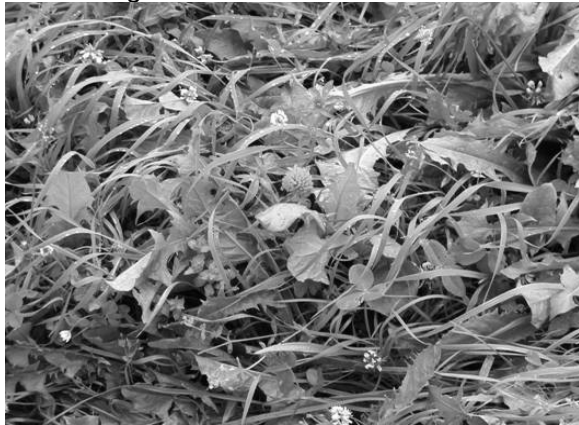


THE ART AND SCIENCE OF PASTURE MANAGEMENT

By Sarah Flack

Our abilities as farmers to do a good job of pasture management means we need to have not only the technical and scientific knowledge of grazing management, but also the observational skills to see subtle changes over time in our livestock, soils and pasture plants. One way to learn about pasture management is to get a grasshoppers-eye-view of it. Get down into the pasture, push the plants apart and take a look at the amazing diversity and complexity of soil, plants and other life, which comprises this part of the farm organism.



When you look closely at a well developed perennial pasture here in the northeastern US, you'll probably see Kentucky blue grass, perennial ryegrass, orchard grass and other cool season grasses. The grasses will be spreading by a process called tillering, where they send up new side shoots, or sometimes by seed. You'll also see white clover, with its stems spreading across the ground, ready to take advantage of any opportunity provided by a space in the pasture canopy. You may also see a few tiny new clover plants starting. Clover seed is very hard, and can sit patiently for many years in the soil, waiting for the right mixture of light, temperature and moisture to germinate. You may also see dandelion, plantain and other plants which livestock enjoy eating. In a high quality pasture, the plant density will be so great that you will have difficulty parting the plants to see the

soil, but perhaps the earthworm castings will be easy to see.

Now stand back from the pasture and take a larger view of it. A well managed pasture will be a mix of many plant species, with no bare soil showing, with uniformly distributed cow pies from the most recent grazing. The pasture will have patches that didn't get grazed closely during the last grazing, since cows and sheep don't like to eat the grass right next to their manure (and who can blame them). You can take an even larger picture view of it by looking at all the pastures on the farm to see how they fit into the whole farm organism. Step back even farther to see how the pastures, and the whole farm, are part of the larger world and cosmos.

“In a high quality pasture, the plant density will be so great that you will have difficulty parting the plants to see the soil...”

What you are seeing is the result of several or perhaps many years of good grazing management. Good grazing management will encourage the pasture plant species which you want, reduce weed problems, and increase the quantity of pasture dry matter produced while improving the nutritional quality of the feed. A high quality pasture, particularly with good care of the soils, will produce livestock feed of the highest nutritional value and vitality, so that the meat, milk and manure produced is of the highest possible benefit to you and your farm.

Now if you were to go look at a poorly managed pasture, it would appear very different. You will be more likely to see bare patches of soil, there will be less diversity of cool season grasses, clovers and other legumes with an increase in types and numbers of weeds. There will probably be patches of pasture which seem to never grow very tall, and clover and other

legumes may be completely absent. There may be a buildup of dead plant material or thatch on the soil surface, and cow pies may not be decomposing quickly. Pastures don't suddenly become poor quality, it is a gradual change over time, and a good understanding of grazing management techniques as well as trained observational skills are vital in developing this part of the farm organism.

So, what exactly *is* good grazing management?

Pasture plants need to rest after each grazing, giving them time to replenish energy, which is stored in their roots by photosynthesis. Continuously grazing animals in the same pasture or returning them to a pasture before it is fully re-grown does not give the plants time to recover. Repeated grazing, without adequate time for plants to re-grow, will result in plants that weaken, may stop growing, and even die. These weakened plants will not be able to compete with weed species, and won't be able to hold the soil as well, resulting in bare soil and erosion. Some grasses and clovers will survive by staying very short, never growing tall enough for livestock to easily graze, while other areas in the pasture will be rejected by livestock, soon growing up into weeds, brush or small trees.

How often should I move my animals?

With good grazing management, livestock are usually moved to a new pasture every 12 hours to 3 days. Livestock may return to the pasture when it has fully recovered by re-growing to 6 to 10 inches of height. Here in the northeast, this may be as soon as 14 days in early summer when the plants are growing rapidly, but it may be 40 days or longer later in the summer before the plants are fully recovered.

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Many dairy farmers will give cows a fresh pasture after each milking. Cows will graze each area for 8 to 10 hours, and then that pasture will be left to re-grow. Sheep or beef may be moved as frequently as dairy cows, or they may be moved every 1 to 3 days. It is important to move animals frequently, so that each paddock is not grazed for more than three consecutive days. Grazing periods of half a day to one day will result in much higher pasture quality and livestock performance. Some farms use a grazing method called strip grazing, where livestock are given a fresh strip of pasture many times each day by moving pieces of portable electric fence.

How do I know how much land I'll need?

Another important part of management intensive grazing is that when pasture growth slows down in later summer, the total number of acres needed to graze will have to be increased. If the number of grazing acres is not increased, the plants will not be getting enough rest, and dry matter intake by animals will drop, resulting in both poor animal and poor pasture performance. One of the most common mistakes in grazing is not adding additional acres as plant growth rates slow.

For grazing planning on your farm, it is helpful to keep records of how often, and for how long your graze each pasture each year. Once you have some information about how fast your pastures grow at different times of the year, you can plan out your grazing system. You can calculate how large each pasture needs to be, based on the amount of dry matter per acre available to graze and how much feed your livestock need. You can plan how many acres you'll need to graze at each time of the growing season based on dry matter intake requirements and pasture re-growth times. This technical grazing knowledge can be an important part of improving and maintaining good quality pastures, but don't overlook the intuitive and observational skills which are also an important part of pasture management and good animal husbandry.

Are there other benefits to this type of grazing?

When animals go into a pasture they aren't just eating. They are trampling weeds and dead plants into the soil, which adds organic matter. They are fertilizing the pasture by spreading manure as they go. They are selecting the plants that they want to eat, then they go chew their cud, and contemplate the pasture, and produce their answers... in the form of lovely cow pies. The role this contemplation (and the resulting manure) plays in improving your pastures and farm should not be underestimated.

Well managed perennial pastures provide livestock with a "salad" of many types of plants. There may be as many (or more) as 20 or 30 different species of plants in a single pasture. This bio-diversity provides the grazing animals with a range of plants to eat, and means that even in a drought year or in a very wet year, something will grow.

The bio-diversity of plants above ground in a pasture is reflected below the soil surface by an amazing amount of biological activity. The roots from all these different types of grasses, legumes and other plants combine to make up one of the highest root concentrations found in any crop. In and around these roots there is a huge population of beneficial earthworms, bacteria, fungi and other organisms.

Good grazing practices can improve pasture quality and yield, or convert weedy or brushy pastures where animals have to search to find good quality forage into productive pastures. Well managed pastures can feed more animals, and produce higher quality forage, which is grown and harvested at a low cost. High quality pasture and managed grazing can improve the health of livestock, and research shows that pasture fed livestock produce eggs, meat, milk and manure of a different, much higher quality than grain fed livestock.

To improve knowledge of the science of grazing, attend a grazing school or pasture walk, read books or subscribe to some of

the grazing magazines. To improve your understanding of the art of grazing and to develop intuitive and observational skills: follow earthworms to see where and when they are in the pastures; watch for certain plants which may appear to help correct past years management mistakes of overgrazing or soil compaction; follow the cows and sheep to see what they eat; watch how the texture, color and aroma of the manure changes as the animals graze different areas at different times of the year; lie down in the pastures often to meditate; taste the grasses and smell the soil; watch the color, texture and taste of the cream change as cows move from one pasture to another.

Want more information?

The Vermont Grass Farmers Association & Vermont Pasture Network at the University of Vermont Center for Sustainable Agriculture.

Call: 802-656-3834(technical assistance)
802-656-0858 (general information)
802-656-5459 (Center for Sust. Ag.)

E-mail: jcolby@uvm.edu (Pastures)
sustainable.agriculture@uvm.edu
(Center for Sustainable Ag.)

"Stockman Grass Farmer" Magazine. Call 1-800-748-9808 to order.

"Graze" Magazine. Call 608-455-3311 to order.

***Greener Pastures on Your Side of the Fence* by Bill Murphy.** To order a copy, call 1-800-639-4178.

***Grass Productivity* by Andre Voisin.**

***Soil Grass and Cancer* by Andre Voisin.**

University of Vermont Extension Pasture & Grazing Site:

pss.uvm.edu/vtcrops/?Page=pasturegrazing.html

University of Wisconsin Extension Forage Site: www.uwrf.edu/grazing/

ATTRA fact sheets on grazing:

www.attra.org/attra-pub/grassfarminglist.html

American Farmland Trust, with links to many grazing research projects, resources, and websites. grassfarmer.com/

National Biodynamic Association:
www.biodynamics.com

AND NOW...

THE TECHNICAL PART OF GRAZING MANAGEMENT!

...or How to Estimate Dry Matter Intake and Calculate the Size and Number of Paddocks Needed...

How much pasture (dry matter) are they eating?

Ideally, a pasture should be grazed rapidly down to 1 to 2", then permitted to grow back up to 6 to 8". A good quality pasture (with high plant density) that is 6 to 8" tall has about 2400 lbs of dry matter (DM) per acre. If it is grazed down to 1 to 2", it has about 1200 lbs DM/acre left. This means that 1200 lbs DM/acre is available for the grazing livestock to eat.

The density of the plants in the pasture will have a large influence on how much dry matter there is available to be grazed. If the plants are spaced far apart (low density) so that you can easily see soil between the plants, there may only be 2000 lbs of dry matter per acre when the pasture is 6" tall (instead of 2400 lbs). The best way to learn how to estimate dry matter is to go to some pasture walks, or host a walk on your farm. The density and quality of your pastures will increase as you practice good grazing management!

The amount of pasture DM an animal will eat depends on many factors (such as lactation, stage of growth, animal size, supplemental feed ...) Three percent of body weight DM intake is a reasonable estimate for lactating cows grazing well managed pasture. This means that a 1000 lb cow will eat 30 lbs of pasture DM per day.



To prevent overgrazing of plants and maximize dry matter intake, move animals frequently, so that each paddock is not grazed for more than three consecutive days. Grazing periods of 12 to 24 hours result in much higher pasture and livestock productivity.

What size should the paddocks be?

Paddock size depends mostly on how many animals you have, and how long they will be in the paddock. **Refer to the pasture worksheet at the back of this handout.** EXAMPLE: You have 50 cows, each weighing 1000 lbs, so each cow will need an estimated 30 lbs of pasture DM per day (3% of 1000 lbs). You plan on giving them a fresh paddock after each milking. You let the paddocks grow up to 6 to 8" (2600 lbs DM/acre) before grazing, and graze them down to 1 to 2" (1200 lbs DM/acre), so you have 1200 lbs of DM per acre (2600 lbs - 1200 lbs = 1200 lbs) for the cows to eat (this is a high quality pasture with a high plant density). The 50 cows need 1500 lbs DM per day (30 lbs DM x 50 cows = 1500 lbs). So they need 1.25 acres each day (1500 lbs required per acre / 1200 lbs available per acre = 1.25 acres). Since you will give them a paddock after each milking, you need to set up paddocks which are 0.63 acres of an acre each (1.25 / 2 = 0.63). An acre is 43,560 square feet, or about 210 feet on a side if it is a square. 0.63 acre is 27443 square feet (43560 x 0.63 = 27443), which is a square that is about 165 feet on a side (the square root of 27443).

How many paddocks do I need?

Research done by Bill Murphy on a Fairfax Vermont (Champlain Valley) Farm on high quality pasture produced the following average regrowth periods during a three year period (of reasonably average rainfall). The regrowth periods on your farm may be shorter or longer... in a dry summer, the regrowth periods may easily reach 60 days or longer!

12 to 15 days in late April to early May
18 days by May 31
24 days by July 1
30 days by August 1
36 days by September 1
42 days (and longer) by October 1

These numbers are just averages, the actual amount of time needed for complete regrowth will probably be different on your farm. However, in general the pastures grow quite quickly in spring and early summer, and more slowly as the growing season continues.

EXAMPLE: With these regrowth periods, on this Fairfax farm, 50 cows that need 1.25 acres per day, will need a total of 19 acres to graze in the spring. (1.25 acres x 15 days = 19 acres) When pasture growth slows down to 35 to 40 days, acreage needed will increase to 44 to 50 acres. (1.25 acres x 35 days = 44 acres and 1.25 acres x 40 days = 50 acres).

If total acreage is not increased as regrowth periods increases, plants won't get enough rest, and dry matter intake by animals will drop, resulting in poor animal and pasture performance.

For grazing planning on your farm, it is helpful to keep records of how often, and for how long your graze each paddock each year. Then you can know how long it takes the paddocks on your farm to grow back during the grazing season. You can keep these records on a copy of your farm map, or by using a notebook or worksheet where you write down the date, where the animals grazed, and for how

long. These records will allow you to know exactly what the rest periods are in your pastures.

Records of past grazing are only useful if you use them! Walk through all your pastures at least once each week, and record how much each pasture has grown back. This way you can plan what order to graze your paddocks in.

Designing pasture layout

One way to begin thinking about how to subdivide your farm is to use an aerial photograph or a survey map of your farm. You can use a marker to outline pastures and meadows and to draw in existing fences. Then, using the photograph (and some common sense) you can decide where to put lanes, fencing, paddocks and water. When subdividing your grazing land, here are a few things to keep in mind:

- * Put lanes on high dry ground - you will probably need to do some improvement and maintenance on muddy wet areas.
- * Some areas on your farm will grow faster than others, whenever possible, try to put fast growing areas in one paddock and slow growing areas in another.
- * Consider topography... put south facing slopes in one paddock and north slopes in another.
- * Minimize shady loafing areas that animals will tend to nap in and drop all their manure (where it won't do the pasture plants any good!).
- * Try to provide water in each paddock so animals don't have to walk to find it (and drop manure where it isn't needed!).
- * Put gates in the corner of the pasture which is closest to the barn.
- * Attend a pasture walk, visit other grass based farms and learn from their experiences.

Fencing and water

Recent advances in fencing technology makes this type of grazing management much easier. You will need a good quality energizer (well grounded!), and some

perimeter fencing which can conduct electricity with minimal resistance. Here in the North East you will need some type of lightning protection. Most people use some of the wide variety of portable fencing to subdivide larger areas. The type you chose will depend mostly on what type of livestock you are grazing.

Water can be provided to cows in paddocks in several ways. Water lines can be buried, or you can just lay pipe on the ground along a fence line or a lane. Water tubs can be small and portable, or can be larger and rarely moved. It is less expensive to have a few portable tubs than a whole lot of permanent tubs. If piping water out to pastures is not possible, water can be provided using a sap tank (or something like it) on a wagon which is parked in the pasture. Wherever the water source is, you will probably want to use a float valve to control water flow.

To start with, try to be as flexible as possible with your fence and water system. You may change your set up a few times, and you may need to have flexible paddock sizes as your herd size changes and your pasture productivity increases.

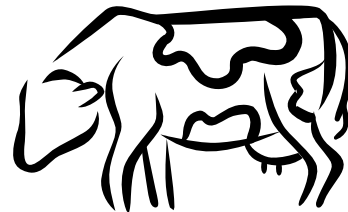
Pasture improvement

Try some of these innovative ideas to get the most out of your pastures. Sometimes just a small change goes a long way!

- * Don't follow a set rotation; graze according to plant growth rates. If one pasture grows faster than the others, graze it more often. If you have a pasture which grows very slowly, graze some other areas and let the plants grow back. Try to walk your pastures each week and record how tall (how much dry matter) each pasture is.
- * Don't let animals back into an area until it

has grown back to 6 inches (4 - 5 for sheep and goats).

- * Don't let animals stay in one area for more than 3 days, 12 - 24 hours is far better.
- * Move animals frequently—moving animals more frequently can increase dry matter intake and improve pasture quality faster.
- * Lock animals in each paddock so they can't wander back to the barn. This is one of the easiest ways to manage soil fertility in pastures.
- * Use a back fence to prevent "back grazing", so that animals don't overgraze favorite plants.
- * When possible, use a follow up or clean up grazing group. On a dairy farm the milking herd can graze the paddocks first (and get the higher quality forage), and a group of dry cows can follow behind them, grazing the rejected forage and "cleaning" the pasture. On a sheep farm, the dry ewe flock can graze behind weaned lambs.
- * Don't let grasses get too tall and shade out white clover. Over mature grass is a lower quality feed, and too much shading may decrease the plant density in the pasture.



PASTURE WORKSHEET

Estimating Forage Dry Matter Intake (DMI):

Average body weight _____ (Line 1)
 Estimated DMI (as % of Body Weight) _____ (Line 2)
 Daily DMI required for single animal (Line 1 x Line 2) _____ (Line 3)
 Daily DMI required for herd (Line 3 times number of animals) _____ (Line 4)

Estimating Pasture Mass (forage dry matter):

Height	Average Density* Pasture lbs DM/acre	Low Density Pasture lbs DM/acre	High Density Pasture lbs DM/acre
8"	2600	2200	2800
6"	2400	2100	2600
4"	1800	1500	2100
2"	1200	1000	1400
1"	900	600	1000

**Lbs of dry matter per acre at each height varies widely with plant density and species - Attending pasture walks or discussion groups are a great way to learn how to make these estimates more accurately!*

Calculating Available Dry Matter:

Available Forage Dry Matter = Pre Grazing Mass - Post Grazing Mass

Example: Pre Grazing 6" 2400
 Post Grazing 2" 1200
 = 1200lbs DM/acre

Your Farm: Pre Grazing Mass _____ (Line 5)
 Post Grazing Mass _____ (Line 6)
 = _____ (Line 7) available dry matter/acre

Calculating Paddock Size:

Paddock size (in acres per day) = Daily DM Required / Available dry matter

Daily DM required (Line 4)
 ----- = _____ paddock size in acres/day (Line 8)
 Available DM/acre. (Line 7)

(There are 43560 square feet in an acre, which is a square that is about 210 feet on a side)

Calculating Rest Period:

Maximum Possible Rest Period = Your total pasture acres / Paddock size

Pasture acres available
 ----- = _____ maximum rest period
 Paddock size in acres per day (Line 8)