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Imperial to Metric Conversion Chart

<table>
<thead>
<tr>
<th></th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 acre</td>
<td>0.405 hectares</td>
</tr>
<tr>
<td>1 foot</td>
<td>0.305 metres</td>
</tr>
<tr>
<td>1 inch</td>
<td>2.54 centimetres</td>
</tr>
<tr>
<td>1 pound</td>
<td>0.454 kilograms</td>
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</tbody>
</table>

FOR MORE INFORMATION

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Introduction to Rotational Grazing as a BMP

A Best Management Practice (BMP) is a proven, practical, and affordable approach to conserving soil, water, and other natural resources in rural areas.

Rotational grazing is a BMP that farmers can use to increase the health of their pastures, their cattle, and the environment. Moving cattle from paddock to paddock during the grazing season has many benefits, and requires few additional resources. This booklet explains the principles of rotational grazing, provides examples of different types of rotational grazing, fencing and watering systems, and outlines the benefits of grazing to the environment. It also features profiles of four Ontario farmers who have successfully implemented rotational grazing and other BMPs on their farms.

Background to Grazing in Ontario

Ontario is home to over 19,000 beef farms. Over the entire province, there are about 328,000 beef cows, or, including the dairy industry, a total of 1,880,200 cattle and calves. All beef cattle spend at least the first part of their lives on pasture. Herds vary in size, but many are small to medium sized with less than 122 head.

Grazing systems in Ontario range from the continuous grazing of one area over a long period of time to intensive rotational grazing of small areas for short periods of time. With continuous grazing, cattle often spread out and become selective, overgrazing in some areas and undergrazing in others. With rotational grazing, livestock are moved to new pastures based on forage condition. This allows for consistent and efficient pasture utilization by giving the pasture plants sufficient time to recover. It can also increase the carrying capacity of the land: increasing the number of grazing days available, the stocking rates, or a combination of the two.
Forage Growth and the Importance of Rest

The impact of grazing on forage plants can be detrimental, beneficial, or neutral. The net impact of grazing on pastures depends on several factors: when the grazing occurs, how much plant is removed, and how soon grazing re-occurs.

Through photosynthesis, energy is produced in the leaves of plants and stored in the roots. It is used to produce new roots, leaves, flowers, and fruits. There is a direct relationship between root growth and the amount of leaf area developed. Removing a plant's leaves (as with grazing) decreases its ability to photosynthesize and thus uses the stored energy in its roots to recover and continue growth.

A unique characteristic of grasses is that they grow from the bottom up, with growth points located close to or underneath the surface of the ground. Plant scientists and graziers agree: grass growth may be stimulated when lightly grazed. However, if the grass does not have a chance to replace the energy used to recover from grazing before being grazed again, its energy stores may be depleted to the point where it can no longer recover from disturbance: this is known as overgrazing.

The quality and quantity of forage available for livestock plays an important role in their growth and future market value.

Overgrazing will result in less root growth and less forage production.
Careful implementation of rotational grazing can prevent pastures from being as overgrazed as the field shown in the picture above has been.

Plant vigour declines when plants are overgrazed. For example, one study\(^1\) found that when 50% of leaves were removed, all roots continued growing, but when 60% of the leaves were removed, nearly half the roots stopped growing. Note that herbaceous plants (e.g. clovers) and shrubs grow from the tips of their stems or branches, and thus the rules for grasses do not apply to these types of plants.

Management practices should aim to avoid having more than half of a plant’s leaves removed at any time; this can be accomplished through rotational grazing. Rotational grazing can also allow you to always have actively growing forage in the fields. The grass plants will also recover much more quickly and grow to provide more forage to be grazed later.

**Four Principles of Pasture Management**

Rotational grazing puts into practice the four principles of pasture management.

1. Balance the number of animals with available forage supply.
2. Manage livestock distribution effectively.
3. Balance periods of grazing with sufficient periods of effective rest to manage and maintain the vegetation.
4. Avoid grazing during sensitive periods. This includes times when fields are flooded, soils are saturated, drought conditions prevail, and during wildlife nesting.

There are several types of rotational grazing systems, differing in the number of fields required and how often each is used.

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## Examples of Continuous and Rotational Grazing Systems

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CONTINUOUS GRAZING*</th>
<th>DEFERRED ROTATIONAL GRAZING</th>
</tr>
</thead>
</table>
| **OVERVIEW** | • one pasture system  
• livestock have unrestricted access throughout the grazing season  
• livestock do not move out of the field for most, if not all, of the grazing season | • three or more pastures  
• one pasture is left to rest for a year  
• livestock are rotated through all other pastures  
• a different field is left to rest each year |

### ADVANTAGES

<table>
<thead>
<tr>
<th>CONTINUOUS GRAZING*</th>
<th>DEFERRED ROTATIONAL GRAZING</th>
</tr>
</thead>
</table>
| • typical system used in Ontario  
• less management needed  
• minimal capital costs  
• under moderate or light grazing pressure, creates a diversity of habitats for different wildlife and plant species  
• maximum gains per animal because they can select the most nutritious forages | • works well on marginal lands where it is difficult to establish forages on an on-going basis  
• some management flexibility  
• can provide a longer grazing season, reducing the need for feeding harvested forages  
• slight improvement in plant vigour, animal distribution and forage use over continuous grazing  
• long rest period for plants to recover |

### DISADVANTAGES

<table>
<thead>
<tr>
<th>CONTINUOUS GRAZING*</th>
<th>DEFERRED ROTATIONAL GRAZING</th>
</tr>
</thead>
</table>
| • selective foraging leads to decreased forage quality and yields, and increased weeds  
• need to re-establish forage over a shorter timeline  
• inefficient harvest and nutrient distribution because of poor livestock and manure distribution  
• greater forage losses due to trampling  
• no rest period for plants  
• cattle are not accustomed to people and handling | • requires more management than continuous grazing  
• may have increased needs for fencing and watering systems  
• forage production and utilization not as high as in intensive grazing  
• one field not available for production each year |

*This is not an example of rotational grazing.*
### SIMPLE ROTATIONAL GRAZING AND TWICE-OVER GRAZING

**Simple rotational grazing**
- three or more pastures
- livestock are moved to each pasture once during the grazing season
- allows for one period of grazing and several periods of rest for forages each year

**Twice-over grazing**
- three or more pastures
- includes two passes through each field
- first pass keeps grass from going to seed and in an active growth stage for second pass

**ADVANTAGES**
- works well on marginal and productive lands
- some management flexibility
- can provide a longer grazing season
- increases forage production and pasture conditions
- allows for forage regrowth
- reduces the need for feeding harvested forages
- better manure distribution
- potential for targeted grazing, which can manage brush expansion, and weed invasion
- potential to avoid certain areas during sensitive periods of the grazing season like when fields are flooded, soils are saturated, drought conditions prevail, and during wildlife nesting

**DISADVANTAGES**
- requires moderate amounts of management
- may have increased needs for fencing and watering systems
- forage production and utilization better than in continuous grazing but not as high as in intensive grazing

### INTENSIVE ROTATIONAL GRAZING

- many pastures, usually eight or more, sometimes referred to as paddocks
- livestock are moved frequently based on forage growth and utilization
- multiple passes through each paddock possible

**ADVANTAGES**
- works best on productive pastures
- highest forage production and use per acre, assuming proper stocking levels
- stocking rates can typically be increased, with care to balance forage supply and demand
- number of grazing days can be increased
- more even distribution of manure
- favourable forage composition maintained because cattle are forced to graze all plant species equally
- weeds and brush can be controlled because cattle are less able to select against them
- more grazing options
- cattle handling becomes easier as they get accustomed to human contact
- disease and pest issues are controlled because cattle are frequently being moved away from fresh wastes
- sensitive areas can be avoided easily

**DISADVANTAGES**
- requires intensive management
- forage quality and quantity must be monitored frequently
- highest initial costs for fencing and watering systems
- creates uniform wildlife and plant habitat through even grazing
- may not work on less productive land
Controlling Desirable and Undesirable Plants

Rotational grazing improves pasture species composition. When pastures do not have enough rest after grazing, the plants most palatable to livestock are less abundant, and are known as “decreasers”. “Increasers” are often less palatable, low-growing, low-producing plants that become more common under sustained grazing pressure.

For example, on the Carden Plain, in the Kwartha Lakes area of Ontario, the native Prairie Smoke (*Geum triflorum*) is increasing on some pastures because cattle do not eat it, and it is allowed to keep growing without stress. Viper’s Bugloss (*Echium vulgare*) is classified as an “invader” because it is not native to Carden Plain. It is undesirable to cattle and thus behaves the same way as an increaser species.

Cattle are selective of what they eat, and will often avoid browsing weeds if given the option, i.e. when stocking rates are low. However, some weeds are readily grazed when immature. Pastures that are part of rotational grazing may therefore have fewer weed problems as a result of increased grazing of young weeds and the improved vigour of the desirable plants.

Improving the distribution of cattle in a field will also result in well-distributed manure, the nutrients of which will allow the forage to grow vigorously.

Importance of Pastures to Grassland Birds

Pastures function as grassland ecosystems in Ontario, and grazing can play an important role in maintaining their health and diversity. This is particularly important for grassland birds, like the Bobolink and Eastern Meadowlark, which are rapidly declining both locally and globally due to habitat loss, habitat fragmentation, incidental mortality, and other factors.

Different species of birds prefer different grass heights for breeding and/or foraging. Many grassland birds nest among the tall grasses that shelter them from predators. They remain there until their young are old enough to leave the nest (“fledge”), which is usually by mid-July. However, if the area that includes their nest is grazed or mowed before they fledge, the young are often killed.

Grazing cattle in a two-to-four field rotational system allows for some forage choice, and thus grasses can be grazed to a variety of heights. In more intensive rotational settings, create diversity by allowing some fields to be grazed more heavily than others in one year and then resting them the next year.

Leaving some fields ungrazed until later in the summer can provide needed habitat for ground-nesting wildlife, as mentioned earlier. Ungrazed and resting fields can also provide habitat for many invertebrates essential to the diets of birds and other wildlife, and to the pollination of both crops and native plants.

As Ron Reid, former Executive Director of the Couchiching Conservancy has said, “The future of grassland bird populations in Ontario depends on the future health and sustainability of the livestock grazing industry.”
Additional Benefits to the Environment

Rotational grazing has other positive effects on the environment. If your pasture is divided into several paddocks, livestock can be excluded from sensitive areas when conditions are not suitable for grazing, such as when pastures are too wet or too dry.

For example, graze riparian areas in the late summer rather than in the spring: this protects the stream banks from compaction and erosion. Stable banks help maintain water quality and will improve fish habitat.

Land covered by healthy pasture reduces the risk of soil erosion from rain, snowmelt, and wind. Overwintering pasture plants will trap snow, insulate the ground, protect the plants, and increase water availability. These permanent cover systems are also more efficient at storing carbon in the soil than annual crops.

How do I Implement Rotational Grazing?

The previous table (pp. 4–5) outlined the basic forms of rotational grazing systems. The best way to choose the most suitable system for your operation is to prepare a grazing plan. This generally includes:
- Goals of your livestock operation
- Property inventory: soil type, forages, current fencing and water sources
- Summary of any sensitive areas on your property (e.g. riparian or wetland areas, known species at risk locations)
- Forage requirements: preferred livestock numbers, grazing time, forage quality
- Desired rotational grazing method, including paddock size and layout
- Process to implement method: includes required fencing and watering systems
- Record-keeping and monitoring: keep track of information such as forage growth, forage remains after grazing season, number and weight of cattle, length of grazing period, etc.

See the inside front cover for a list of resources available on this topic. A rotational grazing workbook is also provided at the end of this booklet (pg 20) to assist you in preparing your plan.
Watering Systems

Water accounts for 50–80% of an animal’s weight, and feed intake is directly related to water intake. Research has shown that livestock prefer alternative water sources to surface water. Studies in western Canada showed steers gained 16–19% more weight over a 90-day period when they drank from a pump-fed trough versus directly from a dugout.

Options for watering systems include pumping water from wells, dug-out ponds, or streams. These systems can be activated by a nose pump, or can feed into a trough where the water level can be controlled by a float or motion detector. Solar-powered pumps are an easy and relatively inexpensive way to provide water to cattle, particularly in back fields where electricity is not available. Hydraulic ram pumps may work in areas of flowing water or water under pressure through a pipe. Water can also be pumped long distances using pressurized systems; this is useful when there is no water available at the site.

Fencing Options

Fences are an essential part of rotational grazing systems, as they are used to create paddocks and keep cattle from particular areas at specific times of the year. Fences can be permanent, temporary, or a mix of the two. For example, permanent page-wire, barb-wire, or high-tensile electric fences can be used around the exterior of the property, and temporary poly-wire fences can be used to subdivide fields into smaller paddocks.

Temporary fencing can be especially valuable as you learn what sizes and layouts work best for your farm, and to avoid having to install multiple fences on small fields. Permanent fencing can be installed in the interior of the field (cross-fencing), particularly if only a few fields are being created and you are comfortable with the layout.

It is essential to consider access to water when developing a grazing management plan.

The physical characteristics of your site will influence the type of fencing system needed. In areas of shallow to bedrock soil, permanent page-wire fencing with brace posts and rock-filled cribs may be needed.

Numbers of Paddocks and Paddock Size

The number and sizes of paddocks needed depend on the following factors:
- Availability of shelter and water
- Forage type, quantity and quality
- Soils and topography
- Stocking rate
- Grazing period
- Grazing strategy

Each paddock needs to include access to drinking water. This can be pumped from near or far sources, but preferably situated so that cattle are no more than 800 feet away at any time. With careful planning, water sources can supply water to multiple paddocks at the same time.

Cattle require shelter from sun and wind, particularly during weather extremes. This can be achieved by planting windbreaks, setting paddocks near treed fencerows or woodlands, or by constructing shelters.

Forage can be quite variable across a field. You will have more control of plant growth and the grazing process if the soils, topography and plant communities within each fenced area are as consistent as possible.

The minimum number and size of paddocks, and the total acreage required, can be calculated using the equations found in the workbook section of this booklet (pg 20). Note that increased herd weights and increased numbers of grazing days can both play a role in determining the carrying capacity of the paddock. It is important to observe and adjust your numbers of cattle or grazing days as conditions suggest.

Movement of Livestock

Movement of livestock from one paddock to another should be based on the height and availability of forage, not a predetermined amount of grazing time. For example, forages grow fast in the spring and slower towards the end of the summer and fall, so the period of rest required between grazing becomes longer as the season progresses.

The faster the grass is growing, the quicker you should move from pasture to pasture. It is the condition of the grass in the last paddock in your rotation that should dictate how quickly you move. You want the grass in that paddock to be at the ideal height when you get there. If it is too short, there will be a shortage of feed; if it is too mature, the quality will be low. In either case, animal performance will suffer and the grass will also be set back, resulting in a weaker pasture.

Your grazing management plan needs to consider how to move livestock between fields. In some instances, livestock lanes or corridors need to be included in your layout. This can allow you to move cattle without having them enter an area that has been recently grazed or an area that you do not want them to start grazing in yet.
If possible, rotational grazing systems should avoid using the same paddock at the same time each year so that plants are not grazed at the same growth stage each year.

In Summary

Rotational grazing can take many forms, but always allows fields to be unused for a period of time. This will give the grass a chance to grow, regrow, and replenish energy stored in the roots. These and other benefits are listed below.

ANIMAL HEALTH BENEFITS
- Improved weight gain
- Potential decrease in diseases and pests

ECONOMIC BENEFITS
- Improved carrying capacity: potential increase in stocking rates and/or increase in grazing days
- Improved animal weight gain
- Lower input costs: less need for fertilizer and weed controls
- Lower pasture management costs: less need to re-seed or rejuvenate pasture
- Lower feed costs: less supplemental and harvested feed required

ENVIRONMENTAL BENEFITS
- Improved habitat: delayed grazing of some fields until mid-July can increase habitat for grassland species, including species at risk
- Less impact on environmentally sensitive areas: for example, streamside areas can be grazed in dry periods (late summer) with less damage

Remember, there is no single plan that works for everyone. Your rotational grazing plan must be developed to suit your unique farm operation and goals. It also must be flexible to take into account fluctuating livestock numbers, forage growth, and weather conditions. A rotational grazing workbook is provided on page 20 to help you with your plan design. For information on grazing near water, refer to the BMP book, Streamside Grazing. If you follow the four principles of grazing management, rotational grazing can result in increased health of both your animals and the environment.

FOUR PRINCIPLES OF PASTURE MANAGEMENT
1. Balance the number of animals with available forage supply.
2. Manage livestock distribution effectively.
3. Balance periods of grazing with sufficient periods of effective rest to manage and maintain the vegetation.
4. Avoid grazing during sensitive periods. This includes times when fields are flooded, soils are saturated, drought conditions prevail, and during wildlife nesting.
Profiles of Ontario Farmers

John Kinghorn

BACKGROUND

John Kinghorn and his wife, Grace, have a cow-calf operation with about 35 cows at their home farm near Cambray, Ontario. They also run 110 stocker steers on 1500 acres rented from the Nature Conservancy of Canada on the Carden Plain north of Kirkfeld.

FENCING AND MOVEMENT

On the Carden pastures, permanent cross-fencing was put in to split the 1500 acres into two main paddocks, and one small one. Despite clearing a 15-ft swath, John finds that there is too much brush, and too much problem with getting grounding to use electric fencing on the large fields. He uses a page-wire fence instead.

However, on the family farm he has a 12-gauge electric wire going around the property and his 11 paddocks. He uses polywire to subdivide these paddocks. "It really pays to train the cows to the electric fence — they’ll leave it alone."

John pays close attention to the status of his pastures in order to decide when to put both the stockers and cows out. "I’m watching the grass like a hawk come the end of April. I want to get that first blush of grass, no question."

He doesn’t consider it a problem to move the cattle from paddock to paddock. "On the Carden pastures, I’ve got a four-wheeler, and always have a box of grain and salt on the back, and within a couple of weeks they’ll come to me, and we get along ok. On the large fields, you can’t chase cattle — I have to have them come to me."

“At home, the cows tell me at 6 a.m. when they want to move; they’ll be waiting right at the fence. It’s not a lot of effort to manage the 11 paddocks at all.” He moves the cows based on the condition of the pasture, and not in any set routine.

Left: John Kinghorn understands the importance of rotational grazing. Both of the properties he manages have multiple compartments: three on the Carden Plain and 11 on the home farm.

Right: John has added a trough to an area where a natural spring comes up from the ground. This provides a source of clean water for the cattle, and lessens disturbance to the adjacent wetland.
**WATERING SYSTEMS**

John is a big believer in the importance of clean and accessible water. “You can control where the cattle are just by putting water troughs in the appropriate places.” He has found that cattle will avoid wetlands and creeks in the field in favour of the water troughs, which are supplied with a solar-powered watering system.

On the Carden property, they have put in three drilled wells, and one solar-powered surface water system. Clean, 500-gallon metal tanks act as a trough, with a 25-ft radius of limestone screenings to keep the surrounding area from getting torn up or muddy.

**WILDLIFE**

A benefit of grazing on the extensive Carden Plain is the ability to maintain and preserve the grassland-like system. “If the cattle were not to be on that land, it would really turn to brush, hawthorns, and cedars. It would only be a matter of maybe 10 years before it would be taken over.”

An endangered bird, the Loggerhead Shrike, nests in the short grass of the Carden Plain. Grazing helps to keep its habitat in place: a win-win situation for naturalists and ranchers.

Grazing creates in the best habitat for the endangered Loggerhead Shrike.

**FINAL WORDS**

“By managing my pastures, the cows are in pretty good condition. They provide a good milk supply to their calves, and have fall weaning weights of 750 lbs, compared to the 500 lbs of other producers.”

“I try to be a good steward of the land — that's the way my parents were, and I've learned a lot from various information flows. I try to keep myself abreast of what's going on. I'm a bit of an innovator, and willing to try new things. I'm trying to put something back in.”
Susan Winter

BACKGROUND
Susan Winter is a farmer in the Kirkfield area, on the Carden Plain. She has a cow-calf operation with about 40 cows on 300 acres, and custom grazes about 165 stockers on two other pastures: one 300 acres and the other 900 acres in size.

COW-CALF AND STOCKER OPERATION
Starting in 2012, Susan is switching to a spring calving operation, to avoid the challenges associated with calving in the winter. Calves are started on creep feed at six weeks. This allows the calves to recognize grain and become desirous for it, resulting in greater marbling in the end product, and better market recognition. Indeed, she has recently created a brand, Carden Angus Beef, and keeps some of her calves back for that program.

The stockers are about 700 lbs when they go on pasture, and average 300–350 lbs of gain by the time they are taken off and sold. This period of grazing is generally from the May long weekend to the first two weeks in October.

MOVEMENT AND FENCING
Susan is aware of the damage that can be done to pastures in a sensitive stage, and will not put the cattle out until she feels the field is ready, despite what others may be doing in the area. "If you put the cattle out one week early, you can lose three weeks of grazing time at the end of the season."

She waits until she sees grass in the three-leaf stage before beginning grazing. "I have two goals when I put the cows out: if you put 100 head out, all 100 have to come back, and they all have to increase in gain."

A challenge that Susan and other ranchers in the Carden Plain often face is very little soil present or exposed limestone bedrock, and thus they cannot anchor a fence post into the ground. Instead, she makes an inverted wood T-post using two five-foot cedar posts. These wood posts are much easier to install and less expensive than steel T-rail posts.
The base or horizontal post is notched in the centre and the base of the vertical post is shaped to fit snugly in the notch of the horizontal post. When you stand it up, the T is upside down. The bottom is spiked with two eight-inch spikes that help to hold it together. For anchor posts, Susan uses a stone-filled wooden crib built using five-foot notched cedar posts secured with crib wire. The crib is then filled with rocks to provide the necessary weight and stability to anchor the fence. Most of the fences that Susan constructs are page-wire held in place by these wooden T-posts, with the stone cribs acting as the anchor posts.

**WATERING SYSTEM**

The 300 acre property that Susan runs her steers on is split into two 150 acre paddocks. Each of these paddocks have a solar powered pump system that provides water to the cattle from a well, as the creek has been mostly fenced off. However, on the 900 acre property, there are no paddocks, and cattle are free to drink directly out of creeks; the rocky area helps to avoid damage from their movements.

**VALUE OF ROTATIONAL GRAZING**

Susan began rotational grazing in 2010 after being visited by AAFC and OMAFRA specialists. Using two 150 acre pastures instead of one large one works well on her marginal land. It gives the grass a chance to rest, without the hassle of moving them every day.

“The thing I like about rotational grazing…instead of the cattle randomly moving around, picking here and picking there, is that you make them concentrate on the grass.”

The 300 acre parcel that the cattle are on is split in half, and the cattle are rotated between the two halves every six weeks. Each of these 150 acre sections has a solar system that provides water to the cattle from a well, as the creek has been fenced off.

**FINAL WORDS**

“Delaying the start of grazing is the main thing that I have done that has made an impact.”
Kim and Charlie Sytsma

BACKGROUND
Kim and Charlie Sytsma are the owners of 8th Line Farm in Athens (near Brockville). Their son, William, farms with them, although he has his own farm too. Their farm is a birth-to-finish operation that calves 220 cows on about 1600 acres (800 acres owned and 800 acres rented).

The Sytsmas have pastures of various sizes, from 40 acres with a lot of bush, to five acres with no bush. Rotational grazing has helped to increase their pastures’ carrying capacity, and has given them flexibility when conditions are not ideal for forage growth. “If we didn’t graze rotationally, in drought situations, after the cows had made their way through the fields, there would be nothing left for them to eat.”

FENCING AND MOVEMENT
Although some rail fencing and page-wire is used, particularly along the road, most of the fencing on the farm is high-tensile electric fence. As they have a number of trees in their fields, they use trees as fence posts. They nail the insulator to a board and then the board to the tree; this prevents the insulator from cutting into the tree. They use a weedwhacker with a saw blade attachment to cut away the brush on the alleyway they are creating along the fence line. These alleyways also act as corridors and helps the Sytsmas move the cattle from paddock to paddock or farm to farm.
The Sytsmas move their large herd with the help of a four-wheeler. The only thing Charlie has to do is call to get them to move between fields. “You can’t chase them, so you have to get the cows to come and get their calves.”

In the winter, hay feeders are moved to a new spot every day, allowing the manure to be spread out. Additionally, every winter, the cattle are in a field they haven’t been wintered in before.

**WATERING SYSTEM**

The Sytsmas use solar-powered water systems to pump water from dugouts to a laundry tub-like tank with holes in the top. In the summer it is on a float system, but in the winter, it is on a motion-sensor-controlled frost-free system, whereby water is pumped into the trough when the cows approach, and 30 seconds after they leave, the water drains out.

They have one solar system that is mounted on a cart that can be moved from pasture to pasture, pumping water from a creek or dugout. The Sytsmas also use a pressurized line system from a well. This allows them to pump water up to a mile away to a field that does not have access to water.

**WILDLIFE**

The Sytsmas have fenced off and planted trees and shrubs around their dugouts and along a stream on their property, which has created wildlife habitat that is inaccessible to the cattle. “By doing rotational grazing we allow diversity on the farm, so we do have lots of different habitat for wildlife.”
Amos Brielman

BACKGROUND
Amos Brielman and his wife, Heidi, operate Pine River Ranch, based in the Rainy River District. Their son, Timo, helps out around the farm as time permits. They operate their small grains, oilseeds, and 550 head beef operation on 8500 acres of land, half of which they rent.

COW-CALF OPERATION
In 1997, Amos began a cow-calf operation. After a few years of calving in a yard, calving was moved to later in the spring, on pasture. A requirement of calving on pasture is that you need forage in the early spring, so pastures must be stockpiled in the fall (seasonally deferred).

“There are specific pastures you must decide to not graze after mid-to-end July, to let grow up and grow tall. Don't look at it and don't get tempted to graze it off in the fall. Leave those specific fields for the cows to move into by the middle of April, so they start eating that old grass…and as time goes on, the new grass starts to grow and the cows get a mix of old and new grass. If you did graze in the fall, there would be no grass for the animals to feed on early in the spring.”

As the calves are born in late May, they are relatively small in the fall, and so are kept over winter. They are fed hay and haylage bales in the winter, grassed through the next spring and summer, and then sold that fall at 16–18 months of age.
When he first started grazing cattle in 1990, Amos would move them from one field to another every six to eight weeks. But after participating in a holistic management course, and meeting with extension personnel, he decided in 1996 to manage his pastures more intensively. Today he moves his steers about once a day (cows and calves every five days), and notices that the pasture really changes under this technique, which gives him the ability to increase the number of cattle, the number of grazing days in the season, or a combination of the two.

FENCING AND MOVEMENT
Amos uses electric high-tensile wire around his fields, which vary from four acres to 160 acres in size, and subdivides them using polywire. “You can regulate the size of the field with polywire as some years you have lots of grass and some years you don’t.”

Amos has no problem getting the cows to move between fields. “They’re standing there, waiting for you. They can see you coming down the road, they can hear you, and they are there waiting for you.”

Generally, Amos leaves the fields for 35 days after the first graze, and a minimum of 60 days after the second graze.

Long-term sustainability of the grasses and legumes in the field is another consideration of grazing. Trefoil, one of the major legumes in his fields, only lives for three or four years. “You have to watch the trefoil and make sure it sets seed, because down the road you need the plants.”

The trefoil is popular with the cows when it is young, but they avoid it when it matures. Therefore, enough plant material must be left in the field so that there are some plants that produce flowers and seeds.
WATERING SYSTEM
Amos finds the greatest challenge with grazing is the water supply: ensuring there is enough water for the cattle, while avoiding a muddy area that the cows all congregate in.

“If you allow the area to be too large, they just hang out, they go to the coffee shop and hang out, they manure there and urinate there and it gets slimy, and then the flies appear, and then they want to congregate together to avoid the flies, and then the quality of the area goes down over time.”

A deep-well, submersible pump with a pipeline is used to supply water to most pastures. In most cases, the water pipe lies on the soil surface along a fence. Amos has had lines last over 20 years with this simple system. For remote pastures, he also uses a solar-powered watering system.

WINTER GRAZING
Pastures, especially poor ones, can be improved by overwintering cattle on them. “We like to feed the cattle in the fields over the winter, as you accumulate manure and therefore nutrients are spread there. You also have an incredible ability to kill the brush areas and trample them down, so it opens up the area.”

Amos feeds them hay, and allows them to eat snow, or when snow is lacking, gives them access to a water source. It is important to note that winter pastures will need recovery time in the spring before being grazed again; therefore these pastures should be the last ones used in the rotation.

An environmental benefit of having cows spread their manure in the fields instead of on a manure pack is that it is less concentrated and the runoff problem is reduced. “If you have a pack, there's not much you can do to prevent that—eventually it will run off and reach a creek.” This runoff may contain nutrients and/or micro-organisms (bacteria and parasites) that can negatively affect the water quality.

WILDLIFE
The biggest wildlife problems that Amos has to deal with are deer, coyotes, and wolves. He often loses a few calves each year to wolves. However, Amos finds that a late calving season seems to help, as there are more young deer around then, which the wolves seem to prefer.

Amos finds that he gets lots of ground-nesting birds, including the endangered Bobolink, which rotational grazing helps by decreasing scrub and increasing tall grass. “As you move the cattle through, the Bobolink find the area where the cattle are through so they don’t get trampled.” The grassy areas allow for an increased mouse population, which also increases the number of hawks, foxes, and other predators in the area.

Female Bobolinks will nest in areas of tall grass that protect them from predators.
Rotational Grazing Workbook

This workbook is designed so that you can apply the concepts discussed in this booklet to your own cattle operation. It has been adapted, in part, from the Streamside Grazing BMP booklet and the Grazing Systems Planning Guide (see inside cover for details). Many farms will have a range of pasture/field capabilities. This work plan can be adapted for your situation. The following items need to be considered.

1. Goals of Your Livestock Operation
2. Property Inventory
3. Preferred Rotational Grazing System
4. Forage Requirements and Paddock Size or Stocking Rates
   - **Option A**: Steps to determine your stocking rate if you are unable to vary your current number or size of paddocks.
   - **Option B**: Steps to determine the number and size of paddocks needed based on your current stocking rate.
5. Developing and Implementing the Plan
6. Record-keeping and Monitoring

### 1. GOALS OF YOUR LIVESTOCK OPERATION

It is important to list and prioritize your goals for implementing rotational grazing, including any positive or negative implications.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Rank</th>
<th>Implications</th>
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</thead>
<tbody>
<tr>
<td>e.g. increase stocking rate</td>
<td>1</td>
<td>Will need to put in more fencing to give pastures a chance to rest and increase forage production.</td>
</tr>
<tr>
<td>e.g. increase grazing days</td>
<td>2</td>
<td>Will need to increase forage availability during mid summer.</td>
</tr>
</tbody>
</table>
2. PROPERTY INVENTORY
Sketch out your property, or use an air photo or Google Maps®, and identify the soil types, forage type and quality, current fencing and water sources, as well as the locations of any sensitive areas (e.g. riparian or wetland areas, known wildlife nesting areas). Note the size of each pasture, and any other descriptive pieces of information you know or observe.

CURRENT PROPERTY SKETCH – SOILS, WATER, FORAGE, FENCING, AND SENSITIVE FEATURES

3. PREFERRED ROTATIONAL GRAZING SYSTEM
The type of grazing system you use is based upon your farm goals, personal preferences, landscape characteristics, ability to provide water and other similar considerations. Greater effort is required with the more paddocks you have. For example, if you want to move through eight paddocks in a twice-over grazing system, then you will have to be out there at least 16 times during the grazing system to shift the animals (this is an excellent time to check for health and management issues). If you wish to move them less often, you will need to decrease the number of paddocks and/or move to a single or once-over rotational grazing system. Refer to the chart on page 4 for a review of the different systems. The calculations in the next section will also help you with the decision on total number of paddocks if this number is not already fixed.

My preferred grazing system: __________________________________________________________
4. FORAGE REQUIREMENTS AND Paddock SIZE OR STOCKING RATES

In order to determine the number and sizes of paddocks needed to implement your chosen rotational grazing system, you must calculate the forage availability of your pastures. If the number of paddocks or their size is already set (or not adjustable) then the variable that you will need to work with is stocking rate. Note that increased herd weights and increased number of grazing days can both play a role in determining the carrying capacity of the paddock. It is important to observe and adjust your numbers of cattle or grazing days as conditions suggest.

**Important**: Choose Option A (Section 4.1) or Option B (Section 4.2) below to set up your grazing management plan, depending on your situation.

**Option A (4.1): Steps to Determine Your Stocking Rate If You Are Unable To Vary Your Current Number or Size of Paddocks**

*Example calculations based on 1300 lb animals on a 40 acre pasture with four paddocks of various sizes (6, 4, 10, and 10 acres respectively). Four-thousand pounds of dry matter (tame forages) is available per acre when only one pass is made through each paddock. The grazing season is 150 days long.*

### 4.1.1 Estimate the Forage Supply Per Paddock

The forage supply is the amount of forage dry matter (DM) available per acre after the rest period. This value can be extremely variable between paddocks and years, and thus should be calculated for each paddock, or area of similar vegetation production. It can be estimated by clipping all of the forage from a square yard when the plants have completed growth and seed formation is occurring (usually in mid to late June). Then air-dry the material in a dry, ventilated area (e.g. hay loft), weigh it in pounds, then multiply by 4840 to get pounds DM/acre. This takes time and planning, but is more accurate than visually estimating in the field. Take a guess at the weight of the forage in the field before taking a clipping and estimating. With practice, you will become good at visually estimating their forage supply, and can stop clipping.

Another way to estimate forage supply is to take the hay bale count per acre of hayfields with similar productivity, and multiply it by the number of pounds per bale. Forages need some leaf material after grazing to photosynthesize and recover; thus, the estimated amount of forage available in the field must be adjusted by a utilization factor to provide the actual amount of forage available for grazing. Native species of forage require more leaf material than tame forages for full recovery, so their utilization factor is 50%, as opposed to 75% for tame forages.

**Step 1: Calculate Forage Supply Per Acre**

**Formula**: Forage supply per acre (lbs forage DM/acre) available = estimated forage production (lbs DM/acre) per area of similar vegetation x utilization factor

**Example Calculation**: lbs DM/acre available = \(4000\) lbs DM/acre estimated \(\times\) 0.75 for tame forage = 3,000

**My Calculation**: lbs DM/acre available = ______ lbs DM/acre estimated \(\times\) 0.75 for tame forage or 0.50 for native species = ______
**STEP 2: Calculate forage supply per paddock**

**Formula:** Forage supply per paddock = forage supply per acre × # acres per paddock

Example Calculation: lbs DM/paddock 1 = 3000 lbs DM/acre × 6 # acres = 18,000
Example Calculation: lbs DM/paddock 2 = 3000 lbs DM/acre × 4 # acres = 12,000
Example Calculation: lbs DM/Paddock 3 = 3000 lbs DM/acre × 10 acres = 30,000
Example Calculation: lbs DM/Paddock 4 = 3000 lbs DM/acre × 10 acres = 30,000

**My Calculation:** lbs DM/paddock 1 = _____ lbs DM/acre × _____ # acres = _____

**My Calculation:** lbs DM/paddock 2 = _____ lbs DM/acre × _____ # acres = _____

**4.1.2 ESTIMATE THE FORAGE DEMAND PER ANIMAL**

The forage demand can be calculated as the amount of forage DM required to feed one animal for one day. It is calculated based on the rule of thumb that grazing animals need to consume an amount of dry forage equal to about 2.5% of their body weight per day, with an additional 1% included for trampling loss and buffer.

**Formula:** Forage demand per animal (lbs DM/day) = avg. weight/animal (lbs) × 0.035

Example Calculation: lbs DM/day = 1300 lbs × 0.035 = 45.5

**My Calculation:** lbs DM/day = ______ lbs × 0.035 = ______

**4.1.3 CALCULATE OPTIMAL STOCKING RATE**

When you have calculated the amount of forage you have available to graze in each paddock over the season, and the amount of forage needed per animal, you can calculate the optimal stocking rate. This involves three steps.

**STEP 1: Calculate the number of animal days† per paddock**

**Formula:** # animal days per paddock = forage supply per paddock ÷ forage demand per animal per day

Example Calculation: # animal days in paddock 1 = 18,000 lbs DM/overall paddock 1 ÷ 45.5 lbs DM/day/animal = 396
Example Calculation: # animal days in paddock 2 = 12,000 lbs DM/overall paddock 1 ÷ 45.5 lbs DM/day/animal = 264
Example Calculation: # animal days in paddock 3 = 30,000 lbs DM/overall paddock 3 ÷ 45.5 lbs DM/day/animal = 659
Example Calculation: # animal days in paddock 4 = 30,000 lbs DM/overall paddock 4 ÷ 45.5 lbs DM/day/animal = 659

**My Calculation:** # animal days in paddock 1 = ______ lbs DM/overall paddock 1 ÷ ______ lbs DM/day/animal = ______

**My Calculation:** # animal days in paddock 2 = ______ lbs DM/overall paddock 2 ÷ ______ lbs DM/day/animal = ______

**STEP 2: Calculate the total number of animal days† overall**

**Formula:** # animal days overall = # animal days in paddock 1 + # days in paddock 2

Example Calculation: days overall = 396 days paddock 1 + 264 days paddock 2 + 659 days paddock 3 + 659 days paddock 4 = 1978

* If you have more than the two paddocks listed in the “My Calculation” examples, remember to add in the additional paddocks when you do your calculations.

† Some sources mention “Animal Unit Days (AUD)” or “Animal Unit Months (AUM).” This is based strictly on a 1000 lb cow (with or without calf). This should not be confused with animal days in these calculations. Conversions usually are available in these sources to account for the size and type of animal.
My Calculation: days overall = ________ days paddock 1 + ________ days paddock 2 = ________

STEP 3: Calculate the total number of animals (stocking rate) the system can support for a desired length of grazing season

Formula: total # of animals in herd = total # animal days overall ÷ desired length of the grazing season in days

Example Calculation: animals in herd = 1978 animal days ÷ 150 grazing days = 13

My Calculation: animals in herd = ________ animal days ÷ ________ grazing days = ________

4.1.4 CALCULATE THE NUMBER OF DAYS AVAILABLE FOR GRAZING IN EACH Paddock*

Once you know the total herd size, you can calculate how long the cattle can spend in each paddock before you need to shift them. Note that the following calculation assumes that each field is only used once during the grazing season. If each field is used more than once per season, you must adjust the number of grazing days appropriately. For example, in a twice-over grazing system, generally ⅓ of the days are used for the first pass, and the remaining ⅔ for the second pass. This is because there is greater forage growth and availability in the spring than in the summer and fall.

Formula: # days grazing per paddock = total # animal days per paddock ÷ total # animals in herd

Example Calculation: days grazing paddock 1 = 396 animal days paddock 1 ÷ 13 animals = 31
Example Calculation: days grazing paddock 2 = 264 animal days paddock 2 ÷ 13 animals = 21
Example Calculation: days grazing paddock 3 = 659 animal days paddock 3 ÷ 13 animals = 51
Example Calculation: days grazing paddock 4 = 659 animal days paddock 4 ÷ 13 animals = 51

My Calculation: days grazing paddock 1 = ________ animal days paddock 1 ÷ ________ animals = ________

My Calculation: days grazing paddock 2 = ________ animal days paddock 2 ÷ ________ animals = ________

OPTION B (4.2): STEPS TO DETERMINE THE NUMBER AND SIZE OF PADDOCKS NEEDED BASED ON YOUR CURRENT STOCKING RATE

Example calculations are based on a stocking rate of 30 head, averaging 1300 lbs each with 1350 lbs of dry matter (tame forage) available per acre for the first of three passes through each paddock. To complete the calculations for the entire grazing season, repeat the steps below varying the number of rest and grazing days as appropriate.

4.2.1 ESTIMATE THE FORAGE SUPPLY PER ACRE

The forage supply is the amount of forage dry matter (DM) available per acre after the rest period. This value can be extremely variable between paddocks and years, and thus should be calculated for each area of similar vegetation production. It can be estimated by clipping all of the forage from a square yard when it is at peak biomass production, air drying the material in a dry, ventilated area (e.g. hay loft), weighing it in pounds,

* If you have more than the two paddocks listed in the “My Calculation” examples, remember to add in the additional paddocks when you do your calculations.
then multiplying by 4840 to get pounds DM/acre. This takes time and planning, but is more accurate than visually estimating in the field. Take a guess at the weight of the forage in the field before taking a clipping and estimating. With practice, you will become good at visually estimating their forage supply, and can stop clipping.

Another way to estimate forage supply is to take the hay bale count per acre of hayfields with similar productivity, and multiply it by the number of pounds per bale. Forages need some leaf material after grazing to photosynthesize and recover; thus, the estimated amount of forage available in the field must be adjusted by a utilization factor to provide the actual amount of forage available for grazing. Native species of forage require more leaf material than tame forages for full recovery, so their utilization factor is 50%, as opposed to 75% for tame forages.

**Formula:** Forage supply per acre (lbs forage DM/acre) = estimated production (lbs DM/acre) per area of similar vegetation x utilization factor

**Example Calculation:** lbs DM/acre available = 1350 lbs DM/acre estimated x 0.75 for tame forage = 1013 lbs

**My Calculation:** lbs DM/acre available = ________ lbs DM/acre estimated x 0.75 for tame forage or 0.50 for native species = ________

### 4.2.2 ESTIMATE THE HERD FORAGE DEMAND

The herd forage demand is the amount of forage dry matter (DM) required to feed the herd for one day. It is calculated based on the rule of thumb that grazing animals need to consume an amount of dry forage equal to about 2.5% of their body weight per day, with an additional 1% included for trampling loss and buffer.

**Formula:** Herd forage demand (lbs DM/day) = avg. weight/animal (lbs) x 0.035 x # animals

**Example Calculation:** lbs DM/day = 1300 lbs x 0.035 x 30 animals = 1365

**My Calculation:** lbs DM/day = ________ lbs x 0.035 x ________ animals = ________

### 4.2.3 DECIDE ON REST AND GRAZING (RESIDENCY) Periods

The average rest period for a paddock of tame forage species is 30 days, but it can vary depending on the time of year and conditions, because grass grows more slowly later in the season. For example, 30 days rest after each grazing period, or 30 days rest in the spring after the first graze and 60 days rest later in the fall after the second graze.

The grazing (residency) period is the amount of time you want your cattle to remain in a particular paddock before moving them. It can vary depending on the desired management strategy and pasture conditions. For example, the grazing period could be 2 days with intensive rotational grazing systems, or 60 days in simple rotational grazing systems; it can be shorter when forage conditions are poor or longer when forage is plentiful. Your time and materials and labour costs must factor into this decision.

**My Rest Period:** ________ days

**Example Rest Period:** 45 days

**My Grazing (or Residency) Period:** ________ days

**Example Grazing (or Residency) Period:** 5 days
4.2.4 DETERMINE Paddock SIZE
The size of your paddock is dependent upon how long the cattle will be grazing there, and the amount of forage available to them (i.e. forage demand).

Formula: \( \text{paddock size} = \text{herd forage demand} \times \text{grazing period} \div \text{forage supply} \)
Example Calculation: \( \text{acres} = 1365 \text{ lbs/day} \times 5 \text{ grazing days} \div 1013 \text{ lbs/acre} = 7 \)

My Calculation: \( \text{acres} = \underline{\hspace{1cm}} \text{ lbs/day} \times \underline{\hspace{1cm}} \text{ grazing days} \div \underline{\hspace{1cm}} \text{ lbs/acre} = \underline{\hspace{1cm}} \)

4.2.5 CALCULATE NUMBER OF Paddocks
The minimum number of paddocks you need is based on the amount of time the forage is allowed to rest. An extra paddock is included as a buffer to ensure that all paddocks have a full rest period.

Formula: \( \# \text{ paddocks} = \text{rest period/paddock in days} \div \text{grazing period/paddock in days} + 1 \) \( \text{(factor for extra paddock)} \)
Example Calculation: \( \# \text{ paddocks} = 45 \text{ rest days} \div 5 \text{ grazing days} + 1 = 10 \)

My Calculation: \( \# \text{ paddocks} = \underline{\hspace{1cm}} \text{ rest days} \div \underline{\hspace{1cm}} \text{ grazing days} + 1 = \underline{\hspace{1cm}} \)

4.2.6 ESTIMATE ACREAGE REQUIRED FOR ROTATIONAL GRAZING
Once you have determined the optimum number of paddocks for your system, you can estimate the total amount of acreage required to support it. If the number of acres required is higher than you have access to for grazing then you may need to readjust your stocking rate or the number of days spent grazing per paddock.

Formula: \( \text{total acreage required for your rotational grazing plan} = \text{paddock size} \times \# \text{ number of paddocks} \)
Example Calculation: \( \text{acres} = 7 \text{ acres/paddock} \times 10 \text{ paddocks} = 70 \text{ acres} \)

My Calculation: \( \text{acres} = \underline{\hspace{1cm}} \text{ acres/paddock} \times \underline{\hspace{1cm}} \text{ paddocks} = \underline{\hspace{1cm}} \)

5. DEVELOPING AND IMPLEMENTING THE PLAN
Re-draw or sketch your farm property to show the locations and shape of the new paddocks you wish to implement, the water sources, access points, and other management features. Get advice from other experienced farmers or extension personnel to decide on the set-up and implementation. Then create a schedule based on the number of days the herd is to be in each paddock. If you are renting the land, be sure to speak with the landowner before making any modifications.
## DETAILS ON THE PROPOSED MANAGEMENT PLAN

<table>
<thead>
<tr>
<th>Management Plan Item</th>
<th>Paddock 1</th>
<th>Paddock 2</th>
<th>Paddock 3</th>
<th>Paddock 4</th>
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<tr>
<td>Acreage</td>
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<td>Location and size of invasive plant populations</td>
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<td>Methods, other than grazing, to control invasive plant populations</td>
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</tbody>
</table>

*Remember that the start and end dates will likely vary year to year. Therefore they must be flexible and based on local and seasonal conditions.
6. RECORD-KEEPING AND MONITORING

It is important to keep track of information such as forage growth rates, the amount of forage that remains after grazing season, the number of cattle grazed each year, their pre-and post-grazing weights, their health, the length of the grazing period, the size of each paddock, the density and species of weeds and techniques used to manage them, the amount of exposed soil, and similar factors. This allows you to compare year to year, and can indicate whether your pastures are overgrazed or undergrazed, whether stocking rates should be increased, decreased, or maintained, and whether the forage is improving or not. This information can be collected in a table similar to the one on page 27, and included with your plan. Your rotational grazing plan should be reviewed and updated regularly.

**UPDATED PROPERTY SKETCH**