

Pasture Principles for Smaller Acreages

Kenneth Hart, Randall Brooks, and James Church



University of Idaho
Extension

CONTENTS

PASTURE PLANNING	1	PASTURE GRAZING	9
Setting goals for the pasture: An example	2	Carrying capacity and stocking rate	9
PASTURE IMPROVEMENT AND RENOVATION	2	Take half, leave half	9
Seeding	2	Determining stocking rate: An example	9
Choosing forage species	3	Grazing timing	10
PASTURE SOIL	4	Grazing systems	10
Soil pH	4	Designing a grazing system	11
Organic matter	4	FOR MORE INFORMATION	12
Compaction and erosion	5		
Soil fertility	5		
Soil testing and fertilization recommendations ..	5		
Types of fertilizers	6		
Timing fertilizer applications	6		
How to take a soil sample	6		
Nutrient cycling on grazed pastures	7		
PASTURE WEED MANAGEMENT	7		
Noxious weeds	7		
Weed prevention	7		
Scouting for weeds	7		
Weed control	8		
Equipment for small acreages	8		

AUTHORS

Kenneth Hart, Extension Educator, Lewis County

Randall Brooks, Extension Educator, Clearwater County

James Church, Extension Educator, Idaho County



RANCHETTES AND SMALL FARMS ARE CROPPING UP IN RURAL LANDSCAPES ACROSS IDAHO. With this trend has come an increasing demand for information on pasture management. The United States Department of Agriculture (USDA) defines pasture as “land used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources.” The goal of this publication is to help you become a better pasture manager and to address the most common concerns of Idahoans interested in improving their pasture conditions.

PASTURE PLANNING



Begin with a written plan for your pasture. Your plan should contain these elements:

- **A detailed assessment of your resources.** Make a map of your

farm or obtain one from your local Natural Resources Conservation Service (NRCS) office. Inventory your land, soil, water, fences, buildings, livestock, growing crops and forages, and machinery. Use a standard inventory form (figure 1).

A good source of information is the NRCS soil survey for your land. Soil surveys provide basic information on soil identification and properties, land use, vegetation composition, and productivity. Soil surveys are available from your local NRCS or UI Extension office or online at <http://websoilsurvey.nrcs.usda.gov/app/>.

Also list the people involved with your pasture including family members, hired labor, and other resource individuals such as your insurance agent, lender, accountant, etc. Note the management and production skills of these individuals. This is your team.

- **Goals for your pasture and specific steps needed to accomplish the goals.** Include production goals and specific forage production and livestock grazing plans. You may also include wildlife, soil resource protection, or other goals of importance to you. Written goals increase the likelihood of accomplishing those goals. Begin with at

least one long-term goal (2 to 5 years) and one or more short-term goals (1 year). Short-term goals should support your long-term goals. Include specific objectives or action steps for each goal, a timeline to accomplish the objectives, and who will be involved in the effort.

- **Budgets.** A simple monthly cash flow budget will help you plan production and marketing throughout the pasture year. It will also help you focus on labor needs and capital investment plans. The University of Idaho provides cost and return estimates for producing crops and live-

Figure 1. Resource inventory form.

ITEM	QUANTITY (or size)	QUALITY (age, condition)	VALUE	USABLE?/ LIMITATIONS
Buildings & Fences				
Land				
Tillable				
Other				
Water				
Well				
Surface				
Crops/ Forage				
Machinery/ Equip				

stock in various parts of the state and also custom rate guides online at <http://www.ag.uidaho.edu/aers/resources.htm>. These resources can provide a starting point for your budget.

- **Initial grazing plan for your pasture.** Your pasture has a carrying capacity based on how much forage it can produce. It is important to balance pasture production with livestock consumption. You can get an idea of available forage from the previous owner or from your soil survey.

SETTING GOALS FOR THE PASTURE: AN EXAMPLE



LONG-TERM GOAL: Improve forage quality



Timeline: 3 years



Action steps: Improve soil and grass stand



SHORT-TERM GOAL: Soil test pastures and fertilize to correct soil nutrient deficiencies



Timeline: Early spring



Action steps:

- Get soil test information from UI
- Collect soil samples and send to analytical laboratory
- Work with local UI extension educator to interpret results and make fertilization plan
- Contact fertilizer dealer for materials



SHORT-TERM GOAL: Frost seed south pasture



Timeline: Next year, late winter



Action steps:

- Select appropriate species for seeding
- Buy seed from dealer
- Rent broadcast seeder from neighbor
- Seed in late February

PASTURE IMPROVEMENT AND RENOVATION



Pasture managers are really grass farmers. Your livestock harvest the grass plants. A healthy grass stand is a must. The first step toward improving your pasture is to practice proper grazing management. Supplemental fertilization and an active weed control program also may be important for optimal forage production.

Most pastures will respond to renovation efforts. Improved grazing management and improved soil fertility are often the most cost-effective renovation options. Improved grazing practices, especially well-managed rotational grazing, will improve the health of pasture plants. Well-managed grazing helps maintain species diversity in a pasture by minimizing shading of growing grasses and seedlings by undergrazed forages. Over time, plant communities in the pasture should become more diverse. Soil health will also improve.

Seeding

Overseeding can be used to improve the mixture of pasture grasses and legumes. Before seeding desirable species use light tillage, an herbicide application, or heavy grazing to suppress existing vegetation. The point is to suppress vegetation just enough to minimize competition with new seedlings, not to destroy all existing pasture plants.

Soil and climactic conditions will affect your choice of planting date for either overseeding or new pasture establishment. An early fall seeding requires enough soil moisture for pasture plants to establish in time to withstand harsh winter conditions.

Spring seeding may be the best choice when fall conditions are too dry or winters too severe for seedling survival. Spring seeding should wait until soils have warmed enough to encourage rapid germination and early growth, helping the seedlings resist diseases and overcome insect attacks. Waiting will also help seedlings, particularly legume seedlings, to avoid killing frosts. On the other hand, spring

seeding needs to be early enough that seedlings have time to develop an adequate root system to survive hot and dry summer periods. Generally, spring seeding should begin as soon as cultivation and seeding equipment can be in the field without compacting the soil.

When machinery for seeding is unavailable or not suitable for your pasture site, frost seeding and livestock hoof action are good alternatives. First prepare the pasture by grazing or mowing closely at the end of the grazing season. If you have one, use a harrow or cyclone fence drag to rough up the ground surface. Then broadcast seed of desirable pasture species onto the ground or onto the last snow in late winter. The freezing and thawing of the soil produce heaving and ice crystal movement that help improve seed-to-soil contact.

Allowing livestock onto the pasture can supplement this effort, but be careful not to trample the seed too deeply into the ground on wet soils. Animal hoof action can firm the soil, cover seeds for seedling germination and growth, and provide small depressions to store water.

Establishing a new pasture may be necessary for much-depleted pastures or when converting from annual crop production. A new pasture may be established with no tillage (direct seeding), minimum tillage, or conventional tillage. A weed-free, firm seedbed is required.

Choosing forage species

Choose adapted varieties that the animals you plan to graze find palatable and that have characteristics that match your planned timing and intensity of grazing. Available water may limit the selection to drought-tolerant species. Local seed companies or the UI extension educators in your county can help you identify good varieties for your area. Including alfalfa, clover, or other legumes can increase protein levels and provide a source of nitrogen for plants.

Here are characteristics of common pasture grasses and legumes:

- **Meadow brome**—High seedling vigor, excellent palatability, heat and frost tolerant, regrows quickly after grazing.

- **Smooth brome**—Sod-forming, establishes quickly, palatable, shade tolerant, slow to recover after grazing.
- **Tall fescue**—Bunchgrass, adaptable and productive, moderately palatable. Use endophyte-free seed.
- **Orchardgrass**—Bunchgrass, highly palatable, somewhat disease and frost susceptible, for irrigated or higher-rainfall areas.
- **Perennial ryegrass**—Bunchgrass, establishes easily, short-lived, highly palatable, recovers well after grazing, tends to go dormant in summer.
- **Timothy**—Bunchgrass, moderate palatability, establishes quickly, best in wet areas and cool climate, slow to recover after grazing, does not tolerate overgrazing.
- **Intermediate or pubescent wheatgrasses**—Sod-forming, highly palatable, grows in early spring and fall, drought tolerant. Use intermediate for higher-rainfall areas and pubescent for lower-rainfall areas.
- **Tall, crested, or bluebunch wheatgrasses**—These bunchgrasses are long-lived, palatable, with good early spring and fall growth. Choose adapted varieties for your site and rainfall.
- **Altai or Russian wildrye**—Long-lived, robust, variable palatability, withstands saline conditions. Often used for standing winter feed.
- **Legumes**—Alfalfa, clover (alsike, red, and white), sanfoin, sweetclover, cider milkvetch, and birdsfoot trefoil are possible choices for pasture. The choice depends on your management objectives and the legumes' compatibility with grasses.

Legume-grass mixes will have higher yields and protein contents than grass alone and are less likely to cause bloat-ing or grass tetany problems. Having many species in a mixture presents grazing management challenges, however. Consider a mixture with one or two grasses and one or two legumes. Local seed companies have pasture mixes that should work well in your location.

PASTURE SOIL



Healthy soil is the foundation for productive pastures. Pasture plants obtain water and nutrients from pasture soil. Soil characteristics such as structure, permeability, organic matter content, pH, and fertility affect the ability of soil to provide necessary water and nutrients.

Soils are composed of mineral material and organic matter. In between the mineral particles are pores filled with water, air, and soluble nutrients. Organic matter serves as a binder for mineral particles and contributes to good soil structure and to water- and nutrient-holding capacities.

Soil pH

The ideal pH range for pasture soils is between 6.0 and 7.0, but pasture plants can tolerate a wide range of soil pH. Pasture grass yields are usually not reduced until soil pH drops below 5.1. Legumes are more sensitive to soil pH and grow best in the ideal pH range. Soils with a lower pH will not produce maximum legume yields.

Whether to add lime to correct low soil pH is a cost/benefit decision that should take into account the availability and cost of lime and the projected increase in production from the application. To figure possible increases in production, look at production yields on local fields with pH in the "ideal range," ask your neighbors or UI extension educators, or consult data from University of Idaho test plots.

Organic matter

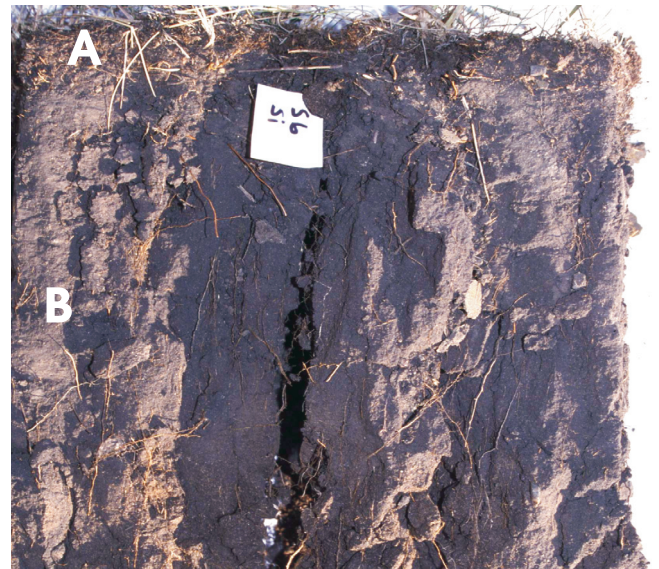
Increased organic matter in soil enhances moisture- and nutrient-holding capacities and improves soil structure. Organic matter in pastures comes from plant and animal residues on the surface and in the soil. While you can spread compost or manure to boost organic matter, plant roots are the primary source of organic matter in pasture soils.

Figure 2. Effects of grazing on root growth and soil structure. Photos courtesy of North Dakota State University Grasslands Research Station.



Soil sample from short-duration rotational grazing system (above).

- A. Roots not bound at surface in root mat.
- B. Large, connected pores result in high water infiltration and root penetration. Deeper roots add to soil organic matter at deeper levels.
- C. Robust, abundant roots deeper than 15 inches.



Soil sample from continuously grazed pasture (above).

- A. 1.25-2 inch, dense root mat.
- B. Weak vertical soil structure is nearly clodlike with few vertical pores. Fragile and twisted roots grow in very dense, hard soil.

Well-managed grazing keeps pasture grasses tillering and productive, with more extensive root systems. Overgrazed pasture plants have pruned root systems (figure 2). A pasture grazed to produce healthy pasture plants will maintain or increase soil organic matter.

Compaction and erosion

Compaction and erosion are soil degradation problems. Compaction usually occurs when equipment operates on wet or moist soils. Pores are squeezed, making it difficult for air and water to penetrate the soil. Compaction can also be caused by livestock, particularly when soil is saturated and grazing is concentrated. Areas such as water supply, feeding, or mineral locations are particularly susceptible to compaction.

Erosion is the process that loosens or dissolves soil or rock materials and carries them away. Erosion is caused by wind and water. Erosion can be severe when the surface of frozen soil thaws. Rainfall and snowmelt have limited ability to permeate frozen soil and instead can wash away the thawed soil surface.

The susceptibility of soils to erosion depends on the amount of rainfall and its intensity, soil particle size, organic matter content, permeability, steepness and length of slope, amount of vegetative cover, type of crop, and management factors. Low-quality pastures have more bare ground and poorer soil quality, making them more susceptible to runoff and erosion.

Pastures often contain water sources such as springs, wells, ponds, or a stream. Keep manures or eroded soil out of these water bodies.

Soil fertility

Pasture plants require adequate levels of light, heat, air, water, and nutrients. When one of these factors is limiting, plant growth can suffer even when all other factors are adequate. It is important to identify the factor(s) limiting

growth or yield in your pasture. When soil moisture conditions are satisfactory, nitrogen and phosphorus levels in the soil are often the factors limiting growth, yield, and forage quality. Potassium, sulfur, boron, and molybdenum can also be deficient in Idaho soils, but applications of these nutrients may or may not generate an economic response.

Nitrogen. Of all the nutrients, plants use nitrogen the most, causing it to be deficient in many grass pasture soils. Plants growing in nitrogen-deficient soils will readily respond to nitrogen fertilizer applications with increased yield and forage quality. When legumes are present, however, too much nitrogen can lead to a reduction in the legume fraction of the pasture. Also, nitrate-nitrogen not taken up by plants has the potential to leach into groundwater.

Phosphorus. Phosphorus may also be deficient in pasture soils. Since phosphorus has limited mobility in the soil, it is best to apply it when establishing a new pasture, mixing it well in the top 5 to 6 inches of soil. On established pastures, phosphorus can be broadcast on the soil surface. Apply enough to supply pasture needs for 2 to 3 years. Adequate phosphorus is especially important for pastures containing legumes.

Soil testing and fertilization recommendations

A soil sample analysis will provide you with information on the levels of available nutrients in your pasture soil. Use your soil test results and University of Idaho fertility guides (see further readings) to determine which nutrients are deficient in your soil and how much fertilizer to add.

Fertility guides, though specific to northern or southern Idaho, are generalized to cover a large geographic area and many soil types. Nutrient requirements for your pasture may differ as a result of specific soil type, pasture plant nutrient requirements, or production potential. An experienced local grass farmer or University of Idaho extension educator could review your fertility plan for its appropriateness for local conditions.

HOW TO TAKE A SOIL SAMPLE

- 1 Collect soil samples from representative areas of the pasture about 2 to 4 weeks before fertilizing or seeding. Avoid areas where animals or manure concentrates.
- 2 Use a sampling tool to collect 15 to 20 randomly selected core samples from the pasture. Sampling tools include core tubes, augers, and shovels. A sampling depth of 0 to 12 inches is ideal.
- 3 Thoroughly mix together all your core samples. From this combined sample, take about 1 pint or 1 pound of soil. Place this combined sample in a clean container, and keep it cool. Soil sample bags are available from local UI Extension offices.
- 4 Label the sample (or multiple samples, if you have more than one pasture) with your name, sample number, sample depth, and field identification. Send the sample to a laboratory for analysis. At the University of Idaho in Moscow, the Analytical Sciences Laboratory does soil testing:

2222 W. Sixth St.
Moscow, ID 83844-2203
Phone: 208-885-7900
Fax: 208-885-8937
Email: asl@uidaho.edu

Refer to UI bulletin 704, *Soil Sampling*, for detailed guidelines. The publication is available online at <http://info.ag.uidaho.edu/resources/PDFs/EXT0704.pdf>.

UI extension educators or agricultural service field personnel who are familiar with crops and soils in your area can help you with nutrient recommendations.

Types of fertilizers

Commercial fertilizer applications are commonly used to address soil nutrient deficiencies. Such fertilizers are widely available and easy to apply. They are labeled with a guaranteed “analysis” of the nutrients they contain. For example, a fertilizer bag labeled 10-10-10-6 contains 10% nitrogen, 10% phosphorus, 10% potassium, and 6% sulfur, by weight. You will need to choose a fertilizer blend and rate that meets your needs.

Organic farmers cannot use most commercial fertilizers on their pastures. Organic production should rely mainly on nitrogen produced by legumes in the pasture. Supplemental nutrients can be applied to the pasture in the form of manure, compost, or other natural nutrient sources.

Manure should be managed as carefully as commercial fertilizers. Manure contains roughly equal concentrations of nitrogen and phosphorus, while plants require about half as much phosphorus as nitrogen. Manure applications that target nitrogen requirements will result in a phosphorus buildup.

Also, manure and other organic materials release nutrients over time. About 30% of the mineralizable nitrogen in manure will be available in the season of application, with the rest becoming available in decreasing fractions through the following several years. It is essential to account for the addition of organic materials from previous years when planning to meet plant nutrient requirements for the current growing season.

Timing fertilizer applications

Match the timing of fertilizer applications to the needs of pasture plants as much as possible. Irrigated and high-rainfall areas will benefit from several yearly fertilizer applications, 5 to 7 weeks apart, to meet plant needs throughout

the growing season. In dryland pastures, two nitrogen applications are recommended, the first as early in the spring as possible and the second in June.

Sulfur should be included in the first spring nitrogen application. Phosphorus and potassium should be applied in the fall.

Correct application timing is intended to: (1) make the nutrients available when pasture plants need them, (2) avoid adding excess nitrogen that the plants cannot use during the growing season, and (3) coincide with conditions that make it feasible to operate application equipment in the field.

Nutrient cycling on grazed pastures

Large quantities of nutrients are removed from the soil when pastures are mechanically harvested. However, when pastures are grazed, 80% to 90% of the soil nutrients used by pasture plants are cycled back to the soil from urine and manure. The following practices are recommended to efficiently utilize nutrient cycling on grazed pastures:

- Keep animals distributed evenly across the pasture for uniform distribution of urine and manure.
- Drag the pasture with a harrow or similar tool before and after grazing to help distribute cycled nutrients more evenly across the pasture.
- Match soil fertility with the intended grazing plan. For example, dairy cows require higher-quality forages than horses on maintenance diets. Soil nutrient levels need to be adequate for the requirements of the pasture plants and the animals grazing them.
- Adjust recommendations from fertility guides for harvested pastures to reflect cycled nutrients of grazed pastures.

PASTURE WEED MANAGEMENT



Noxious weeds

All pasture owners and managers must comply with the Idaho noxious weed law. Noxious weeds are classified in one of three categories:

(1) early detection/rapid response (EDRR), (2) control, and (3) containment. Your responsibility for controlling noxious weeds varies by classification. More information is available on the Idaho State Department of Agriculture website at <http://www.agri.state.id.us>, or contact your county weed superintendent.

Weed prevention

The first step in weed management is prevention. Beware of weed seed spread to your pasture by movement of hay, equipment, livestock, or wind. Use only weed-free seed and hay.

A properly managed, well-established pasture should have few weed problems. As pasture stands become depleted due to overgrazing, mismanagement, or stand maturity/succession, weeds will move in to occupy bare ground. Unless the problem causing pasture decline can be corrected, weeds will need to be controlled.

Scouting for weeds

Before you undertake any control measures, scout for weeds in your pasture. Know your enemy. Careful inspection of the pasture to determine weed species present, their density, and location is time well spent. Pay special attention to the dominant weed species as well as occasional weeds, particularly perennials. Your weed control program should focus on controlling dominant weeds while preventing the occasional weed from spreading.

Weed control

It is important to control weeds that may cause economic losses. These include weeds that are toxic to livestock and perennial weeds that compete with desirable species for moisture and nutrients. All weeds need to be controlled during the establishment phase of a new pasture. Control methods include ones that are cultural, mechanical, biological, and chemical.

Cultural control. Cultural methods consist of proper fertility, soil, and water management. Proper cultural practices will make your pasture plants more competitive with weeds.

Mechanical control. Mowing is the most common mechanical control method used in pastures. Mowing is effective

for controlling weeds in the pasture establishment phase and for controlling certain annual, broadleaf weed populations. Chopping, digging, and hand pulling isolated or newly introduced weeds will help prevent them from spreading.

Biological control. Biological control can help combat certain noxious weed problems in pastures when specific living organisms or their products are present or can be introduced. These organisms, which interfere with weed growth, flowering, or seed production, are commonly insects.

Livestock grazing can also be a biological weed control tool. For example, goats will graze undesirable forbs and brush. This type of prescribed grazing should be monitored closely to prevent overgrazing desirable species.

Chemical control. Chemical control uses herbicides to kill weeds, often without harming desirable species. Proper choice of herbicide, application method, and rates, along with proper application timing, are critical for a successful program. Annual weeds need to be controlled when small and actively growing. Biennials should be controlled in the rosette stage. Stubborn perennials can best be eradicated when sprayed in the bud stage.

Application methods include broadcast spraying, spot spraying, and weed wipers that target weeds that are taller than desirable pasture plants. Regardless of which chemical control you use, always carefully read and follow the label directions. Current weed control recommendations are available from the annually revised *PNW Weed Management Handbook*, available at your local UI Extension Office or online at <http://pnwpest.org/pnw/weeds>.

EQUIPMENT FOR SMALL ACREAGES



Consider these options for operations that require heavy equipment:

- Find a local farmer willing to work with you either as a custom operator or partner. Smaller-acreage farmers often are best because their equipment is better sized to the task. If you are able to find such a person, cultivate the relationship to make it positive for all parties involved. Put all agreements in writing.
- Do the work yourself. Used small-scale equipment is relatively inexpensive. Local machinery dealers or soil conservation districts may rent specialized pasture planting seeders or other equipment.
- Consider going together with neighbors to accomplish tasks. A custom operator may be encouraged to come if you have lined up several jobs. Also consider sharing equipment and expertise between parties to improve efficiency.

PASTURE GRAZING



Carrying capacity and stocking rate

Carrying capacity and stocking rate are concepts that are used to determine the proper balance between livestock grazing and pas-

ture plant production. Stocking rate is the number of grazing animals on your pasture for a given period of time. Animal unit month (AUM) is a concept that standardizes the expression of stocking rate. An animal unit month is the amount of feed a 1,000-pound lactating cow—one animal unit—will consume in 1 month, commonly 780 pounds of forage dry matter. Other grazing animals are expressed as a fraction of an animal unit based on their feed intake relative to the 1,000-pound cow:

- 1 cow = 1.0 animal unit
- 1 bull = 1.4 animal units
- 1 horse = 1.2 animal units
- 1 sheep or goat = 0.2 animal unit
- 1 llama = 0.3 animal unit

Carrying capacity is the stocking rate that maintains or improves your pasture plant, soil, and water resources given your grazing system. Carrying capacity depends on the total amount of forage produced and on the percentage of total production that can be harvested without harm to the pasture. Use soil survey data for your soil type as a rough estimate of forage production. The previous owner or local, experienced pasture managers can help you fine-tune your production estimate. Tools known as a rising plate meter or pasture stick can also be used to make this estimate.

Take half, leave half

A grazing rule of thumb in regards to stocking rate: take half, leave half. In most pastures, harvesting half of the total forage can be sustainable. If you manage the length of the grazing period and your stocking rate so that you remove half of the forage and leave half of the forage, and

then allow a sufficient rest before regrazing, you will not exceed the carrying capacity for your pasture.

DETERMINING STOCKING RATE: AN EXAMPLE

Suppose your estimate of forage production for a 4-acre pasture is 10,000 pounds of dry matter for a 4-month grazing season.

First, determine how much of that production you will allow the animals to graze. Following the take half rule:



10,000 lb dry matter X 50% = 5,000 lb dry matter.

Next, calculate the total AUM available:

5,000 lb dry matter ÷ 780 lb dry matter per AUM = 6.4 AUM available.

Next, calculate the AUM available per month:

6.4 AUM ÷ 4 months = 1.6 AUM per month.



Finally, calculate your carrying capacity for sheep on this pasture:

1.6 AUM per month ÷ 0.2 AUM per sheep = 8 sheep per month.

So, your carrying capacity on this pasture is 8 sheep for a 4-month grazing period.

Practically, it is difficult to place a definitive figure on how many animals should be placed on a particular pasture. If you are managing your pasture correctly, the figure will vary from year to year based on the condition of the forage. Pasture managers should constantly check grass utilization and make adjustments in the stocking rate based on forage production and the amount of use. Too many animals on a pasture for too long can harm the resources resulting in poor livestock performance. Too few animals on a pasture means the resource will be underutilized.

Grazing timing

Most land managers have a target turnout date they shoot for each year. Do not use a specific date such as May 1. Examine the grass and base your decision on the stage of grass growth. Allow at least 6 inches of grass growth before turning livestock in to graze. This will allow young grass plants to produce energy through photosynthesis and store some of that energy in their lower stems and roots.

Remove the livestock from your pasture when half of the forage has been consumed. If the forage grows back, you can graze it again. Leaving half of the forage will promote a healthy, vigorous, and long-lasting grass stand in your pasture.

Grazing systems

The most common grazing systems for smaller acreages are the following: continuous, deferred, rest rotation, and rotation. Combinations and variations of these grazing systems also exist.

Continuous. Livestock producers using this system simply place the animals in one pasture and leave them there for the entire grazing season. This system, although common, can be very detrimental to the pasture. Livestock will heavily graze the most desirable species, allowing less desirable species to gain dominance in the pasture.

A useful modification is **limit grazing**. Livestock are allowed to graze for part of a day and are then returned to a drylot for the rest of the day to conserve the pasture. This is particularly useful with mature horses or other livestock on maintenance diets; they will consume more pasture in continuous grazing than they need.

Another way to limit continuous grazing is to allow livestock to graze pasture to a prescribed height and then move the animals to a drylot and feed them hay. Return them to the pasture when plants have regrown sufficiently to allow regrazing.

Deferred. A deferred grazing system uses the principle of not grazing a particular pasture for a specific period of time until plants reach a certain maturity level. This system works well in operations that have at least two pastures. The first pasture, pasture A, is grazed at the beginning of the grazing season the first year. The second pasture, pasture B, is left ungrazed at the beginning of the year. After a specific period of time, maybe a month or so, livestock are moved from pasture A to pasture B.

The second year, pasture B is grazed at the beginning of the year and pasture A is grazed later. Every year the pasture grazed first is alternated. See table 1.

Rest rotation. The rest rotation system requires at least two pastures, but three or more are better because one pasture can be rested for a full growing season. In a three-pasture rest rotation system, the first year livestock graze the first pasture, pasture A, then the second pasture, pasture B. The third pasture, pasture C, is rested. The second year, pastures B and C are grazed in sequence and pasture A is rested. The third year, pastures A and C are grazed and pasture B rested. The rotation then starts all over again.

In this three-pasture rotation, the pasture that is grazed first in the spring (the most stressful time to graze the plants) is then allowed to rest a full year plus a spring. The rest rotation system is useful for renovating pastures or stockpiling forage for late fall and early winter use (table 1).

Table 1. Grazing systems.

	Deferred	Rest rotation	Rotation
Number of pastures	2	3	Multiple
Pasture designations	A B	A B C	A B C D E
Pasture grazing sequence by year	1 – A to B 2 – B to A 3 – A to B	1 – A to B, C rested 2 – B to C, A rested 3 – C to A, B rested	1 – A to B to C to D to E 2 – B to C to D to E to A 3 – C to D to E to A to B

Rotation. This system is also known as management intensive grazing. It utilizes small pastures called paddocks. Livestock are rotated from one paddock to the next after they have grazed forage down to a specific level in a short period of time. Forage in previously grazed paddocks is allowed to grow back for regrazing later in the season when forage plants reach the appropriate growth stage. Rotation goes from paddock A, to B, to C, to D, and so on. This system seems to work best in areas where abundant moisture ensures regrowth of forage and available water sources for livestock.

Designing a grazing system

When selecting or designing a grazing system, be sure to keep in mind the following:

- Number of pastures available
- Size of each pasture
- Fencing required to divide pastures
- Ease of moving livestock between pastures
- Water sources

The grazing systems outlined above are presented in ascending order of complexity, management intensity, and capital requirements. A properly managed management intensive grazing system will increase livestock production per acre and improve pasture and soil quality. But a mismanaged system can degrade pasture condition just as readily as continuous grazing.

Management goes beyond building fences and moving livestock: It includes understanding pasture plants and livestock-pasture interactions as a system. Choose the system that you have the skills and resources to successfully implement and maintain. Develop a plan to continue to improve your grazing system and move toward a more complex and productive system.

Regardless of the grazing system you select, time grazing to avoid grazing before plants reach a height of 4 to 6 inches. Allow 4 to 6 inches of regrowth before grazing again. Also closely control severity of grazing to avoid removing more than half of a plant's leaf area.

There is a great deal of information available concerning the various aspects of grazing management. Many grazing practices and systems apply to all pastures, while some must be modified for smaller-acreage pastures. Use the principles outlined in this bulletin, along with your own experience and that of experienced grass farmers, to improve your smaller-acreage pastures.

FOR MORE INFORMATION

Pasture management

- Barnes, R. F., C. J. Nelson, M. Collins, and K. J. Moore, eds. 2003. *Forages: An Introduction to Grassland Agriculture*, Vol.1. Ames: Iowa State Press.
- Barnhill, J., ed. 1999. *Small Pasture Management Guide for Utah*. Logan: Utah State University. <http://extension.usu.edu/files/ag-pubs/pasture.pdf>.
- Griggs, T. C., and P. E. Kingery. 1998. Performance of Forage and Conservation Grasses in Northern Idaho. Bulletin 798. Moscow, Idaho: University of Idaho Extension. <http://info.ag.uidaho.edu/Resources/PDFs/BUL0798.pdf>.
- Griggs, T. C., and P. E. Kingery. 1998. Performance of Perennial Forage Legumes in Northern Idaho. Bulletin 802. Moscow, Idaho: University of Idaho Extension. <http://info.ag.uidaho.edu/Resources/PDFs/BUL0802.pdf>.
- Idaho State Department of Agriculture. 1995. *Improving Pasture and Riparian Management*. Boise, Idaho: Idaho State Department of Agriculture. http://homeasyst.idahoag.us/Water/quiz10/quiz10_information.pdf.
- Kuepper, G. L., and A. E. Beetz. 2006. *Pastures: Going Organic*. Fayetteville, AR: ATTRA. http://www.attra.org/attra-pub/PDF/pastures_organic.pdf
- Rinehart, L. 2006. *Pastureland, Rangeland, and Grazing Management*. Fayetteville, AR: ATTRA. http://www.attra.org/attra-pub/PDF/past_range_graze.pdf.
- Rinehart, L., and A. E. Beetz. 2006. *Pastures: Sustainable Management*. Fayetteville, AR: ATTRA. <http://www.attra.org/attra-pub/PDF/sustpast.pdf>.
- Shewmaker, G., ed. 2005. *Idaho Forage Handbook*. Bulletin 547. Moscow, ID: University of Idaho Extension.
- Pasture soils**
- Bellows, B. 2001. *Nutrient Cycling in Pastures*. Fayetteville, AR: ATTRA. <http://www.attra.org/attra-pub/PDF/nutrientcycling.pdf>.
- Mahler, R.L. 1994. *Liming Materials*. CIS 787. Moscow, ID: University of Idaho Extension. <http://info.ag.uidaho.edu/Resources/PDFs/CIS0787.pdf>.
- Mahler, R.L. 2005. *Northern Idaho Fertilizer Guide: Grass Pastures*. CIS 853. Moscow, ID: University of Idaho Extension. <http://info.ag.uidaho.edu/Resources/PDFs/CIS0853.pdf>.
- Mahler, R.L. 2005. *Northern Idaho Fertilizer Guide: Legume and Legume-Grass Pastures*. CIS 851. Moscow, ID: University of Idaho Extension. <http://info.ag.uidaho.edu/Resources/PDFs/CIS0851.pdf>.
- Mahler, R.L., and R.E. McDole. 1987. *The Relationship of Soil pH and Crop Yields in Northern Idaho*. CIS 811. Moscow, ID: University of Idaho Extension.
- Mahler, R.L., and T.A. Tindall. 1998. *Soil Sampling*. Bulletin 704. Moscow, ID: University of Idaho Extension. <http://info.ag.uidaho.edu/resources/PDFs/EXT0704.pdf>.
- Stark, J., B. Brown, and G. Shewmaker. 2002. *Southern Idaho Fertilizer Guide: Irrigated Alfalfa*. CIS 1102. Moscow, ID: University of Idaho Extension. <http://info.ag.uidaho.edu/pdf/CIS/CIS1102.pdf>
- USDA Natural Resources Conservation Service. 2003. *Managing Soil Organic Matter: The Key to Air and Water Quality*. NRCS Soil Quality Technical Note No. 5. Auburn, AL: Soil Quality Institute. http://soils.usda.gov/sqi/concepts/soil_organic_matter/files/sq_tn_5.pdf.

USDA Natural Resources Conservation Service. Soil Survey. Local NRCS office or <http://websoilsurvey.nrcs.usda.gov/app/>.

Volk, J., W. Barker, and J. Richardson. 2003. Soil Health in Relation to Grazing. North Dakota State University Central Grasslands Research Extension Center Report. Fargo, ND. <http://www.ag.ndsu.nodak.edu/streeter/2003report/Soil%20Health%20in%20Relation%20to%20Grazing.htm>.

Pasture weeds

Beck, K. G. 2006. Weed Management for Small Rural Acreages. Colorado State University Current Topics no. 3.106. Fort Collins, CO: Colorado State University. <http://www.ext.colostate.edu/PUBS/NATRES/03106.html>.

Coffey, L. 2001. Multispecies Grazing. Fayetteville, AR: ATTRA. <http://www.attra.org/attra-pub/PDF/multispecies.pdf>.

Dufour, R. 2001. Biointensive Integrated Pest Management. Fayetteville, AR: ATTRA. <http://www.attra.org/attra-pub/PDF/ipm.pdf>.

Prather, T., L. Wilson, and J. M. Wallace. 2008. Idaho's Noxious Weeds Control Guidelines. BUL 816 Supplement (updated annually). Moscow, ID: University of Idaho Extension. <http://info.ag.uidaho.edu/pdf/BUL/BUL0816supp.pdf>.

Prather, T., S. Robbins, and D. Morishita. 2008. Idaho's Noxious Weeds., 4th ed. 2008. Bulletin 816. Moscow, ID: University of Idaho Extension. <http://info.ag.uidaho.edu/pdf/BUL/BUL0816.pdf>.

Prather, T., and B. Parker. 2007. Weed Control in Pasture and Rangeland. In 2007 Pacific Northwest Weed Management Handbook (revised annually). Corvallis, OR: Oregon State University. <http://pnwpest.org/pnw/weeds>.

Pasture grazing

Porath, M., and T. E. Bedell. 2006. Grass Growth and Development Considerations for Grazing Management. In Cow-Calf Management Guide and Cattle Producer's Library. Moscow, ID: Western Beef Resource Committee.

Beetz, A. E. 2004. Rotational Grazing. Fayetteville, AR: ATTRA. <http://www.attra.org/attra-pub/PDF/rotgraze.pdf>.

Howery, L., J. Sprinkle, and J. Bowns. 2006. Summary of Livestock Grazing Systems Used in the Western United States. In Cow-Calf Management Guide and Cattle Producer's Library. Moscow, ID: Western Beef Resource Committee.

Morrow, R., and A. E. Beetz. 2005. Paddock Design, Fencing, and Water Systems for Controlled Grazing. Fayetteville, AR: ATTRA. <http://www.attra.org/attra-pub/PDF/paddock.pdf>.

Mosley, J. C. 1992. Designing Your Grazing System. In Cow-Calf Management Guide and Cattle Producer's Library. Moscow, ID: Western Beef Resource Committee.

Sanders, K. 2004. Determining Carrying Capacity. Moscow, ID: University of Idaho Department of Rangeland Ecology and Management. <http://www.cnrhome.uidaho.edu/default.aspx?pid=74875>.

University of Idaho Extension

Issued in furtherance of cooperative extension work in agriculture and home economics, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Charlotte V. Eberlein, Director of University of Idaho Extension, University of Idaho, Moscow, Idaho 83844. The University of Idaho provides equal opportunity in education and employment on the basis of race, color, national origin, religion, sex, sexual orientation, age, disability, or status as a disabled veteran or Vietnam-era veteran, as required by state and federal laws.