



## Development of an Equine Rotational Grazing Demonstration Site for Extension Education

Improper management of grazing horses can lead to the loss of vegetative cover, soil erosion and nutrient run-off into nearby water sources<sup>1</sup>. An example of poor grazing management is to allow horses to continuously overgraze pasture without allowing for rest and regrowth of the plants. Best management practices (BMPs) are practices that farm operators can use to control and reduce the farm's risk of negatively impacting the surrounding environment.

Rotational grazing is a recommended BMP that involves rotating a herd of horses through a pasture system containing smaller fenced pastures based on weather conditions, number of horses, and availability of forage. The horse herd is allowed to graze a pasture when the forage growth is above six inches. When horses graze a pasture to an average of three inches, they are moved to the next pasture that has been rested and is ready for grazing. If poor weather conditions occur, like heavy rain, snow, or drought, horses

are removed from the pasture and placed in a loafing (dry) lot and fed hay. The loafing lot provides a minimum of 600 square feet per horse with well drained footing and contains a hay feeder, water trough, and shelter. Loafing lots can be located within a pasture near the entrance gate or connected to many pastures within a larger system. Temporarily housing horses in the loafing lot prevents damage to the soil and pasture plants, thereby protecting the long-term viability of the pasture plants.

Rotational grazing has many benefits over continuous grazing, including improved forage production, improved distribution of manure, ability to manage resting pastures after horses have been removed, ability to make hay off of a rested pasture, lower feed and hay costs, lower labor costs with fewer stalls to clean, and the ability to increase stocking rate during the grazing season. However, some of the drawbacks include that it can be more difficult to set-up, additional fencing costs, and it requires more timely decisions about horse location within the system. A statewide survey in Maryland found that only about 30% of horse farm operators used rotational grazing on their farms<sup>2</sup>.

The objective of this project was to construct and utilize a rotational grazing demonstration site to serve as a living laboratory to use when training horse farm operators how to properly manage pastures for the benefit of their horses and the

environment. A second objective of the site was to take observational data on the effects of the grazing horses on the forage and soil within the system. This bulletin focuses on the initial design and construction of the rotational grazing demonstration site.

## **Materials and Methods**

**Layout.** The development of the University of Maryland's Equine Rotational Grazing Demonstration Site was initiated in May 2006 after the formation of a team of horse, forage, and soil conservation specialists from the University of Maryland, United States Department of Agriculture's Natural Resources Conservation Service (NRCS), and Maryland Soil Conservation Districts. A 5.5-acre parcel of land was identified at the University's Central Maryland Research and Education Center in Ellicott City, MD which is centrally located in the state. After inspection of topography and soil conditions, a site plan including a four-pasture rotational grazing design with a loafing lot, laneway, and two small vegetative heavy use areas (VHUA) was finalized (Figure 1). The two VHUA's were added to investigate the use of novel cool season and warm season grasses under heavy use situations.

A three-year grant from the Maryland NRCS Conservation Innovation Grant program in the amount of \$75,000 was obtained in July 2007. The grant covered most of the costs associated with

establishment and management of pasture, installation of the watering system, internal electric tape fencing, heavy use pad, run-in shed, field research supplies, and Extension education programs and materials. Grant limitations required additional funds to be raised for costs associated with perimeter wood fencing materials, animal care, feed, and run-in shed. As part of the grant contract, non-federal matching funds were required for up to 50% of the project costs and were met by private donations, a percentage of personnel salary and fringe benefits, and graduate assistantship monies covered by the University of Maryland. Equipment, labor, and supplies necessary to manage the pastures during and after establishment were provided by the Department of Animal and Avian Sciences, Central Maryland Research and Education Center, and a grant awarded by the Maryland Agricultural Experiment Station.

***Pasture Establishment.*** Prior to pasture establishment, soil was sampled randomly using a soil probe and then a subsample was analyzed for soil type, pH, and selected macro- and micro-nutrients<sup>a</sup>. Next, the border of the site was established and marked with flags. The project area was then sprayed with Roundup® herbicide<sup>b</sup> in September 2007 to kill existing vegetation. An application of lime was applied three weeks after the herbicide to raise the soil pH between 6.0 and 6.5. Water lines for two frost-free water hydrants and one frost

free automatic waterer<sup>c</sup> were installed in January 2008. Water hydrants were situated along the fence between pastures 1 and 2 and between pastures 3 and 4. The separate lines were installed in case the main waterer in the loafing lot needed repair.

Seeding of the 4.8 acres of pasture used for rotation was performed in April 2008. Forage type 'Jesup MaxQ®' tall fescue<sup>d</sup> and 'Slezanka' Kentucky bluegrass<sup>e</sup> were seeded using a no-till drill in two passes somewhat perpendicular to each to create a diamond-shaped pattern. Seeding rates were 20 lbs of tall fescue/acre and 5 lbs of Kentucky bluegrass/acre. Forefront® R&P herbicide<sup>f</sup> was applied in June 2008 to control Canada thistle and broadleaf weeds in the pasture. Alice white clover was seeded in April 2009 at 1 lb/acre using a broadcast seeder.

Soil in the two 0.2 acre VHUA's was tilled and then cultipacked prior to broadcast seeding by hand in mid-June 2008. The warm-season VHUA consisted of four equally sized areas of either 'Wrangler'<sup>g</sup>, 'Cheyenne II'<sup>h</sup>, 'Mohawk'<sup>i</sup>, or 'Riviera'<sup>j</sup> bermudagrass. The cool-season VHUA consisted of three equally sized areas, all seeded with a turf-type 'Justice' tall fescue<sup>k</sup> and either 'Bandera', 'Cheetah', or 'SR2100' kentucky bluegrass<sup>l</sup>. Weed Beater herbicide<sup>m</sup> was applied to both VHUA's for the control of broadleaf weeds in July and then again in August 2008.

**Loafing Lot and Laneway.** The heavy-use pad for the loafing lot and laneway was installed by a commercial excavator in August 2008<sup>n</sup> following NRCS guidelines. Those guidelines stipulated excavation of 13 inches of soil, class SE non-woven filter fabric, 6 inches of compacted #2 stone, 3 inches of compacted CR6 stone, and 4 inches of compacted blue stone dust. Compaction was done using a commercial roller. The 10 x 36 foot wood run-in shed<sup>o</sup> was shipped and built on-site by the company in August 2008.

**Fencing and Gate Installation.** The fencing and gates were installed during November and December 2008 by a commercial company<sup>p</sup> using commercially available products<sup>q</sup>. Four wood perimeter fence types and three interior fence types were used to allow for showcasing of different safe fence types for a rotational grazing system (Figure 2). Four different 2-inch galvanized steel pipe powder finished gates were featured including a 6-bar heavy duty, 6-bar light duty/economy, 7-bar light duty/economy, and a 2 x 4 inch wire-filled gate<sup>r</sup>.

**Horses and Management.** Four donated Thoroughbred geldings (initial body weight  $476.4 \pm 5.4$  kg; initial body condition score  $4.9 \pm 0.9$  units) began grazing the site in April 2009. Each morning, the horses were brought into the loafing lot to be observed

for general health. They were then turned back out to graze based on weather conditions and/or forage availability. If turned out, horses were given access to one of the rotational pastures with access to the laneway and loafing lot at all times. When horses were restricted to the loafing lot, hay harvested from the site or an orchardgrass/alfalfa mixed hay was fed to horses free choice using an equine hay basket feeder<sup>r</sup>. Horses received standard preventative health care including teeth floating, vaccinations, and deworming as needed.

Forage height was determined prior to, during, and after grazing using a meter stick with a Styrofoam plate. When a pasture was grazed to an average of 3 to 3.5 inches, horses were either moved to another pasture that had completed its regrowth period or to the loafing lot if forage availability was limited. For the portions of the year when forage and weather were not optimal for grazing, horses were housed in the loafing lot with free choice hay or stalled with ad libitum hay during severe weather.

## Results

The development of the site from planning to completion took 2.6 years. When grazing commenced in April 2009, vegetative cover (desirable grass and legume) averaged 67% across all four rotational pastures with a weed percentage of 3% and bare ground of 30%. One year later, in April 2010, vegetative cover had

increased to 81% as a result of the additional establishment of white clover (15%) and a decline in bare ground (16%). Initial development and management costs totaled \$55,459 (Table 1). In addition, grants and sponsorships totaling \$115,540 were secured to cover costs associated with construction and management of the site. Results on the performance of the forage and horses and the impact of the educational events will be published separately.

## Discussion

The unique benefit of using this site as an education tool is the ability to visually show horse owners the results of properly managed pastures and grazing horses. We achieved our main goal by being able to showcase desirable forage species for horse pasture managed at a high vegetative cover. Therefore, we are able to demonstrate to horse farm operators how they too can offer nutritious pasture to horses while at the same time anchoring soil and reducing nutrient run-off with a dense stand of vegetation. Another benefit of using the site is the ability to showcase a simple rotational grazing layout and safe fencing types for rotational grazing of horses. This will help provide horse farm operators with additional knowledge they need to make sound choices when developing the layout and design of their own rotational grazing system.

Educational events using this site offer hands-on training including soil sampling and interpreting test results, plant and weed identification, vegetative cover assessment, vegetative height measurement, and making management decisions based on forage availability. The true success of this project will be gauged using post-event surveys that assess whether horse farm owners adopted the environmentally-friendly pasture BMP's demonstrated at this site.

## Product and Manufacturer Information

<sup>a</sup>Rutgers Soil Testing Laboratory, New Brunswick, NJ

<sup>b</sup>Monsanto, St. Louis, MO

<sup>c</sup>Omni 2, Ritchie Industries, Conrad, IA

<sup>d</sup>Pennington Seed, Inc., Madison, GA

<sup>e</sup>DLF International Seeds, Halsey, OG

<sup>f</sup>Dow AgroSciences, Indianapolis, IN

<sup>g</sup>Johnston Seed Company, Enid, OK

<sup>h</sup>Pennington Seed, Inc, Madison, GA

<sup>i</sup>Seeds West, Inc., Roll, AZ

<sup>j</sup>Johnston Seed Company, Enid, OK

<sup>k</sup>Pennington Seed, Inc., Madison, GA

<sup>l</sup>Seed Research of Oregon, Corvallis, OR

<sup>m</sup>Bonide, Oriskany, NY

<sup>n</sup>Level Land, Inc., Lisbon, MD

<sup>o</sup>Horizon Structures, Atglen, PA

<sup>p</sup>P.H. Drayer, Inc., Jefferson, MD

<sup>q</sup>Kencove Fence, Blairsville, PA

<sup>r</sup>Tartar Farm and Ranch Equipment, Dunnville, KY

## Literature Cited

1. Hubbard, R. K., G.L. Newton, and G.M. Gill. 2004. Production, management, and the environment symposium - impact of animal feeding operations on the environment water quality and the grazing animal. *J Anim. Sci.* 82:E255-E263.
2. Fiorellino, N.M., K.M. Wilson, and A.O. Burk. 2013a. Characterizing the use of environmentally friendly best management practices by horse farm operators in Maryland. *J. Soil Water Conserv.* 68:34-40.



**Table 1. Total expenses for initial development and management of site from 2006-2009**

<b>Item</b>	<b>Cost, \$</b>
Pasture Establishment	3,068
Pasture Management	501
Water Trough Supplies	1,130
Stone Pad Materials and Installation	12,900
Perimeter Fence Materials	17,908
Gates	2,357
Fence and Gate Installation	10,924
Internal Fence Supplies*	0
Run-In Shed and Installation	6,671
Hay Feeder*	0
Horses*	0
<b>TOTAL<sup>1</sup></b>	<b>55,459</b>

\*Denotes items were donated

<sup>1</sup>Unless denoted by the word installation, items do not take into account labor by University staff

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