



Success with ALUS Enhanced Grazing Projects

How to establish and maintain Adaptive Multi-Paddock grazing projects in ALUS' Western & Prairie Hubs

AN ALUS GUIDEBOOK



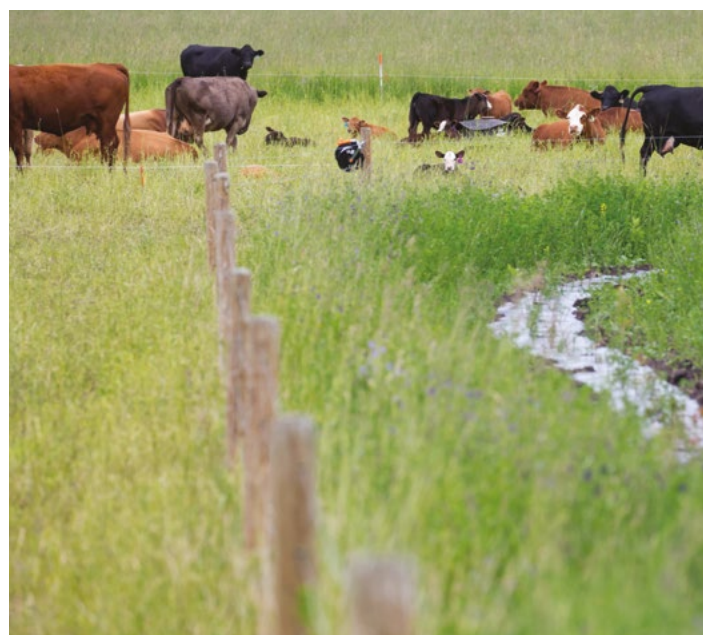
What are Enhanced & Adaptive Multi-Paddock Grazing?

Enhanced Grazing

Enhanced grazing with ALUS is a suite of management tools used to catalyze accelerated grass growth and ultimately build rich, healthy soils that sequester carbon and provide many other ecological and agricultural benefits. **Adaptive Multi-Paddock (AMP) Grazing** is one tool to achieve these enhanced grazing outcomes. AMP grazing involves using multiple, relatively small paddocks to manage cattle grazing in

high densities, followed by extended periods of rest per paddock. In some ways, this style of grazing is designed to mimic wild herds of ruminants moving across grasslands, thereby engaging the grassland ecosystem's evolved strategies to drive optimal plant growth and provide beneficial outcomes to the land and the landowner.

Smaller Paddocks



The first task in AMP grazing is usually to subdivide pastures into smaller paddocks. Pastures are comprised of many plant communities, each of which grows at a different rate. AMP grazing allows the rancher to manage each of these plant communities for optimal growth. Natural places for division may include riparian buffers around wetlands or watercourses, transitions between north- and south-facing slopes, edges of forests, places where the field changes from convex (uplands) to concave (lowlands or wetlands), or any other place the plant community changes considerably.

Higher Stocking Density



Grazing livestock in a smaller area for a shorter period means that stock density usually increases. This also typically sees the livestock graze more evenly. When cattle are grazed at a lower density, they will gravitate toward their preferred vegetation and may overgraze some areas and leave others untouched. Overgrazing puts the cattle's preferred plants at a disadvantage as they try to regrow. Meanwhile, less desirable plants, like woody shrubs or invasive species, are left to flourish.

Ecosystem Services Produced by ALUS AMP Grazing Projects

CARBON SEQUESTRATION: AMP grazing results in a deeper topsoil layer enriched with organic matter and increased leaf litter on the surface. The enhanced biomass above and below ground plays a key role in storing soil organic carbon.

CLEANER WATER: The improved vegetation biomass and leaf litter also increase water infiltration into the soil. Healthy soils work as a filter, reducing nutrient flows from the agricultural landscape into the water cycle, and provide a buffer against flood and drought conditions.

CLEANER AIR: Soil absorption of the greenhouse gas methane (CH₄) increases in AMP-grazed lands at higher temperatures, along with other kinds of carbon storage.

WILDLIFE HABITAT: AMP grazing maintains habitats for numerous grassland species, including mammals, birds and pollinators. Building healthy soils supports a robust population of insects and soil microbes.

Longer Recovery Period for Plants



The most critical feature of AMP grazing is plenty of rest for each paddock to encourage plant recovery. Animals are not returned to the paddock until the plants have reached the correct recovery stage, which is determined by observation of plant health in the paddock. Over time, AMP grazing gives well-adapted grassland plants and plant communities the opportunity to recover, while invasive and woody species decline. The time needed for a paddock to fully recover will differ depending on the time of year, weather conditions and plant species.

What it Means to be Adaptive



Enhanced grazing, and especially AMP, works when tailored to the unique conditions of the land. By observing the natural systems and adapting to their needs, AMP grazing practitioners can maximize land productivity. That's why this ALUS guide focuses on the rancher's desired outcomes to support flexibility in how the AMP grazing is executed on the ground.

A hallmark of AMP grazing is careful observation and recordkeeping. Ranchers should observe ecological indicators to assess how well the management strategies are working. For more information, see the section **Ecological Indicators to Monitor for AMP Grazing**.

What Does the Research Say?

University of Alberta Research on AMP Grazing

AMP grazing provides countless benefits to the ecological function of pastureland, as well as to ranch operations. Research completed by the Boyce Lab (the study) at the University of Alberta (see **Additional Resources**) has added to the compendium of knowledge on the benefits of AMP grazing.



For more information on the study, including publications and articles, or to contact the researchers, visit: grad.biology.ualberta.ca/boyce/aggp-project

Environmental Benefits of AMP Grazing

- Increased carbon sequestration
- Improved water infiltration in the soil
- Improved drought, flood and climate resilience
- Increased vegetation growth
- Improved water quality
- Increased nutrient cycling

What do ALUS Ranchers Say?

- Improved animal health
- Improved quantity and quality of forage
- Increased efficiency in forage utilization
- Improved nutrition
- Improved livestock handling
- Improved length of grazing season
- Improved social license



Buffers Against Flood and Drought

The University of Alberta study found that AMP-managed ranches have significantly more above-ground and below-ground biomass than non-AMP ranches. Vegetation litter also increases on AMP ranches. This greater vegetative cover helps to keep water on the landscape, mitigating the effects of drought and regulating water movement, which helps mitigate the effects of flood. This enhanced vegetation biomass and litter means that AMP ranches experience higher productivity overall, with more plant growth and greater forage availability.

AMP ranches also demonstrated improved water filtration into the soil. Water infiltration largely determines soil water availability. This makes water infiltration central to plant productivity and ultimately the capacity of grassland ecosystems to provide some of the functions mentioned in this guide, drought and flood mitigation, nutrient capture and the like.



Carbon Sequestration

The topsoil layer (or the **Ah horizon**) provides the most growing material for plants and has the greatest direct impact on ranch productivity. A deeper Ah horizon provides improved capacity for soil to sequester carbon and convert carbon into plant production. According to the study, a higher resting period to grazing days ratio leads to deeper topsoil and increased soil organic carbon—i.e., carbon sequestration in the soil.

Absorption of Methane (CH₄) into Soil

Absorption of methane is higher in warm soils on AMP ranches, according to an incubation study conducted by the University of Alberta. Methane contributes to a warm-ing atmosphere, but microbes in the warm soils are able to break down methane when it's captured. Engaging soils in the consumption of methane helps mitigate methane's impact on the global climate.



AMP Grazing Infrastructure

Grazing infrastructure allows for effective management of cattle to maximize forage and ensures cattle have access to a clean water source. Simply put, paddocks and water access are the primary infrastructure required to establish an AMP grazing system.

Other important considerations may include animal shelter and livestock management tools, such as batt latches and tumble wheels. These tools can be invaluable in reducing the labour and intensive management associated with frequently moving cattle. Thoughtful paddock design makes AMP grazing management easier and helps drive the environmental and agricultural outcomes.

Types of Grazing Infrastructure

Fencing

Many grazing systems use a combination of permanent and temporary fencing. Permanent fencing is well suited to the perimeter of the pasture or field and for exclusion fencing along rivers, wetlands and other permanent waterbodies. Temporary electric fencing is useful for subdividing paddocks, providing flexibility and reduced costs. Reels and tumble wheels are tools that can simplify paddock rotation.

Tailoring the design of permanent fences to work with nature can prevent injury to wildlife and reduce damage to the infrastructure. The ideal wildlife-friendly fence has a barbless top wire no more than 40" from the ground and a bottom wire at least 18" off the ground. Highly visible wire, PVC cover or a flag on the top wire also helps wildlife to better navigate fences.



Each pasture and grazing system are unique. ALUS AMP grazing projects will feature a paddock setup tailored to the specific conditions of the project site. The design, infrastructure and strategies are determined by the rancher's goals, the needs of livestock and land managers.

Over time, adjustments to paddock layout are to be expected. In fact, the initial layout should be easily adapted to a complete redesign with minimal effort or added expense. Observation and adaptation are key to achieving the desired outcomes and the intent of an AMP grazing plan.

Watering System

Many ALUS projects consist of alternate water sources like pasture pipelines, solar watering systems, portable or permanent systems that give livestock an alternative to drinking directly from a natural water body. The ecological benefits of alternate watering systems include source water protection and improved riparian health. Pasture watering systems also provide benefits to the livestock operation, such as improved herd health and increased production.

The watering system should be designed to maximize pasture utilization and provide winter watering that reduces the manure build-up associated with conventional winter corral systems. A centrally located waterer will reduce soil compaction and cattle crowding. A well-placed watering system may be able to service multiple paddocks.



What About Infrastructure Establishment Costs?

Infrastructure costs for AMP grazing may be supported in part by ALUS. Eligible expenses that support AMP grazing and enhance ecosystems are determined at the local level by the ALUS Partnership Advisory Committee (PAC), determined by site-specific needs and may include:

- Development of pasture water systems to provide livestock with an alternative to drinking directly from a natural water body, such as pasture pipelines, solar watering systems, portable or permanent systems, etc.
- Electric fencing and energizers or wildlife-friendly barbed wire fencing for cross-fencing and riparian management
- Shelters (as an alternative to sheltering in riparian zones or forested uplands)
- Portable feed bunks, salt and mineral tubs, oilers, etc.
- Livestock crossings for water bodies, such as creeks
- Enhancements for vegetation, including reforestation, seeding, etc.
- Batt latches (automatic gate openers)
- Tumble wheels, portable reels, polywire and other temporary fencing tools
- Other tools or innovations as approved by the PAC and based on available funding

Contact the local ALUS Program Coordinator for more information about eligible project costs.

AMP Grazing Infrastructure	Paddocks	Watering Systems	Fencing
Considerations	<ul style="list-style-type: none"> • Where do plant communities differ? • How many paddocks are required for adequate rest periods? • How can cattle best move between paddocks? • Where will temporary wire and/or permanent fencing be best placed? • What is the capacity (time or skillsets) of the rancher to manage the grasslands? 	<ul style="list-style-type: none"> • What are the water requirements for the herd size? • How are the paddocks laid out? • What is the distance to a water source? • What is the vertical height the water must travel? • Is there access to power? • Are there seasonal considerations (e.g., winterized system)? • What is the pumping distance/pressure required? 	<ul style="list-style-type: none"> • How many cattle grazed, where, when and for how long? • Is temporary or fixed fencing needed? • Is there suitable perimeter fencing? • What supporting infrastructure is needed? • What are the winter vs. summer fencing needs?
Key Performance Indicators	<ul style="list-style-type: none"> • Even grass forage by livestock • Suitable vegetative regrowth before re-grazing • Areas of under-grazing or over-grazing identified • The plant community in each pasture growing at a relatively similar rate 	<ul style="list-style-type: none"> • No queuing at water trough • Trough always refills after use • No leakage • Water system drained over the winter if necessary 	<ul style="list-style-type: none"> • Hot wire training of cattle • Low wire breakage • High conductivity • Time efficiency when partitioning

AMP Grazing Techniques & Tips

Grazing is part science, part art. AMP grazing must be adapted to meet the unique needs of the ranching operation. Knowledge of the basic principles of AMP grazing and an understanding of environmental, agricultural and economic goals will inform the most effective management strategies. Outside of this

guide, strong mentors, including the local ALUS Partnership Advisory Committee (PAC), can provide guidance to get the most out of a grazing strategy.

Management Recommendations for AMP Grazing

Observation

Observation is critical to AMP grazing success. Each pasture should be watched carefully, with grazing plans adapted as needed to achieve optimal plant growth and recovery, while meeting all the nutritional needs of the herd. For example, seasonality and weather conditions can cause the recovery time of a pasture to vary. A keen eye and attention to detail will help inform decisions about the appropriate rest period for optimum pasture production and animal health.

Subdivided Pastures

Subdividing pastures allows each area to be managed differently. It may be logical to put subdivisions (either permanent or temporary fencing) between north- and south-facing slopes, along dividing lines between different plant communities, along the edges of forested areas or as buffers to streams, rivers and wetlands, or where a field changes from concave to convex. Consider fencing areas to create uniformity in landform, vegetation, drainage, etc. Further subdivisions may be made based on the required amount of pasture acres per day to feed the herd.

Shorter Number of Grazing Days

Cattle should be in each paddock for a short time, so that stress to each plant community is limited. This could be a few hours or a few days. Again, observation is critical. The goal is to leave the plants with enough carbohydrate energy reserves that they remain healthy and survive. If enough residual photosynthesizing plant material is left after grazing, photosynthesis will be able to provide most of the energy needed for regrowth rather than plants having to spend energy from their roots to regrow. Plants will have the most vigorous root growth if less than half of their leaf area is removed at each grazing, though that metric may fluctuate between species and locations.

Monitor Pasture Regrowth Period

How long each paddock takes to regrow will depend on

the type of plants, season, temperature and rainfall or irrigation pattern. For example, warm season grasses will grow fastest during the hot summer months, while cool season grasses will grow quickly during spring and fall. Watch for the plants to return to the vegetative stage where the stem has had a chance to elongate but before flowering and seeding.

Riparian Grazing Limits

Grazing livestock in riparian areas may cause the removal and trampling of vegetation, compaction of soil and potentially long-term effects on the structure, composition and productivity of riparian plant communities. Graze riparian pastures after July 15 and before April 1, or as advised by local biologists, to avoid disruption to migratory birds and other breeding wildlife. Preferably, graze riparian pastures while the ground is frozen or at its driest to minimize soil compaction. It may be appropriate to graze riparian pastures at a lower stocking density.

Upland Water Source

Providing a clean and convenient water source in pastures separate from surface water will benefit the livestock and water quality. When determining the size of a watering system, consider the number of head, gallons/day/head, refill time, distance to water and percentage of the herd drinking at one time. Reputable dealers or mentors in AMP grazing, such as the ALUS PAC, can help advise.

Weed Control

Healthy pastures and forage stands can be maintained through an AMP grazing plan that helps keep weeds from being introduced or becoming established. AMP grazing can contribute to an integrated weed management strategy by promoting the health and vigor of desirable species, which allows them to better compete against weeds. Targeted grazing that capitalizes on the different preferences of cattle can be used to control and reduce invasive plants.

Ecological Indicators to Monitor when AMP Grazing



The health of the grazing pasture, as indicated by the ecological features, provides guidance on how to execute a grazing plan. AMP grazing relies on the producer's observation of the pastures and adaptation of grazing plans based on:

- Rate of plant growth
- Rate of pasture consumption
- Even distribution of manure
- Weather patterns
- Indicators of increased production of ecosystem services:

- ▲ Increased vegetation cover
 - Increased cover of preferred tree and/or shrub seedlings and saplings
 - Increased percentage of native plants with deep-binding roots

- ▼ Decreased weed cover
 - Decreased cover by disturbance-caused vegetation, e.g., dandelion
 - Decreased browsing of preferred trees and/or shrubs by cattle
 - Decreased bare soil

AMP Grazing Tips

Soil Testing

Conduct soil testing and have a health assessment completed at baseline to compare later results and adjust the AMP grazing plan as necessary.

Winter Feeding

AMP grazing may reduce the length of time that winter feed is required, which can greatly reduce costs. However, each year will see variance in when the pastures are ready for grazing. When it seems the pastures are close to ready conduct forage testing.

Tools

Consult the local ALUS Coordinator and local producers for specific advice on tools. For example, some producers find tumble wheels helpful during winter months when fence posts can't be pounded into the ground.

Be Creative

Print out and laminate large maps of the land. Use dry erase markers to experiment with pasture design.

Recordkeeping

Keep careful records. They are effective tools in evaluating what works and what needs adjustment. Consider a spreadsheet, mobile application or software package, such as PastureMap or Maia Grazing. Pen and paper with a grazing chart can work equally well.

Work Strategically

Think about how cattle will move around the ranch and leverage natural behaviours. Use reinforced lanes to give cattle pathways to water. Start with the paddock closest to the water and slowly move further away so the cattle get the idea.

Don't Give Up

Transitioning to a new grazing system may not be easy. Expect to encounter challenges and problems. Fix things and adapt as needed, but don't give up or try to implement AMP grazing only partially.

AMP Grazing Challenges

AMP grazing may be a new concept or a substantially different approach for some ranches. At first, AMP grazing may appear as though it costs producers both time and money to get established. However, the initial time and expense should be a fruitful, long-term investment. Not only can AMP grazing improve the ecological health of the ranch, but it may allow

a ranch to become more productive and support a higher carrying capacity. The local ALUS program may help with initial establishment costs, managing and maintaining projects via annual payments and accessing information and knowledge, potentially offsetting additional infrastructure and labour requirements.



Establishment Costs

The financial requirements for the setup of an AMP grazing program include physical infrastructure, such as watering systems, fencing, livestock lanes, handling systems and other accessories. The capital investment to start an AMP grazing system is often perceived as a barrier to adoption, but the start-up and maintenance costs can be overcome by long-term improvements in net farm income. Some infrastructure or establishment costs may be supported in part by ALUS. Contact the local ALUS Program Coordinator to learn more about eligible infrastructure purchases.

Labour

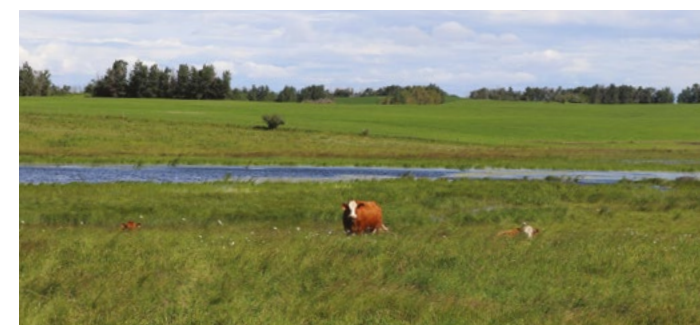
The labour requirements to regularly move livestock through different paddocks during the grazing season could be a barrier to the adoption of AMP grazing. The additional labour requirements of AMP grazing can be weighed against the benefits to the ranch—i.e., stocking more cattle per acre, more efficient forage utilization,

impact on habitat, carbon storage, less tillage. Experienced AMP grazers often gain labour efficiencies by adjusting their grazing plans using AMP grazing software (see **Additional Resources** section of this guide), efficiently designing paddocks and by refining the principals of herding behaviour, moving large groups of animals from pasture to pasture more easily and quickly.

Knowledge

Understanding how to set up AMP grazing can be a challenge. ALUS recommends that those new to AMP grazing attend workshops, conferences and master classes to further their learning. There are many excellent books, podcasts, research articles and producer groups that ranchers can access (see **Additional Resources** section of this guide). The first step is to understand the concepts of grazing period, rest period, animal impact and stock density. One of the most beneficial ways to learn is to tap into the experience and knowledge of other ranchers that are practicing AMP grazing.

Additional Resources



ALUS encourages participants to work closely with other knowledgeable agencies and to find a mentor experienced in AMP grazing. The additional resources below, when used in combination with this ALUS AMP grazing guidebook, will help in the establishment and management of a successful enhanced grazing plan.

About this Guide

This booklet is part of the ALUS Guidebook series, illustrating the types of ALUS projects available to participating farmers and ranchers.

The success with ALUS Enhanced Grazing Projects guidebook is supported by a partnership with the University of Alberta and made possible by the Government of Canada through the Agriculture Greenhouse Gases Program.

ALUS is a national program helping farmers and ranchers produce cleaner air, cleaner water, more biodiversity and other ecosystem services in their communities. Specifically, ALUS helps farmers and ranchers enhance wetlands, plant shelterbelts, improve riparian buffer zones, create habitat for pollinators and other wildlife, and establish other types of projects to produce ecosystem services. As an Alberta Emerald Award-winner—and guided by a Clean 16 Award-winning team—ALUS is a recognized leader in sustainability that is revolutionizing the way Canadians support the environment. For more information, please visit ALUS.ca

© ALUS 2021. All rights reserved.

Software

Pasture Map
pasturemap.com

Maia Grazing
www.maia grazing.com

Research and Other Articles

Bork, Edward, et. Al. "Comparative Management Attributes Associated with Adaptive Multi-Paddock Grazed Ranches and Neighbouring Cattle Operations." University of Alberta. grad.biology.ualberta.ca/boyce/ Accessed 4 May 2021.

Bharat Shrestha, et. Al. "Adaptive Multi-Paddock (AMP) Grazed Soils Have a Lower Greenhouse Gas Emissions Potential than Conventionally Grazed Soils." University of Alberta. grad.biology.ualberta.ca/boyce/ Accessed 4 May 2021.

Carlyle, Cameron, et. Al. "The Benefits of Cattle for Carbon Storage and Biodiversity in the Canadian Prairie." University of Alberta. capi-icpa.ca. Accessed 4 May 2021.

Boyce, Dr. Mark S. "Adapting Grassland Grazing to Boost Carbon Sequestration." Scientia. scientia.global/dr-mark-boyce-adapting-grassland-grazing-to-boost-carbon-sequestration/

Videos

Boyce, Mark, et. Al. "AMP Grazing — University of Alberta Study Results March 4, 2021." YouTube, uploaded by Christine Campbell, 9 March, 2021.

AMP Grazing-Related Producer Groups

Beef Cattle Research Council
beefresearch.ca/

Holistic Management Canada
holisticmanagement.ca/

Western Canada Conference on Soil Health & Grazing
absoilgrazing.com/

Saskatchewan Forage Council
saskforage.ca/

Manitoba Forage and Grasslands Association (MFGA)
mfga.net/

Canadian Forage and Grassland Association
canadianfga.ca



Success with ALUS Enhanced Grazing Projects

How to establish and maintain Adaptive Multi-Paddock grazing projects in ALUS' Western and Prairie Hubs

The ALUS Guidebook Series is made possible in part by the Government of Canada through the Agricultural Greenhouse Gases Program.

ALUS.ca



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

Canada

Opinions expressed in this article are those of the author and not necessarily those of the Government of Canada. The Government of Canada and its directors, agents, employees, or contractors will not be liable for any claims, damages, or losses of any kind whatsoever arising out of the use of, or reliance upon, this information.

