considered collectively.

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

woodland: Any land used primarily for growing trees and shrubs.

SUGGESTED REFERENCES

The following guidesheets are available from the Penn State Cooperative Extension Office in your county.

Title	Agronomy Fact No.
Ryegrass	19
Birdsfoot trefoil	20
Red Clover	21
White Clover	22
Summer-Annual Grasses	23
Timothy	24
Orchardgrass	25
Reed Canarygrass	26
Smooth Bromegrass	27
Tall Fescue	28
Warm-Season Grasses	29
Forage Quality in Perspective	30
Soil Fertility for Forages:	
Pre-establish	31A
Establishment	31B
Maintenance	31C
Pasture & Hay for Horses	32
Use of Brassica Crops to Extend the Grazing Season	33
Prairie Grass	39
Strategies for Extending the Grazing Season	41
Grazing Alfalfa in Pennsylvania	42
Four Steps to Rotational Grazing	43
Forage Chicory	45
Successful Forage Crop Establishment	49

ADDITIONAL REFERENCE BOOKS

100 Native Forage Grasses in **11** Southern States, Ag. Handbook, No. 389 U.S.D.A., Soil Conservation Service, Washington D.C.

Dalrymple, R.L., Forage and Crop Management Specialist, Samuel Roberts }Noble Foundation, Old World Bluestem: Planting, Stand Establishment and Early Stand Production Management Available through: Agricultural Division, Samuel Roberts Noble Foundation,. Inc., Ardmore, OK 73402

Dietz, Harland E., Range Conservationist (retired), S.C.S., Grass; The Stockman's Crop – How to Harvest More of It Available through; Sunshine Unlimited, Inc., P.O. Box 471, Lindborg, KS 67466

Key to the Perennial Grasses, Midwest Region East of The Great Plains (abstracted from Hitchcock's Manual of the Grasses) SCS -TP-151 U.S.D.A., S.C.S., Washington D.C.

Martin, Zim & Nelson; American Wildlife & Plants: A Guide to Wildlife Food Habits, Dover Publications, Inc., New York

Pasture and Range Plants, Fort Hays State University, Hays, Kansas. Available through: Fort Hays State University, Hays, Kansas

Range Grasses of Kansas, #C567 Cooperative Extension Service Manhattan, Kansas

Range Plant Handbook, U.S. Dept. of Agriculture, Forest Service, Dover Publications, New York, 811 p., No. 0-486-25783-

Stubbendieck, Hatch & Hirsch, North American Range Plants, 1989, Third Edition, 465 p, University of Nebraska Press

Symonds, George W.D., The Shrub Identification Book William Morrow & Co., New York

Waller, Steven S. Lowell E. Moser, Patrick E. Reese, Understanding Grass Growth: The key to profitable livestock production. Available through: Trabon Printing Co., Inc. 430 Bannister Road, Kansas City, MO 64131

Weeds of the North Central States, N.C. Regional Pub. No. 36, Circular 718 of the University if Illinois, Ag. Experiment Station, Urbana, IL

Wildlife Management For Missouri Landowners, Pitts, David E., Mo. Dept. of Conservation, Box 180, Jefferson City, Mo. 65101. (Booklet free upon request)

GRASSLAND EVALUATION CONTEST

GRASSLAND CONDITION

STUDENT I.D. NO._______ 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 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. 4.5 - 5.0
- B. 5.1 - 5.5
- C. 5-6 - 6.0
- D. 6.1 - 6.5
- E. 6.6 - 7.0
- F. 7.1 - 7.5

6. The pounds per acre of each plant nutrient recommended for this pasture?

________ lbs. N ________lbs P_2O_5 ________lbs K_2O

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

________ Tons limestone

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 the given 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:

_____ 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

SEE 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 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 a killed sod
- C. Overseed or interseed in a closely grazed sod
- D. No additional forages needed - use existing pasture

4. The pounds per acre of each plant nutrient recommended for this forage?

________ lbs. N ________lbs P_2O_5 ________lbs K_2O

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

________ Tons limestone

Revised: June, 2001

Soil Interpretation **Grassland Evaluation Contest**

Student I.D. NO. : ____________ **Student Name:** ____________ **Score:** ____________ **Points:** **100**

Soil Evaluation

(5 points each)

______ 1. Surface Texture

A. Sand D. Clay loam or silty clay loam

B. Sandy Loam E. Clay or silty clay

C. Loam or Silt Loam

______ 2. Fragment content of the surface layer (The A Horizons)

A. 0< 15% (no coarse fragment modifier)

B. 15-< 35% channery or gravelly

C. 35 - 60% very chanery or gravelly

D. > 60% extremely channery or extermely gravelly

______ 3. Slope (between 50' stakes in field)

A. 0-3% nearly level D. 15-25% strongly sloping

B. 3-8% gently sloping E. 25-35% steep

C. 8-15% mod. Sloping F. >35% very steep

(if slope ranges do not match, use the average slope)

______ 4. Depth of soil (or zone) limiting rooting depth

A. 40-60+ inch deep or very deep C.10 -< 20 inches shallow

B. 20 -< 40 inches D. 0 -< 10 inches very shallow

______ 5. Drainage Class

A. Very poorly drained E. Well Drained

B. Poorly drained F. Somewhat excessively drained

C. Somewhat poorly drained G. Excessively drained

D. Moderately well drained

______ 6. Depth of surface layer (the A horizon)

A. < 3 inches C. 7 - 10 inches

B. 3 -< 7 inches D. > 10+ inches

______ 7. Permeability of most limiting layer or to 60 inches

Inches / Hour	Class
A. <0.06	very slow
B. 0.06 -< 0.2	slow
C. 0.20 -< 0.6	moderately slow
D. 0.60 -< 2.0	moderately
E. 2.00 -< 6.0	moderately rapid
F. 6.00 -< 20.0	rapid
G. > 20.0	very rapid

______ 8. Available water capacity to most limiting layer (fragipan or bedrock)

A. 0 -< 3 very slow

B. 3 -< 6 low

C. 6 -< 9 moderate

D. 9 - < 12 high

E. 12+ very high

______ 9. Land capability class

A. Class I E. Class V

B. Class II F. Class VI

C. Class III G. Class VII

D. Class IV H. Class VIII

______ 10. Major factors, if any, that keep area out of Class I

A. S = stoniness, shallowness, droughtiness

B. W = wetness, and/or flooding

C. E = erosion

D. None

Forage Adaptation

(5 points each)

(Check one space per answer)

Forage	Adapted	Not Adapted
1. Tall Fescue		
2. Indiangrass		
3. Timothy		
4. Red Clover		
5. Bromegrass		
6. Big Bluestem		
7. White or Ladino Clover		
8. Orchardgrass		
9. Little Bluestem		
10. Alfalfa		

Revised August 2023

Score Card: Grassland Evaluation Contest

Student I.D. NO. _______ Student Name: ________________________ Score: _____________ Points: 100

APPRAISAL OF EXISTING CONDITIONS

(5 points each)

__1. Distance from center of field to the nearest protected odd area or ungrazed old field:
A. Over 500 feet C. Less than 249 feet
B. 250-499 feet

__2. Percent of field covered by winter or escape cover (include brushy draws, brush piles, fallen logs, etc.):
A. 0 to less than 1% C. Field is less than 10 acres in size
B. 1% to 10%

__3. Percent canopy coverage of shrubs and herbaceous vegetation 6 to 18 inches tall. (Refer to 50 X 50 foot enclosure)
A. Less thank 25% coverage C. More than 76% coverage
B. 26 to 75% coverage

__4. Grazing pressure (refer to 50 X 50 foot enclosure):
A. Heavy B. Moderate C. Light

__5. Percent of ground covered or shaded by both native and introduced legumes. (Refer to 50 X 50 foot enclosure)
A. 5% or less of the ground covered by legumes
B. 6 to 50% of the ground covered by legumes
C. 51% or more of the ground covered by legumes

__6. Plant composition (Refer to 50 X 50 foot enclosure)
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)

__7. Distance from center of field to edge of nearest crop field:
A. Over 500 feet to cropfield
B. 250 to 499 feet to chiseled or disced cropfield
C. Less than 249 feet to chiseled or disced cropfield
D. 250 to 500 feet to crop field with no fall tillage or with crop of winter wheat
E. Less than 249 feet to cropfield with no fall tillage or with crop of winter wheat

__8. Field size – the % of field within 250 feet of dense woody cover or ungrazed woodland.
A. Less than 25% C. 51 to 75%
B. 26 to 50% D. 76 to 100%

This completes the evaluation portion – be sure each question is answered. Now, complete the following questions by placing the proper letter in the blank preceding the question.

MULTIPLE CHOICE QUESTIONS

(3 points each)

__ 1. The soil temperature at which warm-season grasses grow most efficiently is between (degrees F):
A. 40 & 78 degrees B. 55 & 90 degrees C. 88 & 100 degrees

__2. Warm-season grasses are best adapted to the following site conditions:
A. North facing & shaded B. East facing & sunny C. South facing and Sunny

__3. Several species of wildlife use grasslands for:
A. Foraging B. Nesting C. Dusting D. Roosting E. All of these

__ 4. The maximum density or the upper limit of survival possible of a species that particular range or area is capable of supporting during a definite period of the year is referred to as:
A. Diversity B. Habitat C. Carrying Capacity D. Limit

__5. The place where the animal lives; where all its requirement for life are fulfilled is referred to as its:
A. Diversity B. Habitat C. Carrying Capacity D. Limit

__6. Warm-season grasses should be cut for hay during this period:
A. May to mid June B. June 1 to 15 C. Late June to early July D. August only

__7. The transition zone or area between two or more diverse communities or habitat types is referred to as an ecotone, but is more commonly called:
A. Border B. Zone C. Edge D. Niche E. None of these

__8. Grazing livestock can do extensive damage to woodlands, therefore, all livestock should be excluded from woodlands:
A. Statement is true B. Statement is false

COMPLETE QUESTIONS ON REVERSE SIDE

__9. An organism or species that is not native to the region in which it is found.

A. Exotic B. Endemic C. Invader D. Endangered

__10. Cool-season grasses do most of their growing during the spring and fall.

A. Statement is true B. Statement is false

__11. The following is not a grass:

A. Yellow nutgrass B. Foxtail C. Downy chess D. Purple top

__12. Native warm-season grasses considered to be in poor condition should not be fertilized, limed, or have seed added.

A. Statement is true B. Statement is false

__13. Which plant type(s) will live for at least two (2) years?

A. Perennial only B. Perennial & annual
C. Biennial & perennial D. Biennial & annual

__14. A low growing, woody plant with several permanent stems arising from a common base.

A. Shrub B. Grass C. Forb D. Herb

__15. A cross section of an area used as a sample for recording, mapping, or studying vegetation.

A. Sward B. Spot sample C. Transect D. Indigenous sample

__16. In dealing with grass seed, the letters P.L.S. stand for:

A. Pounds live seed B. Productive live seed C. Pure live seed

__17. The parameter or item in an animal's habitat that outweighs all others in limiting productivity is called a:

A. Succession B. Dominant factor C. Limiting factor D. Niche

__18. Rabbits prefer grasses that grow in clumps, rather than those that form dense sods.:

A. Statement is true B. Statement is false

__19. The stages through which an ecosystem passes from less complex to more complex, i.e., from bare ground to an oak-hickory forest in Pennsylvania, is called:

A. Succession B. Dominant factor C. Limiting factor D. Niche

__20. Research has shown that rabbits rarely move further that this distance between different habitat components

A. One mile B. one-half mile C. one-eight mile D. Two miles

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 suing 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 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: **Pounds Dry Matter**

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		65,000
Minus hay harvested		-76,923			
TOTAL	**120**	**383,577**	**199,400**	**175,200**	**65,000**

Hay available to feed: 50,000 lbs.

GRASSLAND CONDITION

STUDENT I.D. NO. "Sample" STUDENT NAME "Exercise Scenario" SCORE:____ Points: 100

APPRAISAL OF EXISTING CONDITIONS
(5 points each)

_____1. What is the pasture type?
A. 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 species?
A. Vegetative D. Mature
B. Boot or bud E. Dormant
C. Heading or bloom

_____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. 4.5 -5.0 D. 6.1 -6.5
B. 5.1 -5.5 E. 6.6 -7.0
C.5-6-6.0 F. 7.l-7.5

_____6. The pounds per acre of each plant nutrient recommended for this pasture?

________ lbs. N ________lbs P_2O_5 ________lbs

_____7. What limestone rate is recommended for this forage in tons per acre?

________ Tons limestone

SEE REVERSE SIDE

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

__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 – 100 days (4 Pts.)
_____ Adequate
__X__ Not Adequate

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. The pounds per acre of each plant nutrient recommended for this forage?

____________ lbs. N **_________lbs P_2O_5** **_________lbs K_2O**

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

________ Tons limestone

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 only in spring 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 "E – 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	Calf Number:	Calf Avg. Weight:
30 cows @ 1100 lbs. = 33000 lbs.	30 X .90 = 27	450 + .5 (150) = 525
1 bull @ 2000 lbs. = 2000 lbs.		
27 calves @ 525 lbs. = 14175 lbs. (Spring		

Forage Consumption:

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

Fall	lbs. dry matter
Cows (lact)	= 33,000 x .03 = 990
Bull (brdg)	= 2,000 x .025 = 50
	1040

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

Winter	lbs. dry matter
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		lbs. dry matter
1125/.35 =	3214 x 100 =	321,400
1125/.65 =	1731 x 100 =	173,100

Summer		lbs. dry matter
700/.35 =	2000 x 100 =	200,000
700/.65 =	1077 x 100 =	107,700

Fall		lbs. dry matter
1040/.35 =	2971 x 100 =	297,100
1040/.65 =	1600 x 100 =	160,000

Winter		lbs. dry matter
1030/.35 =	2943 x 100 =	191,295
1030/.65 =	1585 x 100 =	103,025

Practical Exercise and Scenario --Wildlife Habitat Score Card

Objective: Evaluate a specific grassland for its value to cottontail rabbits and other wildlife.

A grassland manager who is interested in both livestock and wildlife production :must be able to recognize the habitat requirements of both. It is important to remember that wild animals are not confined by fences. Cover such as brush piles and shrubby thickets may be located in areas next to the grassland while additional food and cover can be provided within the grassland unit.

The following form lists factors considered when evaluating a specific tract of grassland, pasture or hay field. The objective of this exercise is to identify limiting factors that can be overcome to improve habitat for rabbits. Each field or pasture unit should be rated on the conditions within the fenced area only. An aerial photograph of a specific grassland unit would be helpful in identifying habitat components in adjacent fields. A brief explanation follows each appraisal category.

APPRAISAL OF EXISTING CONDITIONS

1.DISTANCE FROM CENTER OF FIELD TO THE NEAREST PROTECTED ODD AREA OR UNGRAZED OLD FIELD:

A. Over 500 feet
B. 250 -499 feet
C. Less than 249 feet

Odd areas and old fields that are relatively close to the center of the field are important to rabbits and songbirds. They provide excellent nesting and roosting sites, and often these area;; support seed producing plants that songbirds need. The peak bird hatching period is around .June 15, so these protected areas and old fields provide undisturbed nesting sites. Nest trampling by livestock is eliminated. When appraising an area for wildlife, consider whether there are any areas that are not productive, that could be protected and managed. When managing for rabbits, try to find areas that can be protected that are less than 250 feet from the center of the fields being appraised. Obviously, this is easier to do when the pasture is relatively small. Often, these odd areas or old fields will require some management (prescribed burning, light disking), or they will go through successional plant stages and may not be as beneficial to some wildlife species.

2. PERCENT OF FIELD COVERED BY WINTER OR ESCAPE COVER (Include brushy draws, brush piles, fallen logs, etc.):

A. No cover present. The field is devoid of any usable thickets, blackberry patches, or dense, brushy cover.
B. 1-10 % of field has winter/escape cover. This would be considered to be a "marginal" amount of cover and valuable to wildlife if livestock have not trampled and grazed through it. Look into the thicket to see if predators could pass through easily, or would a rabbit be able to escape.
C. Field is less than 10 acres in size. Choose this category only if the fence rows consist of very dense escape cover as described in B. If not, select ".A" above, since this field would be of little value to wildlife for escape cover.

Winter and escape cover is very important to the survival of rabbits :and other wildlife.
These areas include dense brushy cover, brush piles, fallen logs, etc. In order to be: of value within this category, the cover must be dense enough that a man would have great difficulty walking through it, and a coyote or fox would not be able to catch a rabbit that ran into it.

3.PERCENT CANOPY COVERAGE OF SHRUBS AND HERBACEOUS VEGETATION 6 TO 18 INCHES TALL:

A. Less than 25% coverage
B. 26 to 75% coverage
C. More than 76% coverage

Consider the shrubs and weedy plants that are from six inches to eighteen inches tall or around knee high. This category is different from number two, since canopy cover provides protection from birds of prey (aerial cover), while allowing easy movement through the vegetation. The ideal range of canopy cover for rabbits would be between 26% to 75%. An area with more than 75% coverage may be difficult for rabbits and turkeys to walk through. When canopy coverage is less than 25% or more than 75%, the area is considered to be less attractive to upland wildlife, especially rabbits & songbirds.

4.GRAZING PRESSURE:

A. Heavy Less than three inches of forage height. Heavy stocking rate of livestock.
B. Moderate Three to eight inches of forage height.
C. Light Stocking rate is light, resulting in tall forage remaining on the unit.

Grazing pressure: The height of the grass or forage is a critical habitat factor for wildlife such as rabbits. During the growing season, songbirds may utilize the field edges for nesting, but will be forced to move to other sites if plants are grazed to less than 8 inches. Bird nests can be destroyed by livestock trampling when pastures are heavily grazed.

If the cool-season grass pasture has a history of heavy grazing, all grazing should be deferred during the growing season to improve the vigor of the grass stand. Deferment will also tend to improve the species composition of the stand. After a period of rest, the stand can be grazed, but it should be monitored closely to avoid the removal of too much of the forage:.
Moderate grazing will apply mainly to a cool-season pasture and is defined as leaving 3 -8 inches during the winter. Light grazing may result in tall forage being on the unit during most of the year. This could result in too much forage being present for the benefit of rabbit and sonbirds. Very dense grassy vegetation, especially fescue, can become a negative factor by restricting the movement of young wildlife from the nest. Grazing to remove only 50% of the year's growth is usually applied to native, Warm- season grasses. These grasses should not be grazed to a height of less than eight inches.. Livestock should never be allowed to "winter" on any native warm-season grass land.

5.PERCENT OF GROUND COVERED OR SHADED BY LEGUMES:

A. 5% or less
B. 6 to 50%
C. 51 % or more

Legumes are an important plant group for both wildlife and livestock. Rabbits find grazing units with less than 5% or more than 50% of the ground covered by legumes to be less attractive than when the ground cover ranges between 6 and 49%.
Wildlife use both the seeds and the vegetative parts of these plants. Legumes are also important in the removal of nitrogen from the air and fixing it in the soil for use by other plants, including grasses and forbs. Insects that make up a high percentage of songbird diet can also be found on these plants. Legumes include alfalfa, clovers, Korean lespedeza, partridge pea, hop clover and many others.

6.PLANT COMPOSITION:

A. Tall fescue (90% or more)
B. Mixed cool-season grass (10% legumes or less)
C. Cool-season grass dominant (10 to 25% legumes or other grasses)
D. Cool-season grass & legumes (26 to 60% legumes)
E. Legumes dominant (75% legumes or more)
F. Warm-season grasses dominant (other species 25% or less)

Tall Fescue (90 % or more) The stem density at ground level would be too thick: to be attractive to wildlife. When fescue approaches just 40% of the pasture composition, most wildlife species will not use this habitat situation for nesting, feeding, roosting, etc.

Mixed Cool-season grasses (10% legumes or less) A common pasture throughout Pennsylvania, but legumes do not make up enough of the plant population to be attractive to many wildlife species. The grasses could be a mixture of orchard grass, tall fescue, bluegrass, timothy, etc.

Cool-season grass dominant (10 to 25% legumes or other grasses) The dominant grass could be tall fescue, orchard grass, timothy, etc. with legumes making up only a small percentage of the composition.

Cool-season grass & legumes (26 to 60% legumes) Usually considered to be a cool- season/legume pasture. The grass component could be tall fescue, orchard grass, timothy or bluegrass, etc. with legumes such as clovers, lespedezas, hop clovers, etc. This is probably the most widely used forage system in Pennsylvania. The grass-legume mixture is also attractive to insects that make up nearly all of the diet of young birds. Young birds and rabbits can use the pasture only if the stem density at ground level is not too dense to allow ease of movement.

Legumes dominant (75% legumes or more) An excellent pasture where young turkey poults and many songbirds can easily move through the vegetation in search of insects and succulent plants for food. Deer, rabbits, groundhogs and other smaller rodents, also find this pasture attractive as a source of food and cover.

Warm-season grasses dominant (other plant species 25% or less) The native warm- season grasses provide an excellent condition for most wildlife species, when managed with other necessary habitat components. A mixture of broadleaf plants and warn-season grasses provide the diversity required by ground nesting birds. These grasses provide a cool, moist summer environment and a warm, dry winter environment. They are compatible with species such as legumes, sedges, and seed-producing forbs which are used as browse by wildlife species. Insects, which are important in the diet of many wildlife species, thrive in the bunch-grass and feed mainly on the legumes and forbs. It should be noted that not all introduced warm-season grasses provide an attractive habitat component after they have become established. Most often, these grasses form a dense sod that eliminates or restricts wildlife movement.

7.DISTANCE FROM CENTER OF FIELD TO EDGE OF NEAREST CROP FIELD.

A. Over 500 feet to crop field
B. 250 to 499 feet to chiseled or disked crop field
C. Less than 249 feet to chiseled or disked crop field
D. 250 to 500 feet to crop field with no fall tillage or with crop of winter wheat.
E. Less than 249 feet to crop field with no fall tillage or with crop of winter wheat

Studies show that crop fields are an important part of the habitat of some birds.
When the minimum amounts of pesticides are used, the soil disturbance produces ragweed and other seed-producing plants that are important bird foods. Crop residue (waste grain) left on the soil surface after harvest can be an important source of emergency food during the winter.

Studies also show that a high number of ground nesting bird nests will be located from 50 to 150 feet of bare ground. If bare ground, such as a crop field, is located next to a properly managed grassland, the chances of a pair of songbirds successfully hatching and rearing their brood of young chicks are greatly increased.

Estimate the distance from the center of the grazing unit or paddock to the edge of the nearest crop field. A crop field that is located more than 500 feet from the center of the grassland unit is considered to be of no value to upland wildlife, such as rabbit. A crop field with no fall tillage and located less than 250 feet from the center of the pasture is considered to be of the highest value.

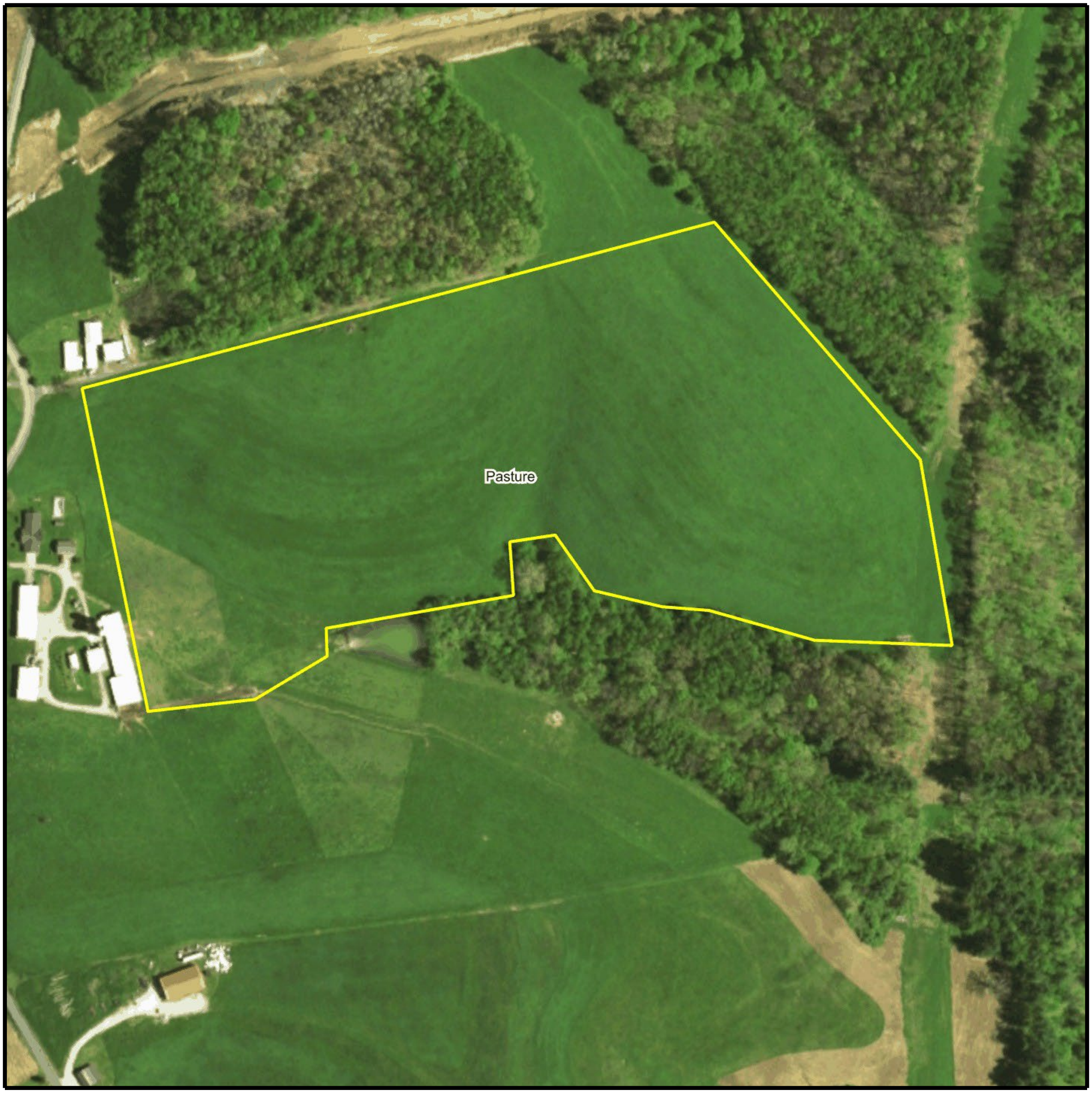
8.THE PERCENT OF GRAZING UNIT THAT IS WITHIN 250 FEET OF DENSE WOODY COVER OR UNGRAZED WOODLAND.

A. Less than 25%.
B. 26 to 50%.
C. 51 to 75%.
D. 76 to 100%.

Generally speaking, the larger the field, the less value it has for wildlife. Most wildlife use the field edge where other habitat types, especially escape cover, are available. Cottontail rabbits require habitat components that are closer together, within 250 feet. The interior of a very large grassland grazing unit, therefore, would be utilized very little by rabbits and many other wildlife species.

Estimate or measure the percent of the field that is located within 250 feet of concealment cover, ungrazed woodland or dense woody cover. Generally, this represents that portion of a pasture or hay field that will be utilized by rabbits during average seasonal conditions.

Wildlife Example



* 326.0 feet per inch

0 163 326 489 652 feet

Score Card: Grassland Evaluation Contest

Student I.D. NO. _______ Student Name: __________________ Score: _____________ Points: 100

APPRAISAL OF EXISTING CONDITIONS

(5 points each)

__1. Distance from center of field to the nearest protected odd area or ungrazed old field:
A. Over 500 feet C. Less than 249 feet
B. 250-499 feet

__2. Percent of field covered by winter or escape cover (include brushy draws, brush piles, fallen logs, etc.):
A. 0 to less than 1% C. Field is less than 10 acres in size
B. 1% to 10%

__3. Percent canopy coverage of shrubs and herbaceous vegetation 6 to 18 inches tall. (Refer to 50 X 50 foot enclosure)
A. Less than 25% coverage C. More than 76% coverage
B. 26 to 75% coverage

__4. Grazing pressure (refer to 50 X 50 foot enclosure):
A. Heavy B. Moderate C. Light

__5. Percent of ground covered or shaded by both native and introduced legumes. (Refer to 50 X 50 foot enclosure)
A. 5% or less of the ground covered by legumes
B. 6 to 50% of the ground covered by legumes
C. 51% or more of the ground covered by legumes

__6. Plant composition (Refer to 50 X 50 foot enclosure)
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)

__7. Distance from center of field to edge of nearest crop field:
A. Over 500 feet to cropfield
B. 250 to 499 feet to chiseled or disced cropfield
C. Less than 249 feet to chiseled or disced cropfield
D. 250 to 500 feet to crop field with no fall tillage or with crop of winter wheat
E. Less than 249 feet to cropfield with no fall tillage or with crop of winter wheat

8. Field size – the % of field within 250 feet of dense woody cover or ungrazed woodland.
A. Less than 25% C. 51 to 75%
B. 26 to 50% D. 76 to 100%

This completes the evaluation portion – be sure each question is answered. Now, complete the following questions by placing the proper letter in the blank preceding the question.

MULTIPLE CHOICE QUESTIONS

(3 points each)

__ 1. The soil temperature at which warm-season grasses grow most efficiently is between (degrees F):
A. 40 & 78 degrees B. 55 & 90 degrees C. 88 & 100 degrees

__2. Warm-season grasses are best adapted to the following site conditions:
A.North facing & shaded B. East facing & sunny C. South facing and Sunny

__3. Several species of wildlife use grasslands for:
A. Foraging B. Nesting C. Dusting D. Roosting E. All of these

__ 4. The maximum density or the upper limit of survival possible of a species that particular range or area is capable of supporting during a definite period of the year is referred to as:
A. Diversity B. Habitat C. Carrying Capacity D. Limit

__5. The place where the animal lives; where all its requirement for life are fulfilled is referred to as its:
A. Diversity B. Habitat C. Carrying Capacity D. Limit

__6. Warm-season grasses should be cut for hay during this period:
A. May to mid June B. June 1 to 15 C. Late June to early July D. August only

__7. The transition zone or area between two or more diverse communities or habitat types is referred to as an ecotone, but is more commonly called:
A. Border B. Zone C. Edge D. Niche E. None of these

__8. Grazing livestock can do extensive damage to woodlands, therefore, all livestock should be excluded from woodlands:
A. Statement is true B. Statement is false

COMPLETE QUESTIONS ON REVERSE SIDE

__9. An organism or species that is not native to the region in which it is found.

A. Exotic B. Endemic C. Invader D. Endangered

__10. Cool-season grasses do most of their growing during the spring and fall.

A. Statement is true B. Statement is false

__11. The following is not a grass:

A. Yellow nutgrass B. Foxtail C. Downy chess D. Purple top

__12. Native warm-season grasses considered to be in poor condition should not be fertilized, limed, or have seed added.

A. Statement is true B. Statement is false

__13. Which plant type(s) will live for at least two (2) years?

A. Perennial only B. Perennial & annual
C. Biennial & perennial D. Biennial & annual

__14. A low growing, woody plant with several permanent stems arising from a common base.
A. Shrub B. Grass C. Forb D. Herb

__15. A cross section of an area used as a sample for recording, mapping, or studying vegetation.
A. Sward B. Spot sample C. Transect D. Indigenous sample

__16. In dealing with grass seed, the letters P.L.S. stand for:

A. Pounds live seed B. Productive live seed C. Pure live seed

__17. The parameter or item in an animal's habitat that outweighs all others in limiting productivity is called a:

A. Succession B. Dominant factor C. Limiting factor D. Niche

__18. Rabbits prefer grasses that grow in clumps, rather than those that form dense sods.:

A. Statement is true B. Statement is false

__19. The stages through which an ecosystem passes from less complex to more complex, i.e., from bare ground to an oak-hickory forest in Pennsylvania, is called:

A. Succession B. Dominant factor C. Limiting factor D. Niche

__20. Research has shown that rabbits rarely move further that this distance between different habitat components

A. One mile B. one-half mile C. one-eight mile D. Two miles

GRASSLAND EVALUATION CONTEST

Wildlife Score Card
Example Exercise

1. B	6. C	3. E	8. A	13.C	18. A
2. B	7. B	4. C	9. A	14. A	19. A
3. B	8. C	5. B	10. A	15. C	20. C
4. B	1. B	6. C	11. A	16. C	
5. A	2. C	7. C	12. A	17. C	