The Art and Science of Grazing for Soils, Forage, Water, Livestock and People

Grazing is both an art and science, with constant adaptations for weather, forage growth, soil conditions, livestock needs, and many other factors. It requires managing the intensity, frequency, duration, timing, and animal numbers on pasture according to the rate of plant growth, vegetation density, plant types, and livestock nutritional needs, to ensure that animals get high-quality forage every day.

Healthy Forages, Healthy Soils

Pastures with vegetative cover throughout the year will provide many benefits over the long-term, especially to soil health. Healthy soil functions as a living ecosystem, teeming with bacteria, fungi, and other microbes in a symbiotic relationship with plants and animals. It requires cover and living roots throughout the year, high plant diversity and minimal soil disturbance. When animals graze only a portion of the forage, then pastures are allowed to rest. The plants will regenerate vegetative cover as well as root growth. Deep root systems and earthworms create channels and mechanisms to transport water and nutrients throughout the soil, storing and redistributing where needed.

A cover of living plants feeds and protects soil organisms, such as bacteria, fungi and earthworms. This “soil livestock” works for you, by breaking down dead vegetative material, producing sticky substances that hold soil structure together, creating fertile habitat and forming pore space, so that water, air, and nutrients can infiltrate and become available to plants and microbiota.

Healthy soils will allow more water and nutrient infiltration, storing these components for when they are needed, and reducing the risk of run-off, erosion and flooding. With greater water retention, pastures are more resilient to extreme droughts. Pastures with healthy soil may start growth earlier in the spring and continue producing longer in the hot summer and cool autumn. The soil is more resistant to pests and diseases, and its structure can support the weight of grazing animals without compaction and erosion. Greater soil health will increase forage throughout the year.

Livestock Management

Under managed grazing, livestock does some of the work that humans do in confinement operations. Livestock do most of their own harvesting, without labor, fuel and equipment expenses. They deposit most of their manure directly on the pasture, reducing the equipment and time for manure storage and hauling. Feed costs are reduced, more than compensating for the production loss in most cases.

High animal density may result in more uniform grazing, weed consumption, and even manure distribution. A shorter grazing duration allows plants longer recovery times, increased rooting depth, and overall increase in forage stands.
Economic Benefits of Grazing
Rotational grazing has helped many farmers to balance expenses and income, while improving the quality of farm life by reducing labor and costs, and providing access to the rapidly growing markets for pasture-raised meats, eggs and dairy products. Grazing operations generally have lower start-up and maintenance costs than confinement operations. Under grazing production systems, veterinary expenses and cull rates may drop, due to fewer foot ailments, parasites, mastitis and other herd health problems, since the animals are more active and outside. There is steady, demand-driven growth in the market for locally produced, grass-finished meats and dairy products. Many consumers will pay a premium price for healthier foods from grass-fed livestock and poultry.

The Pennsylvania Grazing Lands Coalition (PAGLC) is a producer-led association that aids farmers and community members in keeping grazing lands productive and in the forefront of agriculture in Pennsylvania. The PAGLC works with technical advisors and assistance from the US Department of Agriculture, Capital Resource Conservation and Development (Capital RC&D), Pennsylvania Association for Sustainable Agriculture (PASA), Penn State Extension, and others.

The PAGLC strives to increase public awareness and understanding of profitable conservation practices on grazing lands by providing grants for conferences and pasture walks, producing informative videos and podcasts, and maintaining an online library of grazing materials and literature. Research is key to improving land management and conservation for the future, so PAGLC explores management innovations by supporting research partners such as the USDA Agricultural Research Service's Pasture Systems Lab.

PAGLC mentors use their combined expertise to help graziers increase profits while improving the health of their livestock and their land. The website (paglc.org) features mentors’ contact information and types of advice they can provide. Grass farmers discuss their operations and give useful tips on a variety of topics in frequent “Graziers Grapevine” podcasts (paglc.org/category/the-graziers-grapevine/).

Learn from Others
Seeing other grazing operations is a great way to learn to start or improve your operation. You’ll see their forage species, height when animals start and leave a pasture, stocking rate, livestock breeds, paddock layout, walkways, fencing, and watering system. It’s always useful to learn about successes and failures from your fellow farmers, so please reach out to PAGLC mentors and technical advisors, or connect with other graziers in your local area.

This 2019 Pennsylvania Grazing calendar aims to provide helpful, sound, technical information each month about the soil, water, forage and livestock components of a grazing system, with hints from other graziers, local resources, as well as space to make notes and list things to do for your farm operation. We hope you enjoy using it!

Some of the information included here is based on the Tennessee Grazing Coalition’s 2018 Pasture Planner, by Greg Brann. Design, layout and cover photo by Kelly O’Neill, Chesapeake Bay Foundation.
SOIL
Microbial life inside the soil engages a system of energy and carbon cycling, which fortifies plants by producing, storing, reusing, and releasing nutrients at appropriate times and in appropriate quantities. More life in the soil ensures better pasture and healthier livestock.

WATER
Check heat lamps and tightness of pump and pump houses against cold. A small stream of water flowing continuously through troughs will reduce freezing. Or, in ball waterers, set slight 3/8 inch gaps around balls. Painting open tanks black, with 1/2 tank covered also reduces freezing. A gallon jug of salt water floated in the trough may also prevent freezing.

FORAGE
Winter annuals are best used by livestock with a high nutritional need, such as growing animals and those in the last trimester of gestation or peak lactation. Livestock on wet pastures will cause soil pugging and compaction, harming forage growth during the remaining year. Limit winter feeding to a relatively small, easily accessible paddock far from areas that could be damaged by runoff. Choose an area where the soil may be low in nutrients, because it will receive a large amount of manure. Unroll large bales or scatter smaller bales across this area to improve manure distribution and reduce soil compaction.

LIVESTOCK
Livestock in good body condition tolerate cold weather best; wet, muddy animals are most vulnerable to wind and cold. Nutritional demands are required first for maintenance, then for growth, and finally for breeding. Round bales can be strategically placed to provide windbreaks and facilitate trampling of weeds. Wide forage distribution, such as a large unrolled bale, allows more animals to feed at one time, so the dominant animals are less likely to intimidate others.
“Grazing is a wonderful art. Learn to enjoy it. Work with those who have done it so you don’t become discouraged.”

Titus Martin

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Notes

- Capital RC&D’s Grass Roots program provides resources for graziers, including educational videos that may be viewed at capitalrcd.org/grass-roots.html.
SOIL

Inventory fields to identify areas that need additional or more varied forages. Relative to a monoculture, diverse plants not only extend the grazing season but also provide more sugar and amino acids to feed soil microbes, which then make nutrients available to plants. Plant diversity leads to more life in your soil and provides forage for a longer period than monocultures. Frost-seed (broadcast) a mix of legumes and brassicas for renovation. Pastures should be grazed low prior to frost-seeding to ensure seed contact with soil.

Too much legume (such as over 45% clover), or too low a carbon to nitrogen ratio in the soil, can break down aggregate stability, reducing pore space and increasing the soil’s susceptibility to compaction.

FORAGE

Stockpiled tall fescue can hold good quality nutrition through March.

Unrolling hay on well-drained pastures will lead to manure nutrients being spread uniformly to build soil fertility. Feed away from water areas, sinkholes, depressions, and other sensitive areas. Instead, feed on weedy areas or thin soils to tread weeds down, add nutrients and organic matter.

LIVESTOCK

Reduce stocking rate during prolonged winter or drought. The stocking rate should be based on periods when forage is limited, not springtime abundance. Appropriate stocking rate with proper pasture management will allow you to plan for no more than 90 days of feeding hay or silage per year.

Locate mineral feeders closer to water to encourage mineral intake in times of stress such as heat or cold, or where toxic plants are in abundance.

The least productive and hardest to manage 20% of your herd typically demands much more than its share of input costs. Culling PAYS!
February 2019

Jennifer Albright of the Goldfinch Meadows Farm, states:
- “A grazing network is like a support group for farmers. Don’t be afraid to ask questions of the people you meet along the way.”
- “The life balance that comes with rotationally grazing our cattle is worth its weight in grain!”

Pennsylvania Association for Sustainable Agriculture Conference.
See pasafarming.org/conference

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SOIL

No-till planted winter annuals can tolerate hoof action better than tilled plantings, because surface cover and root mass are left in place without compromising soil’s aggregate stability. Legumes are valuable in a mixed stand. A nitrogen deficiency is generally what limits grass production, and legumes make nitrogen available by extracting it from air spaces in the soil. To achieve the full benefit of mixtures, delay grazing until legumes bloom. Mixes provide some insurance of getting a stand and keeping cover, by extending the growing period, at both ends of the season.

Begin controlling any weed problems before they become unmanageable.

WATER

If livestock must drink from a stream or pond, install fence so that they drink only from a stabilized area without eroding the bank. Manure transmits disease organisms that are attached to sediment suspended in water. Hoof action then stirs up sediment and organisms, further lowering water quality and increasing exposure to disease. Allowing livestock in ponds causes sediment to erode where they enter, and the pond edge sloughs. The dam also is destroyed, reducing the life and use of the pond.

FORAGE

If you’re turning animals out on high energy grasses, wait for the frost to melt to prevent bruising that will hinder vegetative regrowth.

Resist the urge to graze too early! Continue feeding hay until grass is about 8 inches tall before grazing. This will set you up for good growth for the entire growing season.

If necessary, confine herd in a “sacrifice pasture.” Ideally, this should be a pasture with no sensitive areas (such as drainage ways, water bodies, or karst areas) facing south, if possible, to dry out more quickly when wet. Total area sacrificed should be less than 20% of all pasture acres, but preferably 10% or less.

LIVESTOCK

Grass tetany, a metabolic disorder caused by magnesium deficiency, is most commonly seen during warm spring weather when leaves are growing but cool soils prevent root uptake of magnesium. Feed magnesium from March through mid-May (or until daytime temperatures are consistently above 60° F) to prevent this potentially fatal condition for ruminants. Adequate phosphorus in soil enhances forage magnesium uptake and lowers risk of grass tetany.

Pay attention to animals’ body condition to ensure that they are getting the necessary nutrition.
Multiple livestock species help the farm utilize different forages and increase the variety of goods produced. Some parasites only affect one livestock species, so different animals moving through pastures will disrupt their life cycles. Goats are very useful in controlling poison ivy, tree of heaven, multiflora rose, Japanese honeysuckle, mile-a-minute, and other invasive plants and weeds.

Ann Basehore-Starbard raises dairy goats and sees their many benefits, especially for controlling invasive plants and cleaning understory debris. She makes fresh chevre cheese, and needs high quality milk that requires superior forages. She says that the goats are “getting goodness of land, soil and plants,” which “goes directly into quality of milk.”
LIVESTOCK
A mixture of grasses, forbs and legumes usually provides essential nutrients and reduces risk when a season is not ideal for one particular forage. Lush, spring pastures will be high in protein, which causes diarrhea and requires livestock to spend energy excreting the excess protein rather than using energy for milk production or growth. Balance fresh forage with mature forage or hay.

Normal rumination time is 5–9 hours after grazing; adequate rumination indicates a good balance of fiber and nutrients. Cattle normally graze 6 to 11 hours per day depending on their needs, taking the largest meal at dawn, a second just before dusk and usually a “snack” during the night, often between 1:00 and 4:00 am.

Four circumstances compound the chances of bloat: 1) Hungry cattle with rapid feed intake, 2) lush pasture, 3) high pH soil, and 4) wet forage. To prevent this, rotate later in the day after they’ve eaten in the morning, so they are less hungry and pasture has dried.

FORAGE
Winter annuals can provide early spring grazing, after they’ve provided beneficial cover in row crop fields to improve soil tilth, and prevent erosion and nutrient runoff. Inter-seeding annuals in pastures lacking forage also works well. Rye can be grazed very early in spring, a week or two before other annuals or perennial grasses, but it matures very quickly within a few weeks. Triticale and annual ryegrass are very palatable and have high-quality forage. Annual ryegrass can be easily established in a standing row crop or after harvest, and maintains quality for a long period in the spring.

Turn livestock into pastures when forage is at least twice as tall as the planned height when done grazing. Recommended ending heights are: cool season grass (fescue, orchardgrass) at 4 inches, warm season grass (bluestem, sudangrass) at 6 inches, native grass 8 inches.

SOIL
A soil test is essential. Knowing deficiencies aids in knowing where to feed hay and minerals, or where to hold stock to build nutrients. Soils low in phosphorus and/or potassium give a 75% or higher response to nutrient application. A cost-effective alternative to adding nutrients is to plant native grass, lespedeza, or hairy vetch, all of which require less nutrients.

Nitrogen should only be applied when plants are actively growing, such as early spring or fall after hot temperatures break.

Fertilizer is wasted if soil pH is 5.5 or lower. Soil biology is more active at a higher pH, improving overall soil health and performance.

Photo by K Bar K Farm
**Duane Hertzler** started Moo-Echo Farms in 1978 as a confinement dairy and switched to a grass-based operation in 1994, now managed by his son Neil. Duane credits grazing with simplifying life: “This system may not work for everyone, but I’m happy with the lifestyle and lower costs.” In addition to the organic milk premiums earned, grazing has reduced feed costs, vet expenses and the cull rate.

Check the Pennsylvania Grazing Lands Coalition calendar for upcoming pasture walks, field days and other events to learn what’s working for other graziers, under “about” on paglc.org. Also, see upcoming Penn State Extension events at extension.psu.edu/animals, and Pennsylvania Association for Sustainable Agriculture events at pasafarming.org/events/farm-based-education.
SOIL
Prepare and re-seed any winter feeding sites where soil disturbance and sod damage have occurred. Also, collect and spread any manure accumulated on winter feeding sites.

To promote weed control, no-till plant a warm-season mix, such as millet, sudangrass, cow-peas, soybeans, and buckwheat. It’s best if weeds don’t shade desirable forage; however, weeds are not necessarily your enemy. Many plants not typically considered forage offer good nutrition; lambsquarters, amaranth, common and giant ragweed, and curly dock are comparable to alfalfa in nutritive quality. Multi-species livestock and/or higher density grazing will encourage livestock to try a variety of plants. The best weed control is good pasture management: raise grazing or clipping height and use higher stock density. If you must apply herbicides year after year, your management is not breaking the weed life cycle. Rather than spraying entire pastures, consider spot spraying.

FORAGE
When pastures are at least 8 inches tall, begin rotating quickly, keeping residual cover and increasing plant recovery. “Take half/Leave half” of total forage height is good universal advice, and leaves enough reserves for plants to regrow. Turning into pasture with 8 inches of grass allows animals to get a mouthful; leaving 4 inches stubble allows plants to capture sunlight for quick re-growth.

If pasture “gets ahead of you,” RELAX! It’s not wasted forage; instead, it’s a powerful mix of nutrients, water retention, cooling, and plant maturation to enhance soil biological activity.

You might skip a field, bank that carbon until August, then graze hard and trample it down to prepare for stockpiling.

Graze down taller forage where needed to prevent shading of a young clover crop. Graze or clip hairy vetch or winter peas now; or hold off, allowing the canopy to develop and smother weeds.

Properly managing grazing/cutting heights may be the most important tool available. The second most important tool is time for rest, recovery, and regrowth. Maintaining the plant’s solar panel (leaf area) lets it harness more energy from the sun, rather than using precious energy stored in roots.
Poultry can be a valuable management tool for your operation. They eat parasite eggs, fly larvae, and weed seeds, while distributing manure.

“Overgrazing is a result of amount of time animals are exposed to the plant rather than number of animals exposed to the plant. Grazing periods of less than 24 hours are the ideal. Timing of grazing events is key. Short grazing periods must be followed by rest periods that fit the season and climate at the time. Rest will be different for Northwest PA versus Southeast PA.”

Justin Geisinger of Air Hill Acres Farm in Franklin County
LIVESTOCK

Walk pastures often to monitor forage growth and livestock. Be flexible in rotating animals without a rigid timeline or sequence if forage growth indicates a change. If forage is growing quickly, consider portable cross fencing to split pastures and increase stock density.

Livestock's nutrient intake increases if they graze only the upper portions of the plants, where there is the most energy and protein. In addition to being less nutritious, the lower portions of the plants also harbor parasite eggs.

FORAGE

Plant warm-season annuals if needed for additional summer grazing.

Make sure plants are established well enough to withstand grazing before putting animals in a newly seeded paddock. Do a "yank test," by grabbing a handful and pulling quickly (like a cow would with her tongue). If the forage comes out of the soil by the roots, grazing livestock would do severe damage to the new pasture. Until the soil is drier or pasture is more mature, graze or feed elsewhere.

Set aside pastures with excess spring growth for making hay or silage, or summer stockpiling. If you’re cutting hay, adjust mower height to leave enough leaf matter to promote regrowth, decrease weeds, improve stands, and enhance soil life.

SOIL

Pastures grazed with high stock density typically maintain or improve in fertility and pH, resulting from better manure distribution.

An earthworm count offers a quick assessment of soil health. Dig a one-foot square hole and count the earthworms when soil is moist, air temperature is 60-70° F, and soil temperature is 50-70° F. Healthy pasture land should have 20 or more earthworms per cubic foot.

WATER

Separate water, feed and shade for better animal distribution across the paddock.

If your watering system is portable, moving the water point to different locations will allow vegetation around a former water point to rest and recover, increasing future forage production there.
Brassicas, such as tillage radish, are considered “miner plants,” because their long roots bring nutrients from deep underground to the surface. They offer terrific forage, with nutrient content comparable to alfalfa.

“The learned art of grazing is knowing when to graze, and conversely, when to refrain from grazing.”

“Learn how not to go broke - manage for what you want, don’t spend for success.”

Cliff Hawbaker of Hamilton Heights Dairy Farm and Emerald Valley Farm
LIVESTOCK

Herds travel as a group if the distance to water or shade is over 800 feet, or if the lead animal must travel out of the herd’s eyesight. This will lead to worn paths, and reduce water intake. Easy access to water will alleviate this.

Eyes infected by pinkeye may attract face flies, which can then spread the disease throughout the herd. A heavy infestation of horn flies can suck a cup of blood per day per steer. If their tails are switching and they are swinging their heads to dislodge flies, they will not be productive.

Most insecticides (that work) can be harmful to beneficial dung flies, dung beetles, earthworms and other soil life, diminishing soil biology.

WATER

Observe livestock when they go to water; they should take 20 or more gulps before leaving. The taste of water with sediment, algae or other pollutants can reduce intake.

Don’t allow a trough to overflow; install an overflow pipe away from the water point to a drainage way. Place water troughs on a high point, so runoff water doesn’t flow through or close to the water point.

SOIL

Reduce or eliminate the need for clipping with higher forage utilization and trampling, through short duration high stocking density with an adequate recovery period.

Clipping fields can be helpful if the plant canopy is shading more desirable plants, or to control weeds. The cost (up to $20/acre) doesn’t always offer a good return on investment, but may help maintain vegetative growth and reduce weed seeds.

Most manure is dropped around shade, water, and hay. Resting these areas increases production and natural regrowth.

FORAGE

Native warm-season grasses have the best drought tolerance. They offer high production relative to inputs because they’re particularly adapted to lower fertility soils, and thrive in less-productive pastures due to lack of competition. A mix of warm-season grasses, native legumes and beneficial flowers provides forage when cool-season grasses slow in the summer. They also attract pollinators, songbirds and barn swallows to help manage fly populations.

Avoid grazing below the desired height. If pasture forages are limited, confine animals to a designated sacrifice lot and feed hay until pastures recover to appropriate heights to allow grazing again. If you are having to confine animals repeatedly and often, then the stocking rate is too high and needs some adjustment.
Fescue, perennial ryegrass, annual rye, white clover, and other grasses and legumes can be stockpiled starting mid-July through mid-August, to extend the grazing season.

“Do your own research, try new things and don’t be afraid to fail.”

“Take care of your land, and your land will take care of your animals.”

Bill Patton of Patton Family Farm in western Pennsylvania

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LIVESTOCK
Worming treatments are expensive. Skipping this practice uncover which animals are less tolerant and need culling. Tannin-rich plants, such as lespedeza, both grazed or in hay, can act as natural dewormers. When offered diverse forage choices, livestock may safely eat toxic plants in small quantities, which may have a deworming effect. However, be careful of prussic acid toxicity with johnsongrass, sorghum or sudangrass, especially when there’s new leaf growth following a drought or frost, when toxins are highly concentrated. A diverse diet where these plants are in small portions will minimize the impacts. Serious problems are more likely when animals are confined with no other choice but toxics to eat. Prussic acid doesn’t remain in hay or silage, so is rarely dangerous. Frost-killed plants should be allowed to dry for a week before grazing. Cattle habitually lounge under trees when shade is unnecessary, pressuring soil with overuse and increasing fertility to an undesirable degree. It’s best to fence cattle out of woods most of the year, only allowing them access when the heat requires it.

FORAGE
Plants absorb sun’s energy during the course of a day, and store it in roots at night. Moving a herd in the afternoon, rather than in morning, ensures they will get more energy. Sorghum, sorghum-sudangrass and other warm-season annuals extend the grazing season by providing forage in the summer when cool-season pastures are less productive. They allow other pastures to regenerate during the summer slump to provide forage later in the fall. They may also be harvested as hay or haylage. Pastures where forages will be stockpiled should be grazed or mowed to a consistent height after the grasses have produced most of their seed heads, so more of the growing forage will be leaf material with greater nutritional value than stems. During a drought, inventory grass and predict how long it will last. Feed hay on a sacrifice pasture until others recover.

SOIL
Sow seed for the season in which you lack forage and soil cover. For spring, fall and winter, sow tall fescue, orchardgrass, and winter annuals between Aug. 15 and Oct. 1, when there is less weed competition and plenty of moisture. Now is a good time to apply high-density grazing pressure on fields to stimulate the waiting seed bank. Cool season annuals such as wheat, rye, ryegrass, oats, radishes, and turnips can extend the grazing season into the fall. Small grains to be used for forage should be planted earlier and at a higher seeding rate than if they are planted for grain. Annuals may be interseeded into pastures that have been grazed, so newly-seeded annuals have less competition.

WATER
Offering a clean supply of fresh water on demand is critical to animal health. Automatic waterers can provide a constant source of fresh, freeze-proof water all year long. Drain them at least 4 times a year. Check springs during low-flow period. You may need more water storage if flow is low; a septic tank works well here.
Plant diversity improves drought tolerance, as different plants thrive in wet and dry times, and tap water at different soil depths. This is a good time to seed rye, ryegrass, crimson clover, vetch, oats, brassicas and other winter annuals for late fall and early spring grazing.

“Grass is very forgiving. It will wait for rain to come after a drought. It will recover from an unintentional overgraze if given adequate, but not excessive, rest.”

Justin Geisinger of Air Hill Acres Farm in Franklin County

Ag Progress Days. See agsci.psu.edu/apd.
SOIL
Some pastures may need additional vegetation. Annuals can improve soil health faster than perennial forages, not only because of increased biomass, but because their root systems die sooner, feeding the soil life and improving porosity and aggregate stability. However, they’re more costly than perennial forages that protect soil for a longer period.

If a stand of **cool-season grass is** 50% or less, reestablish. Distance between tall fescue plants should be 6 inches or less; plants need 3 or more tillers the size of a pencil lead. Seed tall fescue now and over-seed with legumes in February. Over-seeding warm season forages with **red and white clover** will reduce the need for additional nitrogen. Cereal rye, annual ryegrass, and canola rape can weaken surrounding weeds. Hairy vetch and Austrian winter pea can smother undesirables. High biomass production with a heavy canopy of vegetation shades undesirable plants.

FORAGE
Evaluate your winter feed supplies by testing hay or haylage, then determine what additional nutrients might be needed.

**Stockpile!** Exclude livestock from paddocks to be stockpiled. Tall fescue and early orchardgrass accumulate biomass in late summer and fall, but fescue maintains quality better over the winter. Pastures without legumes may need a fall nitrogen application. To get the greatest utilization from your stockpiled pastures, strip graze allowing animal access to no more than 3 days of forage at a time.

LIVESTOCK
Adjust **stocking rate** to your management practices. Proper grazing management allows pastures to support more livestock than over-grazed or infertile ground.

Stocking rate can be increased as long as you can rotate faster and still have 40 days of pasture recovery.

During drought, confine animals to one paddock or continue to rotate and feed hay until other paddocks recover. Livestock nutritional demands are not as high as they are in cold, wet, winter conditions.
The USDA Natural Resources Conservation Service has technical and financial assistance programs to help with grazing systems, streambank fencing, conservation tillage, animal waste storage, nutrient management, erosion control, and many other practices that may help on your farm. Contact your local office for information.

Matt Bomgardner of Blue Mountain View Farm has consistently improved his pastures with greater plant diversity, resulting in soil organic matter increase from 3% in 2007 to 6.0-6.7% in 2017. His cattle enjoy stands rich in clover that boost production. He also maintains fall reserves by removing cattle when grass growth slows to prevent over-grazing.
SOIL

Vegetated cover is one of the most important factors needed to improve soil health. Lack of cover allows rainfall to batter soil, increasing compaction and detaching any soil that’s prone to being transported in runoff. Infiltration is reduced and runoff is increased. Adequate cover also moderates soil temperature, improving moisture availability, reducing evaporation, and boosting biological activity underground.

Prepare for winter and identify a sacrifice pasture, like you would cull livestock. Winter overgrazing damages root systems and leads to soil compaction, limiting forage growth throughout the year. Minimize this by concentrating your winter feeding to a relatively small area that is easily accessible. Cull the least productive pasture, by feeding hay or haylage there when there isn’t adequate fresh forage.

You might also choose an area where the soil is low in nutrients, because it will receive a large amount of manure. Nutrients will accumulate and weeds will be trampled, making it easier to establish a fresh seeding.

Oats, radishes and turnips provide plenty of fall and winter grazing, but will not survive the winter, so might be a good fit where the field needs to be replanted for other reasons.

WATER

Consider manure storage options, so that you can limit spreading to when plants can use nutrients. With heavy liquid manure, hauling is much more difficult and may cause soil compaction. Dry manure can be composted, and stored on a stacking pad with a roof to keep rain water away from it, so that the clean water says clean and doesn’t take away the nutrients.

FORAGE

Grass no longer grows when temperature drops below 59 degrees.

When the soil is dry, feed away from heavy use areas to improve manure distribution and reduce spreading costs.

LIVESTOCK

Nitrate poisoning can result when nitrate remains in hay, and this is most common in a drought year. Nitrate concentration is highest in the base of the plant. For this reason, a higher grazing height can protect your animals. Test for nitrates.

Fall-calving cows require higher nutrition, with better-quality pasture or hay, through the winter, than spring-calving cows. Be sure to monitor their body condition.
Do your *Manure Management Plan* or *Conservation Plan* need updates, with changes to animal numbers, management, or acreage? This is a good time of year to make adjustments based on your operation’s past results and future goals. Contact your local Conservation District or NRCS office to request technical or planning assistance.

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LIVESTOCK

After frost, sweetness and palatability increase in tall fescue, while alkaloids decrease. Animals will test new plants and if they’re nutritious, will return to eat them; if the plants have negative effects on health, they will not eat them again. Young stock learn from their mothers and exposing calves to feed and forage with their mothers improves overall intake.

FORAGE

Forages can typically be grazed down to 4 inches. Inventory available standing forage and hay supplies, to estimate winter requirements. Forage lasts longer when animals are limited to an area for no more than three days at a time, such as with strip-grazing.

SOIL

If you are feeding in a single area, be sure to spread waste hay, mud and manure from there to elsewhere on the farm to distribute nutrients. Unrolling hay improves the soil by increasing animal and manure distribution. Cattle pass 80% of nutrients through manure, so managing distribution helps maintain pasture fertility.

Adding goats and/or sheep to your herd makes further use of various forbs and shrubs. If you don’t stock more than one goat per cow or one ewe per two cows, the grazing behavior of the cow will not be impacted. When diversifying livestock, be sure to consider perimeter fence for the additional livestock type.
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**Titus Martin**, grazing advisor for the USDA NRCS, suggests:

- Invest first in livestock and grasses, rather than equipment.
- Monitor grasses by walking pastures and seeing what animals enjoy. “You don’t need a new grass to have a better grass, you need to better manage the grass you already have.”

You might explore opportunities to tap new markets for eggs, milk and livestock, with consumer willingness to pay a higher price for healthier meat and dairy products from grass-fed livestock and poultry. Organic markets pay a premium price, without the wide fluctuations of conventional markets.
SOIL
Control traffic in pasture and stay off areas when wet. A diverse community of plants with fibrous roots and taproots that can rest for 45 days or more will suffer less compaction.
Living roots growing throughout the year will provide food for soil microbes and reap the benefits of their actions. Keep soil covered as much as possible to conserve moisture, regulate soil temperature, prevent erosion, and suppress weed growth. Native grasses are well adapted to lower fertility soils.

WATER
Manure is a benefit when spread by animals on pasture, but it can be a cost and environmental hazard adjacent to water areas.
Heavy-use area runoff into a pond or stream can cause disease to animals drinking there, so avoid feeding above water sources. Ideally, locate feed areas 300 feet from water on uplands surrounded by grass or trees.

To filter nutrients and capture sediment, make sure feeding and sacrifice areas have a buffer of 35 feet of healthy pasture, or even better, a forested buffer, between them and a water body.

FORAGE
Livestock can graze through snow cover but they should not graze on wet soils, as this can cause pugging and compaction, damaging soils and diminishing future pasture productivity.

The minimum height to support regrowth on cool-season grass is 4 inches, although it can be grazed down to 3 inches when no additional growth is likely, usually starting in mid-December.

Electric poly wire is a convenient temporary fence for subdividing pasture areas.

LIVESTOCK
Use best quality pastures during the breeding season, as well as during calving, peak lactation (calves’ third month of life), and third trimester of pregnancy.

Feeding in hay rings limits access to calves and more timid cows. Unrolling hay is safer for small calves, and helps calves’ digestive systems develop earlier. Consider creep grazing: allowing calves to graze ahead of cows, increasing their daily gains.
Look back at 2019 and consider 2020. Did you have a good balance of livestock numbers and forage availability throughout the year, especially at calving and other times of high demand? Would adding other livestock species or forages complement the operation? Could your paddocks be divided more efficiently?

Laura Kenny, Penn State Extension equine specialist, says that horses can damage fields more than other livestock type because they graze closer to the ground. Continuously grazing pastures without rest leads to overgrazing and kills preferred plants. Rotational grazing allows for rest and higher stock density. Kentucky bluegrass tolerates overgrazing and trampling, spreads to fill bare spots, but goes dormant in summer. Orchardgrass and bromegrass may yield more forage palatable to horses.
Mountains-to-Bay Grazing Alliance

The Mountains-to-Bay Grazing Alliance brings you this calendar to provide ideas on grass-based livestock production. The Chesapeake Bay Foundation (CBF), Capital Resource Conservation and Development (RC&D), Pennsylvania Grazing Lands Coalition, and other regional partners are working together to increase pasture-based livestock production in Pennsylvania, Virginia, and Maryland.

The Chesapeake Bay Foundation (CBF) is dedicated to restoring Pennsylvania waterways and the Chesapeake Bay, and has a long history of working with agricultural producers to improve profitability and water quality. See cbf.org/issues/agriculture/.

The Pennsylvania Grazing Lands Coalition (paglc.org) works to maintain and improve the management, productivity, and health of Pennsylvania’s grazing land through education, mentorship, and research.

The Capital Resource Conservation and Development (capitalrcd.org) Area Council is a seven county non-profit organization that networks people, resources and projects to promote responsible use and conservation of our region’s natural, community and economic resources.

Pennsylvania Association for Sustainable Agriculture (pasafarming.org) seeks to improve the economic viability, environmental soundness and social responsibility of food and farming systems.

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Additional Resources

The Stockman Grass Farmer (stockmangrassfarmer.com) is a grazing publication focused on the art and science of grassland agriculture.

Progressive Forage magazine (progressiveforage.com) offers practical information about forage production.

On Pasture (onpasture.com) is an online magazine with current pasture information.

Graze (grazeonline.com/) is a print magazine devoted to promoting management-intensive rotational grazing and family-scale livestock farms.


Penn State University’s research and educational materials on forages are available at forages.psu.edu.

National Grazing Lands Coalition (grazinglands.org) provides technical assistance to increase awareness of the importance of grazing land resources.

Pennsylvania Association of Conservation Districts (pacd.org) support Pennsylvania’s Conservation Districts who work to enhance locally led efforts to support the wise use of the state’s for clean water and healthy soil.

Many Pennsylvania Resource Conservation and Development Councils (parcd.org) support grazing projects.

Project Grass is a cooperative effort by local farmers, County Conservation Districts, USDA and other industry partners to improve pasture and rotational grazing systems.

Pennsylvania Certified Organic (paorganic.org) educates and certifies growers, processors and handlers of organic crops, livestock and livestock products.

The USDA Science and Training Library (conservationwebinars.net) provides access to webinars on the latest research and industry practices.