

Paddock Design, Fencing and Water Systems for Controlled Grazing

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Interest in controlled grazing is increasing throughout the United States. Controlled grazing systems are economically feasible and are now more easily managed because of developments in fencing and water technology. This publication covers some of the basics of paddock design and current fencing and water technology. Paddock design needs to be based on landscape, land productivity, water availability and the number and types of animals in the system. Water systems are more complex and expensive than fencing systems. Producers need to understand all the technology available before establishing a grazing system. A good way to explore the technology is to order catalogs from companies that sell fencing or water systems.



The paddock to the left was just grazed. Photo by A.E. Beetz, 2005.

Introduction

This publication is an introduction to designing a grazing system. Starting a grazing program can be fairly simple. It is usually best for producers to develop a program instead of jumping in and subdividing their farms into paddocks. Dividing existing pastures in half, closing pasture gates or stringing temporary fencing can be a start to controlled grazing. Watching livestock graze, learning to monitor pastures and using temporary fencing for subdivisions all advance the system without exposing the producer to large risks.

Some producers will use temporary fencing to help develop a grazing system, and then put in high-tensile wire after determining the proper location and frequency of rotation. Some equipment and experience are necessary when working with high-tensile wire. For example, a spinning jenny is a must in unrolling the wire. A crimping tool is necessary when working with lower-gauge (thicker) wire, which should be used if deer are a problem. Deer will not break the lower-gauge wire but might break a higher gauge. Some people who work with graziers to establish controlled

Related ATTRA Publications

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Dung Beetle Benefits in the Pasture Ecosystem

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Organic Alternatives to Treated Lumber

Pasture, Rangeland, and Grazing Management

Pastures: Sustainable Management

Pastures: Going Organic

Rotational Grazing

Ruminant Nutrition for Graziers

Solar-powered Livestock Watering Systems

grazing systems prefer to develop water lines first and then do the fencing.

The first considerations, however, are the number of paddocks and their size and shape. Paddock size is determined by the number of animals, the frequency of rotation and how much forage is needed by the type of animal being grazed. For example, some cow-calf operations are never stocked heavily enough to justify a daily rotation because their animals do not have high enough nutrition requirements to justify that much control.

Stocking rate or stocking density?

Stocking rate is the number of animals or animal units on a unit land area over a specified period of time.

Stocking density is the number of animals on a unit land area at any instant (Heitschmidt and Taylor, 1991).

For temperate pastures, stocking density may be more important than stocking rate.

Manipulate stocking density by adjusting paddock area to size of existing herd and forage regrowth.

Paddocks should be small enough for uniform forage grazing. Paddocks can then be adjusted in size as the season progresses and forage growth slows down. If you have to keep animals on a paddock for more than five days to graze to a set stubble height, this probably indicates surplus forage, which can occur early in the season. If the animals cannot keep up with forage growth during the early season, consider cutting some of the forage as hay. The livestock can be turned onto the mowed fields after appropriate rest and recovery of the grass.

The following ATTRA publications will help you make some of these decisions:

- *Rotational Grazing*
- *Ruminant Nutrition for Graziers*
- *Pasture, Rangeland, and Grazing Management*
- *Pastures: Sustainable Management*
- *Dairy Production on Pasture*

Forage availability

It is important to calculate the forage needs of the grazing animals and how much land is necessary for periodic rotations. Iowa State University Extension has educational material that includes useful worksheets for calculating forage availability (ISU, 2009). Generally, a stock rate of 30,000-50,000 pounds of animals for 1 acre over a day works well. This density range is based on how much forage is available, how much the animals will eat in one day and how much residual forage is left in the pasture. If a producer is rotating every three days, the density is 10,000-17,000 pounds of animals for 1 acre for that period. If the animals are high-producing (milk) animals, the lower figure is used. If forage is abundant, the higher figure is used.

Cow-hand arithmetic simplified

Here is an example of some cow-hand arithmetic:

Thirty 1,100-pound beef animals need about 1 acre of pasture a day. If the animals are rotated twice a week, paddock size should be 3-4 acres each. If, on average, a paddock is ready to be grazed after 30 days of rest, a producer needs 11 paddocks. Remember, a paddock cannot be grazed and rest at the same time. Rest for 30 days plus grazing for three days divided by a three-day rotation requires 11 paddocks. Another way to figure this is to divide the days of rest (30) by the number of days grazing each paddock (3) and add one, or $30/3+1=11$ paddocks.

The figures above are an example. Producers can use the same calculations with their own figures to determine paddock numbers on their own farms or ranches.

Paddock design

Most people think of paddocks as flat, symmetrical squares. Unfortunately, most farms are not flat. They have hills, streams and often trees. A general recommendation is to allow cattle access to water within 800 feet of any point on the pasture. Research has shown that if cattle have to walk more than this distance to water, they tend to undergraze farther from the water source.

Cattle also tend to travel to water in groups when a lane is used or when they are far

How long should animals remain in a paddock?

Use the following principles to determine how long animals should remain on your paddocks:

Prevent grazing of regrowth

Plants may have enough grazable regrowth after six to 12 days

The shorter the period in the paddock, the better the plant and animal production

Protein intake declines the longer the animal is in a paddock.

away from the water. This can be important in determining the type of water system to use. The appropriate distance to water, however, can vary depending on terrain, type of cattle, forage availability and grazing goals of the producer. The recommendation of 800 feet is probably best used in a system designed for maximum forage use.

However, landscape should be considered. Livestock may prefer to graze some slopes or flat areas over other parts of the paddock. If a paddock has a lot of variation in this aspect, it may be poorly used because some areas will be overgrazed and others undergrazed. In this case, it is best to fence according to the landscape or use temporary fencing to control access within the paddock.

When designing a grazing system, also consider differences in the productivity of the land. For example, in a two-day rotation, some paddocks may need to be larger than others to have the same amount of forage available.

Fencing

Electric fencing is very popular among graziers. Electric fencing systems offer many benefits over conventional wire or wooden fences. Light weight, ease of installation and adaptability characterize electric fencing systems. Electric interior fences (that divide paddocks within a grazing pasture or cell) can be single-stranded poly wire or poly tape with portable posts that can be easily installed and removed to make the paddock bigger or smaller, depending on forage quantity.



An example of electric fencing using metal T-post. By A. E. Beetz, 2005.

Some of the necessary equipment for designing and constructing electric fences includes:

- charger (energizer) and grounding rods
- high-tensile wire, 10, 12.5 or 14 gauge
- tensioners and insulators
- poly tape and poly wire for sectioning off paddocks
- tools, including volt meters, crimping devices, lightning arrestors and surge protectors
- posts, such as wood and steel (for permanent and corner braces) and step-in posts (temporary)

The first step in fencing is choosing a low-impedance, high-voltage charger. There are several excellent ones on the market that are powered by the sun, a battery or the power grid. Charger quality varies considerably depending on the make, the size of the battery and the amount of voltage supplied. Proper grounding of the system is absolutely essential to its success. This can be a problem in rocky or very dry soils.

Use fencing system catalogs to compare prices and get an idea of the products and techniques available in fencing and water systems. Several companies have toll-free numbers and will send you catalogs for free. In addition, some companies offer free installation manuals you can download from their Web sites. A list of major suppliers is

included in the **Appendix**. If you call for a catalog, ask about dealers or company representatives in your area. These people can sometimes give you a better deal than the company itself and may provide some practical consultation. Be aware that some custom fencing companies may overbuild fences or use more wires than necessary.

Advances in fencing technology now allow a producer to have greater control over the use and growth of pastures. Water system improvements, such as solar pumps and other devices, enable producers to have enough paddocks to rotate cattle frequently and also have water available in each paddock.

Wire, poly wire and poly tape

There are many fencing materials available. High-tensile wire offers the most permanent option. In the presence of good perimeter fences and cattle that are trained to respect an electric fence, one strand of wire is effective for interior fences and paddock dividers. The wire should be strung at about shoulder-level of the animals. By having the wire high enough, calves can creep into the next pasture and graze more abundant forage. Having two pinlock insulators on a post and moving the fence to the higher one as calves begin to creep graze is an easy way of managing the system. If using wood posts, fasten the pinlock insulator with staples and not the nails sometimes sold with insulators. Some producers feel that having one wire allows calves to get used to being shocked and makes them harder to handle as yearlings and adults. The greatest advantage of one wire for cattle is that the cattle will eat underneath the wire, whereas with more than one wire grass grows underneath the lowest wire, and can cause the wire to ground out, weakening or eliminating the electrical charge. Three wires will normally control sheep and goats, if the animals are trained to electric fence.

For a more portable system, use poly wire and poly tape. Poly tape is more visible, but the wind can loosen step-in fence posts, particularly when the ground is wet. Some producers, in an effort to save money, use the

wire on electric cord reels. Reels cost about \$5 and can be found at hardware stores. Some producers use high-tensile wire as a feeder wire (carrying electric current to paddock fences) and poly wire to divide pastures into smaller areas as needed. Some producers say that ice on poly wire during the winter can be a problem. One person made the mistake of trying to knock ice off and broke the wire filaments. Again, it is important to try out several of these options to determine what is best for each situation. Pasture walks or farm visits are good ways to find out what other producers are using. Contact your local Cooperative Extension office or National Resources Conservation Service (NRCS) office to see if there are producers in your area willing to host a walk or tour.

NRCS and Cooperative Extension phone numbers can be obtained in the federal and county government sections, respectively, of your local telephone directory. Also, you can access local NRCS and Extension directories on the following Web sites:

Natural Resources Conservation Service

<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>

Cooperative Extension

www.csrees.usda.gov/Extension/index.html

Water systems

Water systems should be designed for ease of operation and maintenance. A typical watering system includes a water source (pond, well, municipal water supply), a pump, a pressure gauge, piping and fittings, water troughs and automatic watering valves. Pipe can be made from various kinds of plastic. Black poly plastic is relatively inexpensive, easily to install, comes in 100-foot rolls and can be buried in trenches.

Many producers use gravity flow or solar pump systems with plastic pipe on top of the ground. This works well when the temperature is above 32 degrees Fahrenheit. Pipe made of burst-proof plastic stays intact during the winter without draining. Couplings installed in the pipe at certain intervals can branch off to portable livestock water tanks. Small containers, such as half of a 55-gallon

drum, can water up to 150 head of cattle and have worked well for some producers. Make sure that water is being replenished as fast as it is being consumed. Otherwise, the cattle will tear up the system. A watering system made up of an automatic float valve that discharges 5-8 gallons of water a minute and a water supply pipe larger than 1.25 inches in diameter is adequate for replenishing the water in the tank.

Some devices, such as automatic float valves, are hard to keep clean, so you may want to use a strainer or filter when using pond or creek water.

The accompanying **Appendix** is a list of product distributors. Call to request catalogs. This will help you evaluate the differences in price, and you will also find the catalogs educational. Most offer shortcuts that you can use and give helpful information on how to install fencing and water systems.



Floating pipe and electric fencing limit livestock access to the pond. By A. E. Beetz, 2005.

References

ISU. 2009. Pasture Management Guide for Livestock Producers. Iowa State University Extension. www.extension.iastate.edu/Publications/PM1713B.pdf.

Heitschmidt, R.K. and C.A. Taylor. 1991. Livestock Production, in *Grazing Management: an Ecological Perspective*. Portland, OR: Timber Press.

Further resources

Blanchet, Kevin, Howard Moechnig, and Jodi DeJong-Hughes. 2003. *Grazing Systems Planning Guide*. University of Minnesota Extension Service. www.extension.umn.edu/distribution/livestocksystems/components/DI7606.pdf

This guide discusses the components of a grazing system by taking you through the grazing management planning process. Information on grazing resource

inventory, plan development, pasture management and system monitoring is provided.

Electric Fencing for Serious Graziers. 2005. Columbia, MO: Missouri Natural Resources Conservation Service. 2005. www.mo.nrcs.usda.gov/news/news/MO%20NRCS%20Electric%20Fencing_low.pdf

Techniques described here are primarily for producers installing one-wire and two-wire fences and permanent power stations using 110-volt energizers.

Watering Systems for Serious Graziers. 2006. Columbia, MO: Missouri Natural Resources Conservation Service. www.mo.nrcs.usda.gov/news/images/Watering%20Systemslow.pdf

This publication provides livestock producers with the basic information that they need to plan, design and install water systems that will maximize animal performance and minimize the labor necessary to care for their herds' water needs.

Pfost, Donald, James Gerrish, Maurice Davis and Mark Kennedy. 2007. Pumps and Watering Systems for Managed Beef Grazing. University of Missouri Extension. <http://extension.missouri.edu/publications/DisplayPub.aspx?P=EQ380>.

This publication covers such topics as water quality, distribution systems, specifications for pipe and tank

and pump sizes, and includes a comprehensive resource list for supplies including solar pumps.

Fencing and Watering, in The Northeast Grazing Guide. University of Maine Cooperative Extension. www.umaine.edu/grazingguide/Extension%20Resource%20Topics/fencing_and_watering.htm.

Links to Cooperative Extension publications and resources from several states.

Appendix: Fencing suppliers

Cameo Fencing
1-800-822-5426
www.cameofencing.com

Gallagher Power Fence
1-800-531-5908
(210) 494-5211
www.gallagherusa.com

Gallagher POWER FENCE Manual
www.gallagherusa.com/pf.manual.aspx

Geotek, Inc.
1-800-533-1680
(507) 533-6076
www.geotekinc.com

Kencove Farm Fence
1-800-536-2683
www.kencove.com/fence

Kentucky Graziers Supply
1-800-729-0592
(859) 987-0215
<http://kygraziers.com/kgshop>

McBee Agri Supply, Inc.
1-800-568-4918
(573) 696-2517

Pasture Management Systems, Inc.
1-800-230-0024
www.pasturemgmt.com

Premier 1 Fence Supplies
1-800-282-6631
www.premier1supplies.com

Southwest Power Fence
1-800-221-0178
www.swpowerfence.com

Speedrite Agri-Systems
1-800-323-7306
www.speedrite.com

Twin Mountain Fence Co.
1-800-527-0990
www.twinmountainfence.com

(Source: Stockman Grass Farmer's Grazier's Resource Guide)

Notes:

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