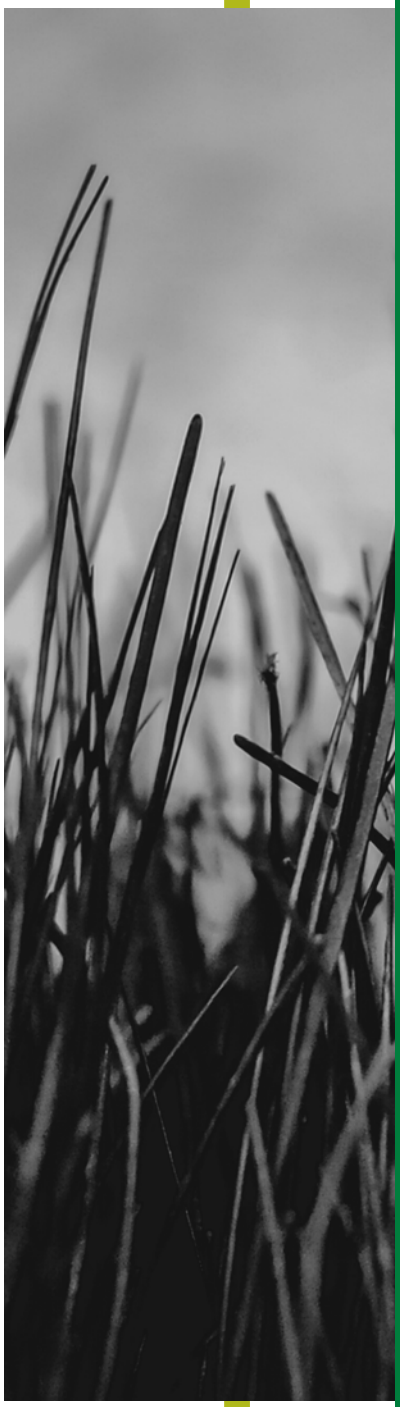

AGS

ADVANCED GRAZING SYSTEMS

MENTOR HANDBOOK

MODULE 3
GRAZING PLAN

Canadian Forage & Grassland Association
Association Canadienne pour les Plantes Fourragères

GREENER PASTURES
RANCHING

FARMERS FOR CLIMATE SOLUTIONS
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MODULE 3 - GRAZING PLAN

A	Cell Design
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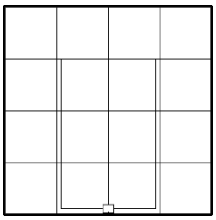
Module 3 - Grazing Plans

A - Cell Design

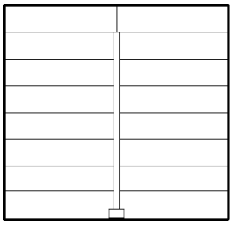
There are five different types of cell design strategies that work with the grazing concepts in order to help manage an AGS. Each cell design has different advantages and disadvantages, and each farm will have to make decisions based on their own context. The size of each paddock is not as important as the number of paddocks. To reduce overgrazing, we need enough paddocks to manage both the graze period and the rest period. The size of each paddock will depend on the overall size of the pasture, the number of desired paddocks and the production of each piece of land. For example, a pasture that is 160 acres in size might have 16 paddocks and each paddock would average 10 acres in size, depending on production. However, if we had a larger pasture of 640 acres, we could implement the exact same cell design and each paddock would average 40 acres in size. In the diagrams below, we will use the same piece of land with no physical land constraints to compare the 5 designs. Each pasture will be 160 acres with 16 paddocks, which will make each paddock 10 acres in size.

The 'alley way' system is quite common and is relatively inexpensive to set up. In the diagram, I have described two different styles of alley system. The 'Two Alley Ways' system will have four miles of cross fencing to build the 16 paddocks. The 'One Alley Way' shown will only have 4.4 miles of cross fencing. Depending on how intensely you manage, the long skinny paddocks of the 'One Alley Way' system will usually become over utilized closest to the water and underutilized at the far end. The more square shaped paddocks

of the 'Two Alley Ways' system will generally be grazed more evenly (depending on grazing intensity).



Two Alley Ways	One Alley Way
4 Miles of Cross Fence	4.4 Miles of Cross Fence
Good Utilization	Poor Utilization
Manure in alley	Manure in Alley
Low Labor & Capital Costs	Low Labor & Capital Costs
Flexibility of Movement	Flexibility of Movement

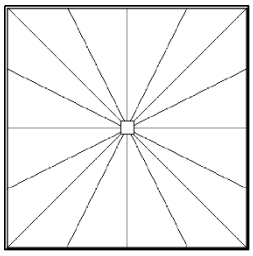


One of the downsides to an alley system is the excess manure and urine that ends up in the alleyway, because of this, the nutrients end up being recycled in an undesirable area. Both of these systems have low set up and low labour costs. They also come with the benefit of flexibility of movement. It is easy to move the herd around in the rotation, to manage the animals individually, or to treat them when needed. Another benefit to the 'One Alley Way' system is that the long rectangle makes a great bale grazing paddock if you have the opportunity.

'Water Truck Method' systems can also be quite successful. This type of cell system has less cross fencing at only three miles of fence. The utilization is better with the square paddocks but has a limitation with animal movement. With a water truck system, a producer has to plan their rotation a little better so that they do not graze themself into a corner.

When using a water truck, the manure distribution can be improved, as you can place it in a different spot on each rotation. There is no constant alley or watering site to be overused. The bonus with this system is that a producer can increase the animal impact in an area by positioning their water truck on a specific spot. It does usually come with increased capital and labour costs.

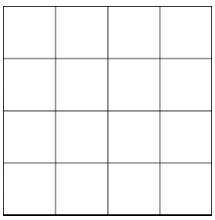
A ‘Cell Center’ design is quite common. It is also known as the ‘wagon wheel’ or the ‘pie’ system. This design has the most cross fencing at 4.8 miles. In this scenario, the paddocks end up being long and narrow; again, which tends to have uneven utilization. From an aerial photo you will see over utilization at the ‘hub’, or center of the wagon wheel. Depending on the intensity of grazing, the manure distribution can be variable.



Cell Center
4.8 Miles of Cross Fence
Poor Utilization
Fair Manure Distribution
Low Labor & Capital Costs
Flexibility of Movement

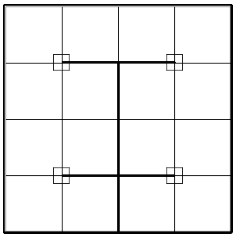
The benefit to this system is that it is cheap to set up and to operate. Labour costs are low and flexibility of movement is pretty good with this system, as all of the paddocks are connected at the watering area. Each paddock funnels nicely to the middle, so bringing in an animal to treat is quite simple.

Water Truck Method
3 Miles of Cross Fence
Good Utilization
Excellent Manure distribution
Increased Capital & Labor Costs
Increased Herd Effect



A ‘Pipeline Method’ system is popular on owned land. The installation of a more permanent system like this might not be so practical with rented land. The difference in this system is that we

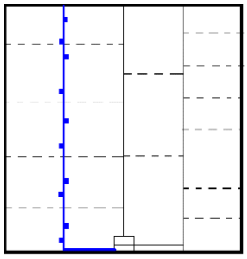
now take the water to where we want it, as opposed to allowing the animals to walk to the water.



Pipeline Method
3 Miles of Cross Fence
Good Utilization
Good manure Distribution
Increased capital costs
Low Labor Costs

This system also keeps the fencing cost low, with only three miles of cross fence. The square paddocks allow for more even utilization of grazing and provide good manure distribution. In some cases, where there is no existing water pressure system, this can be a more costly system to put in. Although once a pipeline system is in place it can lower labour costs. If you look closely at the diagram of the pipeline system, it is actually four small cell centers.

The fifth cell design to be included is the 'Portable Strip Grazing' method. This one is more difficult to put into a mold, as it is quite variable depending on management. As shown in the diagram, there are multiple ways to use the portable strip grazing method. There are three permanent fences, which create four long rectangles across the pasture. This only requires one and a half miles of permanent fencing.



Portable Strip Grazing
1 1/2 miles of Cross Fence
Two Portable Fences
Variable Utilization
Higher Labor Costs
Flexibility of Paddock Size
Low Capital Costs

On the left half of the picture, it shows a pipeline down the center that allows for multiple watering points. A producer can then manage the rotations using two or three portable fences, giving

them flexibility on the size of each paddock. The water trough moves along with the cattle. This style of strip grazing could work in a similar fashion with a water truck. We simply move a portable water tank along the fence in replace of the pipeline.

On the right half, there is no pipeline. A producer would graze down the rectangles by removing fences, allowing access to more grass each time. In this scenario, they are allowing the animals to walk through the first paddocks to get to the next ones. Care is needed to maintain the desired graze period through each rectangle. If the animals are allowed on a piece of land for too long, they will re-graze the first paddocks and cause overgrazing. The far right shows very high stock density or mob grazing. There are more labour costs involved with mob grazing but this can also give you much better manure distribution and plant utilization. As long as the Graze Period and the Rest Period is still maintained, the Stock Density and Animal Impact can be increased. This is highly variable depending on management. Another issue is that animal movement is limited and rotations need to be planned well in advance.

Any of these systems can work depending on the farm and the environment. In some cases, a combination of different designs might work best. Producers could plan to strip graze in a cell center shape, or they could start with an alley way and then plan to follow up with a pipeline system. There are many combinations and variations to these designs. Each cell design will depend on the farm's personal constraints, herd constraints, and the land's physical constraints. There are many factors that go into planning a cell design and every piece of land is different. In different situations, some designs will work better than others.

B – Fencing

There are many different choices when it comes to fence materials. The choice for each farm may be a personal preference, an environmental concern, or an economical choice. This can be broken up into two categories of fencing, perimeter fencing and cross fencing.

Perimeter Fence

Perimeter Fencing - A physical barrier that will contain the livestock within the property. It tends to be more secure than cross fencing. The choice of material used to build a fence will be dependent on the type of livestock that are being managed. There are many different options for posts that could work with each type of wire, such as: wood, composite, steel, temporary and fiberglass, just to name a few.

Page Wire Fencing - Also called farm fencing, can come in a variety of heights, wire sizes and wire spacings. For cattle, bison, and horses, the suggested height for page wire fence would be about 1050-1200 mm (42-48 in.) and maybe only 800-900 mm (32-36 in.) for sheep, goats or pigs. If you were managing deer or elk, you would want this wire to be 2400-2700 mm (96-108 in). The spacing of the wire needs to be taken into account depending on the type of livestock being managed. In some cases, you may want a hot wire, or a barbed wire, to run along the top of the fence for added height to prevent animals from reaching over.

Barbed Wire Fencing - Many farms work with barbed wire as a perimeter fence. It is a type of steel wire constructed as a single, or a twisted double wire with sharp barbs arranged at intervals along the strands. These barbs are to deter animals from reaching under, over, or through the fence. It is also possible to source barbless barbed wire when barbs are a concern. Usually, a barbed wire fence will have two to five strands, depending on the type or class of livestock.

Electric Fencing - Perimeter fences that are electric are similar to cross fences but tend to have more wires. High tensile wire, aluminum wire, poly wire and aircraft cable are common options for materials when building an electric fence. Some fence designs will have all of the wires hot; some will have hot wires that carry a charge

with ground wires that will be connected to a ground rod, and others can be set up with a bipolar system where the positive and negative wires will both carry a charge.

Electrical Offset - There is an option of adding a single hot wire to an existing fence. This adds a mental barrier to the current physical barrier. An electric offset requires an insulator that will hold a single hot wire approximately 6-10 inches off of the existing fence, which ensures that the animals do not put pressure on the physical barrier. This is usually a very economical way to strengthen an older perimeter fence.

Cross Fences

A cross fence is usually not as secure as the perimeter fence. It is designed to separate the pasture into individual paddocks, which allows you to manage an AGS. Cross fences can be any of the fence types talked about previously, but may not have as many wires. The wire will usually be electric and is more of a mental barrier than a physical barrier.

Herding - In some situations, herding may still be an option to manage livestock in an AGS. This could be done on horseback, with the use of dogs, or even with supplemental feed or facilities of some type (ie. A mobile barn or supplemental feed).

Poly Wire - A common type of cross fencing is made of poly wire with temporary fence posts that are easy to move. This type of fence is not as strong and may not last long, but is light and gives the user flexibility of movement. The wire is usually stored on a roller of some kind to make the fence easier to take down and set back up again.

Semi-Permanent - Some prefer to use a more permanent type of cross fence that is designed not to be moved. An example of this might be to use wood posts and a single high tensile wire (with or without insulators depending on your environment), but there are many different types of materials that could be used.

Electric Netting - This type of fencing could be a perimeter or a cross fence but is basically a page wire fence that uses poly wire netting with temporary posts that are electrified. It is usually used for smaller livestock such as pigs, sheep, goats, or poultry. Electric netting can be taken down, moved, and set up again quite easily.

C - Water Systems

There are many different types of water systems to choose from. Each farm will need to choose which type is right for each location. They may choose to invest in one portable system, or to install more permanent systems. Numerous publications are available on water systems and those links can be found on our platform.

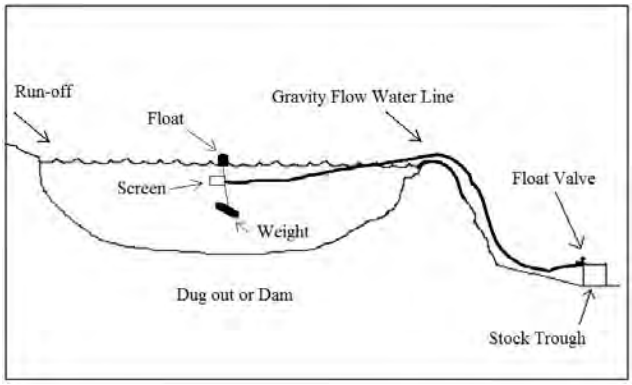
Pipeline - This system will take water to where a producer needs it. Pipelines require a pumping system of some kind, as well as the installation of an above, or below ground water line connected to a water trough of some kind.

Gas Powered Pump - This type of system usually requires a storage tank with a recommended three days worth of water storage. Most gas-powered pumps have a backflow preventer inside the pump to prevent the water flowing back to the source after the pump shuts off.

Generator and Sump Pump - Similar to the gas-powered pump system, the generator and sump pump system has the advantage of using a generator that can be multi purpose. A one-way check valve may be required to prevent backflow.

Solar Water Pump - The solar water pump is a very handy system but can have limitations when the days start to get shorter, or when water sources are getting low. More solar modules and or batteries may need to be added.

Gravity Flow - if you have a height advantage, a gravity flow system can be a very cost-effective solution. This can be set up as a siphon or as a head pressure system.



Elevated Water Reserve - In the right situation, designing an elevated water storage tank can be very useful. With this system a producer would pump water up into the reserve, and from there run a gravity flow system to the water trough.

Nose Pump - A nose pump system requires the animals to learn how to pump their own water by pumping a lever with their nose. This system requires no external energy source and can be set up as a winter water system that requires no power. It does however have a high initial cost per animal as it can only service a small number of animals per pump.

D - Types of Rotation

Every environment is different, and every piece of land can be different. All AGSs will manage the livestock in some type of

rotation. The important thing is to manage for the five grazing concepts and adjust the concepts for the environment being grazed. Grazing management might look different in a wet environment when compared to a dry environment, but the concepts remain the same. Producers must maintain a short enough graze period to prevent the second bite. The rest period needs to be long enough to ensure full recovery of the energy stores of the plant. Animal impact needs to be managed to get the physical and biological stimulation in the soil. Stock density needs to be addressed to acquire the desired plant utilization and manure distribution. Lastly, adequate residue needs to be left behind to maintain the soil armour.

In a dry environment, a producer may plan to graze a once over rotation, in which each paddock is only grazed once in a season. Or they may choose to graze one and a half rotations, in which the producer will graze all of the paddocks once and then half of them for a second time in the same season. The next season they may choose to graze the other half twice and only once on the first half. In a wetter environment, a producer might choose a twice over rotation. Possibly even two and a half or more rotations in a season. The health of the land can be a big factor in how it needs to be managed. The number of rotations might vary between paddocks on the same pasture depending on the health of individual paddocks. A paddock in good health might be able to be grazed three times in a season but the paddock right next to it should only be grazed once. Decisions need to be based on the health of each paddock. The same is true if part of the pasture is under irrigation. The irrigated land might need 3 rotations in a season whereas the dry land might only be grazed once.

Stocking Rate - Not to be confused with stock density, stocking rate is the number of animal units that a producer plans to have on the pasture for the season. This is not determined by the number of acres grazed but is based on the production of the land. Every environment is different and a "one size fits all" style of grazing does not apply. An appropriate stocking rate needs to be determined for each pasture. In a grazing plan, both the stocking rate and the stock density should be incorporated.

Making a Grazing Plan - In order to develop a grazing plan, an appropriate rest period needs to be determined. The rest period will have many different factors that need to be accounted for, and these factors may change from year to year. Some of these are: how dry or wet your environment is, the condition of your pastures, and your desired management for the land. For example, if a producer has chosen a 60-day rest period, this means that between grazing's, they will want to have 60 days for the plants to recover and replenish their energy stores. In a drier environment, the rest period needs to be longer and in wetter areas or under irrigation the rest period can be shorter (25 days to a full year's rest).

Once a producer has chosen their rest period, they then need to calculate the average length of the graze period needed. The calculation for this is: graze period = rest period/(number of paddocks - 1). The cattle will always be on one paddock at any given time, which is the reason that a producer would need to subtract one from the number of paddocks. If they had 22 paddocks and wanted a rest period of 60 days the calculation would be: graze period = 60/(22-1) = 3 days average on the first rotation. This is an average because at the beginning of the season, the producer will not have enough grass in the paddocks to last a full three days. And by the

end of the 60 days they might have far more forage than could be consumed in three days of grazing in each paddock. In reality, each paddock is unlikely to be exactly the same size in acres and in forage production. Some paddocks will be more productive than others. After planning the rest and graze periods, it is time to plot the first grazing plan. This can be mapped out on a map, a grazing chart, an app, or whatever tool the producer is most comfortable with. An important part of this step is to plan for animal movement. With each move, the ease of movement and location of gates should be considered. If a producer uses the estimated average graze period, adjusting for faster moves early in the spring and longer moves later on, they should come to a rest period close to their desired number of days. If the producer is not quite on target with their first plan, they can go back and adjust the plan to either speed up their moves or slow them down.

If, and when, the producer reaches the second rotation in a season, they can now lengthen the graze period a bit, as the speed of growth of forage has slowed. They will also notice that when they are grazing paddocks on the second rotation, production will be more uniform. The first rotation staggered the production of each paddock.

Grazing plans may need to be adjusted and replanned throughout the season as conditions change. A producer may need to make adjustments due to weather, the animals, or the production of their land. The grazing plan will be a guideline to make sure that the producer maintains control of both their graze period and rest period, allowing for a healthy and productive stand. It is important for a producer to continually refer back to their plan during the

spring to ensure that they stay on track. It is a good idea to set target dates to help monitor your rotation.

E - Change as a Tool

Changes in grazing are stimulants to the whole system and should be implemented in a grazing plan every year. Depending on the context of the farm and/or the environmental conditions, management needs to be adjusted to include change. Producers need to adapt to the changing conditions of the land, the economics of their environment, and the people that they interact with. Sometimes they might need to manage for the soil, sometimes for the livestock and sometimes for the people associated with their farm businesses. What is the priority for this grazing of this paddock?

What can we change? How about the starting point? Most pastures have an access point off the road, which is usually the easiest place to unload and start grazing. Often it is the same paddock that gets grazed first every year. The first change to implement is usually as simple as unloading at a different paddock. If a producer can have a different starting point, every paddock receives stimulation from being grazed at a different time of the year. When that is not possible, how about changing the direction of rotation may be an option? Planning the rotation in reverse can become a stimulant to the land as well. A producer could also change the stock density. One rotation they may "take half and leave half" in a paddock, and then on the next rotation they could use ultra-high stock density and take most of it. Ultra-high stock density, or mob grazing, will completely flatten the sward. This can add some great improvements to the pasture when done properly and not

implemented during extremely wet periods. However, it can also lower performance of livestock by increasing stress, depending on the situation. A producer also needs to factor in the labour and equipment costs of ultra high-density grazing. What works in one situation might not work in another. In some situations, producers may want to lower stock density to manage for the livestock, or the people. The stress of both needs to be accounted for because every farm has a different context.

The type of livestock is another change to the system that can be implemented. Is it possible to graze the cattle in one area one year and the next use sheep, pigs, or chickens? Perhaps a producer could mix it up a bit and graze goats with the cows? A producer could include a small percentage of horses with a cow herd in order to create more animal impact. The pecking order of the different species tends to spark more, and a different type of animal movement. When a few horses run through a herd of cattle, the animals move differently than if there was a monoculture of bovines. A few cow-calf pairs added to a yearling or bred heifer herd can change animal behaviour as well. The cows teach the teenagers how to behave.

When changing the type of livestock is not possible, changing the class of livestock may be. If a producer grazes cow-calf pairs on a pasture, the next year they could bring in yearlings, or even bred heifers. Yearlings need high-quality forage to get good gains and they usually get a shorter season. Cow calf pairs need a slower rotation with a longer season. This change can be a stimulant to the system.

If a producer has just taken over a piece of land, or perhaps has just come through a drought, deferred grazing might be the change that

they want to implement. Residue needs to be left after every grazing, but some years skipping a paddock or two in order to rest the land completely is a beneficial change. The roots get to dig down deep, and the plants receive the time needed to set seed and add to the seed bank. This also leaves plenty of litter on the soil surface. Then in the winter, or maybe the next spring, a producer might come in with higher stock density and trample all of that material to the ground adding to the soil armour and giving both physical and biological animal impact.

Questions to ask:

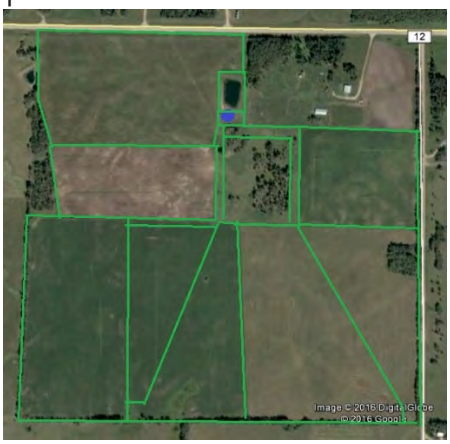
- Is it the land being managed for? What is the best choice to grow soil, increase biodiversity, and build water holding capacity for this paddock, on this grazing?
- Is it th e animals being managed for? What is the best choice to increase gains, reduce stress, or improve performance on this paddock, for this grazing?
- Is it the people being managed for? What is the best choice to increase profitability, reduce labour, or minimize stress on the people on this paddock, on this grazing?

F – Making Maps

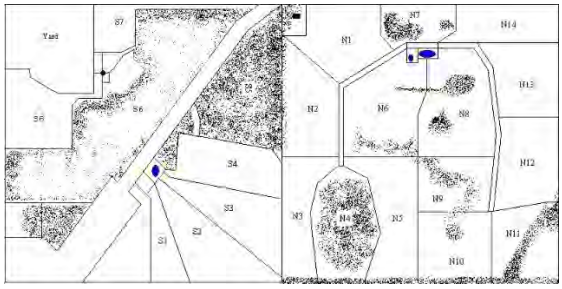
There are many different tools now available to make maps and plan out fencing. Calculating out area and distances are important in figuring out a producer's costs to set up, as well as yields in their grazing plan. Many online tools can be found, or a producer can use some old-fashioned tools with the same results. Each farm may have different preferences, so multiple options need to be made available.

The Kitchen Table Calculator - This is simply using a clear plastic sheet and a ruler to make a grid across an aerial photo. The kitchen table calculator is a very cheap and effective way to determine the estimated area and distances of a given pasture.

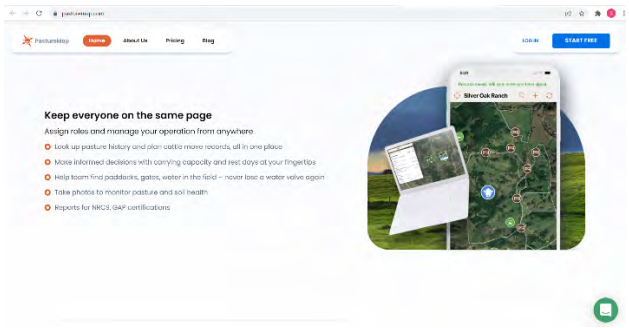
Google Maps - Free online tool that has the ability to calculate area and distance on a map.



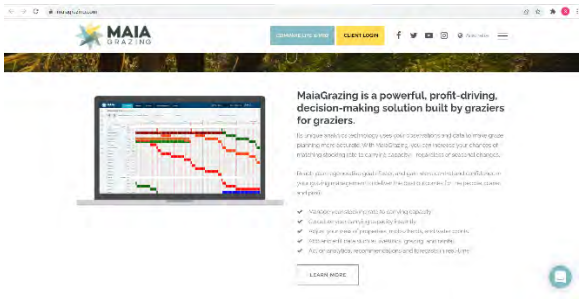
Windows Paint- A very simple paint program that can help a producer create a drawing of their pasture. This can then be used in conjunction with the kitchen table calculator or Google Maps.



Pasture Map - This is an online pasture tool with an app that has many features. There is a free version and a paid version.



Maia Grazing - This is an online pasture tool with an app that has many features. There is a free version and a paid version.



The list here by no means exhausts the options available to producers when they are looking for support in implementing a grazing plan. The tools being used are not nearly as important as the fact that a grazing plan is in place and being utilized.

G - Aerial Photos

With today's access to the internet, there are many places to access aerial photos of a producer's land. Many provincial and federal agricultural bodies may also offer wall sized maps to help plan out an AGS.

Google Maps has high quality satellite views available of most locations that can be printed from a home computer. Most stationary businesses can print larger photos as well.

Most Provincial Ag bodies and some environmental stewardship groups have the ability to view and print aerial photos.