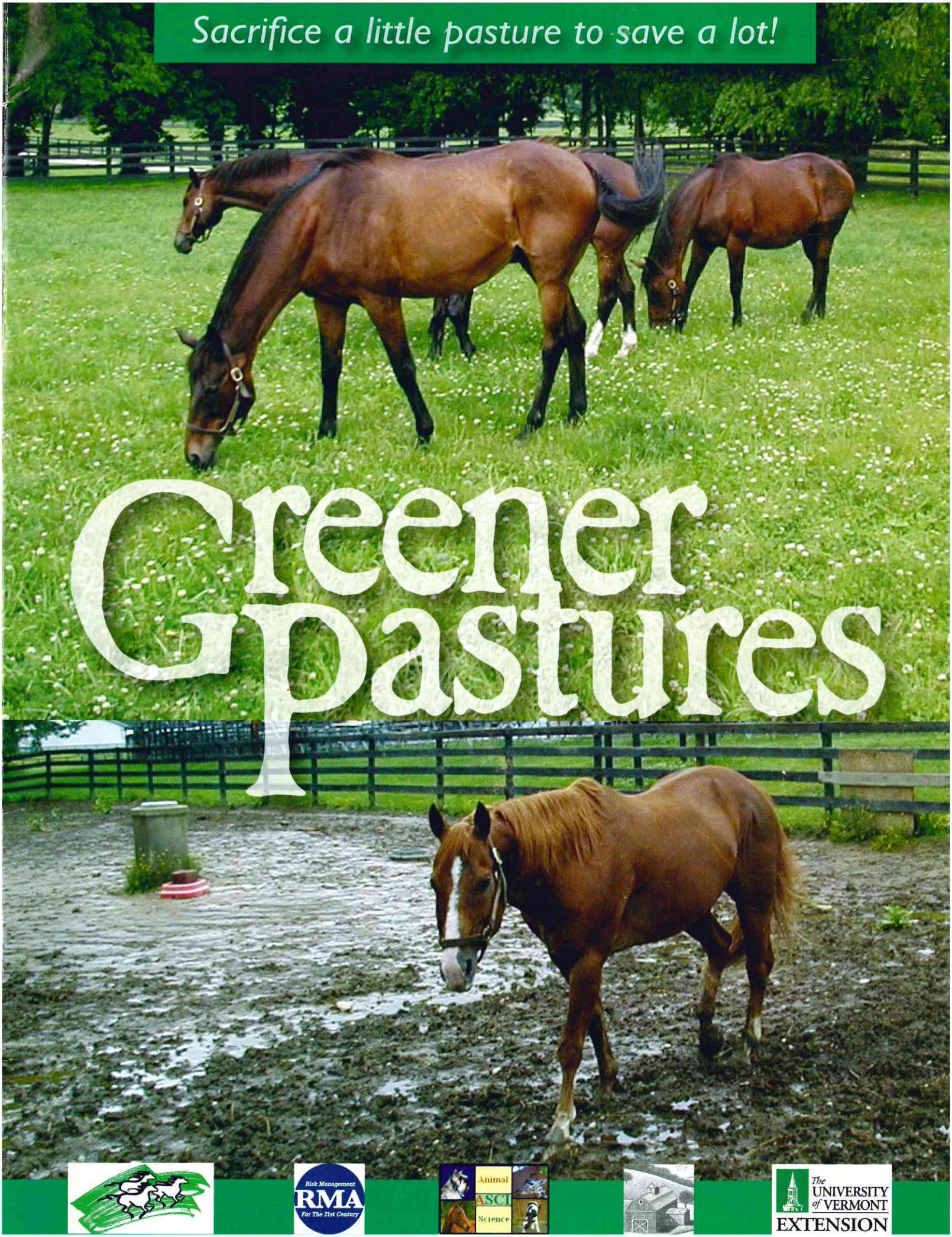
Sacrifice a little pasture to save a lot!



Greener Pastures

Risk Management RMA For The 21st Century

Animal ASCI Science

The UNIVERSITY of VERMONT EXTENSION

Authors

Dr. Betsy Greene
Extension Equine Specialist
Department of Animal Science
University of Vermont
200A Terrill Hall
570 Main Street
Burlington, VT 05405-0148
802-656-2108
Betsy.Greene@uvm.edu

Dr. Rachel Gilker
Pasture Technical Coordinator
Center for Sustainable Agriculture
University of Vermont
63 Carrigan Drive
Burlington, VT 05405
802-656-3834
Rachel.Gilker@uvm.edu

UVM Equine Science Program
http://asci.uvm.edu/equine

UVM Animal Science Program
http://asci.uvm.edu

UVM Extension
http://www.uvm.edu/extension

UVM Center for Sustainable Agriculture
http://www.uvm.edu/sustainableagriculture

Risk Management Agency
http://www.rma.usda.gov/

We extend acknowledgements to the following organizations that in some way contributed to or participated in this project. Thanks also to Frances Greene, Deb Heleba and Mark Young for their assistance.

Vermont Horse Council
http://www.vthorsecouncil.org

Vermont Equine Industry Committee
Contact: Betsy.Greene@uvm.edu

UVM Environmental Council
http://www.uvm.edu/greening/envcouncil

Finding local solutions to natural resource concerns

Vermont Natural Resource Conservation Districts
http://www.vacd.org/conservation_districts.html

Photos by Betsy Greene unless otherwise noted.

Citation: Greene, B. and R. Gilker. 2006.
Greener Pastures: Sacrifice a Little Pasture to Save a Lot. University of Vermont.

Dear Readers,

Very few horse owners haven't had to deal with some sort of mud problem in their pastures or paddocks at one time or another. The majority of horse owners would prioritize the mental health of their animal (and perhaps, the physical structure of the barn) over the health and well-being of their paddocks. Therefore, they would choose to turn out and exercise their horses, regardless of the potential damage to the soil and grass. See if your paddocks have experienced similar difficulties to the true scenario outlined below.

At the University of Vermont (UVM) Ellen A. Hardacre Equine Facility, we had chronic ice and mud issues during the winter and spring seasons. The long winter and "mud" seasons were worsened by the paddock layout. As with many equine operations, we do not have the optimum set-up for equine, human or environmental issues. Several factors that work against our efforts (both design and use patterns) to maintain "dry and healthy paddocks" are listed below.

- The slope of the paddocks runs north to south, and the gates are located on the south end (bottom).
- The paddocks are large enough for exercise, but do not contribute significantly to the horses' nutrient intake (food source).
- The gate areas are extremely compacted and do not support healthy plant growth.
- The water source is located in the high traffic area.
- The horses are turned out regardless of weather or ground conditions.

Due to these factors, we annually deal with wet paddocks that turn into mud, and then freeze. We have to maneuver around both deep, frozen hoof prints and sheets of ice that often make walking impossible. Turn-out can be hazardous to both the horse and the handlers, and the horses have a higher risk of sprains, strains, or even bruising from the uneven and slick surface. Finally, when we go through a melting period, the water runs directly through concentrated manure that sits on compacted soil. Although we do have a grass buffer and some French drains, this is clearly not the best management practice for horses, humans, or the environment.

As with most livestock operations, the "barn coffers" aren't overflowing and priorities go to horse care costs such as high-priced shavings and hay. Since we didn't have barrels of money to throw at the problem, and since these issues are common on all livestock facilities, we acquired some funds to try out methods that might be financially feasible for the average equine facility. Although the solution we found was not a perfect one, the changes made such a difference that we acquired more funds (through a UVM Environmental Grant and other sources) to improve the remaining "problem paddocks" in the same manner.

So, if mud is a problem in your pastures, we have provided some new and old ways to get "more green" in your pastures with less green from your wallet. Please read on and learn methods to improve your paddocks from the work we did to improve ours.

Currycombs and carrots-

Betsy and Rachel

Improving Your Horse Paddock/Pasture Issues Using Geotextile Fabric and Stone

The original project was an effort to improve paddock drainage and water quality at the UVM farm and to share our experiences with livestock owners through extension activities and publications. This entire project involved collaboration among many partners including the UVM Equine Program, UVM Extension, Risk Management Agency, UVM Center for Sustainable Agriculture, the local Natural Resource Conservation District, UVM Environmental Council, and the UVM Horse Barn Cooperative. The available funds allowed us to re-work the paddocks with the worst drainage that produced the greatest negative impact on the facility. Through our trials repairing these trouble spots, we determined that this method is a worthwhile one that can be adapted for many equine facilities.

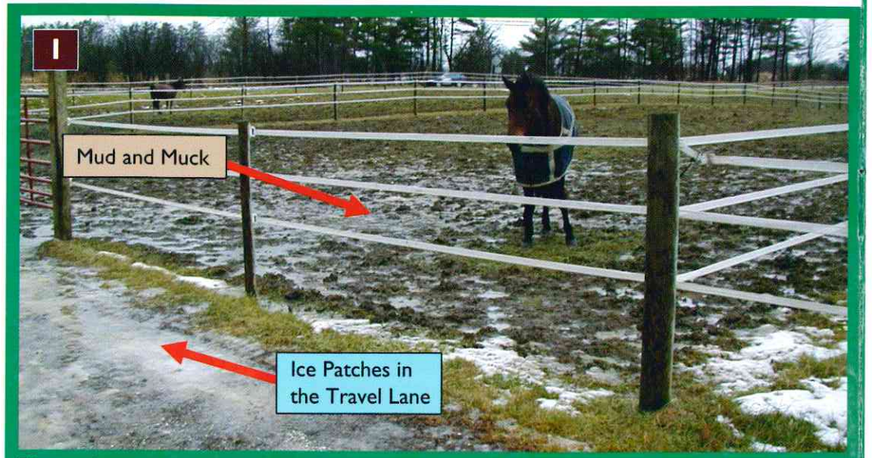


Figure 1. Mud and ice were major problems in the UVM Farm paddocks. High traffic areas are at the low points in the paddocks and become slippery, mucky, and downright dangerous.

Problem: The horse paddocks at the UVM Ellen A. Hardacre Equine Facility are directly adjacent to Spear Street and are a favorite stop for daily visitors. As with any stable that manages horses on small acreage, UVM has issues with compaction in the areas of highest horse traffic. The soil compaction results in reduced grass growth and seasonal mud and ice problems. In addition, the paddocks are naturally sloped from north to south, resulting in water runoff passing directly over the high impact areas near the gate and water tanks at the south end of paddocks. Due to the compaction, water filtration and absorption capacity of the soil is limited, and rain and snowmelt either stands or runs through mud and manure at the high impact gate areas and across the travel lane *(See Figure 1)*.

A good pasture or grass stand serves as a natural filter to clean surface water of organic matter prior to entering lakes or streams. If the soil is compacted, it is not able to sustain healthy grass growth and does not absorb water. Proper land and water quality management dictates either diversion of the water under or around the areas of high animal traffic and manure concentration *(See Figure 2)* and to the grass buffer below.

Figure 2. High traffic areas (water, feed and gate areas) often become muddy messes.

Solution: We renovated a 15x72 foot area in the high traffic section of the paddocks closest to Spear Street to divert water under the compacted horse traffic area. *(See Figure 3)*

Renovation involved replacing compacted topsoil with layers of geotextile filter fabric, large stone (1½"-1¾"), filter fabric, and dirty pea stone *(See Figure 4)*. This provided a pathway for runoff water to travel under the compacted, high traffic areas to drain pipes under the travel lane to a grass buffer below (south) and to an existing French drain.

We combined funding from several sources to test this method on a known mud/ice/safety issue site at the UVM Farm, and incorporated it into an educational venture for UVM Extension and UVM students. The money was used for materials and to hire a local contractor to do the excavation work that was necessary to complete the task. Based on the costs for four paddocks previously done, the cost for labor, trucking, and materials averaged $1,400/paddock. While this may seem to be a sizeable amount, the lessons we learned and the outcomes of the work were valuable. You may be able to use some or all of these methods in your paddocks.

How does it work?

A layer of topsoil (or mud, depending upon the season) is removed and replaced by a series of layers of geotextile fabric and stone of various sizes. Each layer has a specific purpose, as described below, and illustrated in pictures *(See pages 5-7)*. These materials and methods are what we used for our paddocks. You can use this information to determine what aspects of our project apply to your situation.

Figure 3. Horses in photo are standing on the exposed layer of dirty pea stone. The 15' strip of sacrifice pasture no longer has the same problems with mud and icy conditions.

Dirty Pea Stone: This 4" layer replaces the compact surface soil with a stone that will pack solidly over time. The pea stone retains a stable surface, even during "mud season" – stones and water don't make mud. Other materials such as SurePac® can also be used.

Geotextile Fabric: The geotextile fabric keeps the pea stone from sifting down and filling the spaces in the crushed stone layer below. This maintains pore space and drainage in the underlying layer of larger stone and keeps a solid layer of pea stone on the surface. Using two layers of fabric keeps the layers separated and decreases the "disappearing gravel/sand phenomenon," with which many horse owners are familiar, when gravel is put down to improve footing and help reduce mud problems. Without geotextile fabric, the gravel or sand gets mixed into the mud or lost in short order, and its usefulness is decreased.

Crushed Stone (1½"-1¾"): The 4" depth of large diameter stones creates pore spaces, providing a pathway for water movement to the drainpipe. Runoff, surface water, and shallow groundwater drain into this layer. Another layer of geotextile fabric separates the crushed stone from the two layers (pea stone above and the ground below). Water flows through and down to the lowest point, eventually reaching the drainpipes.

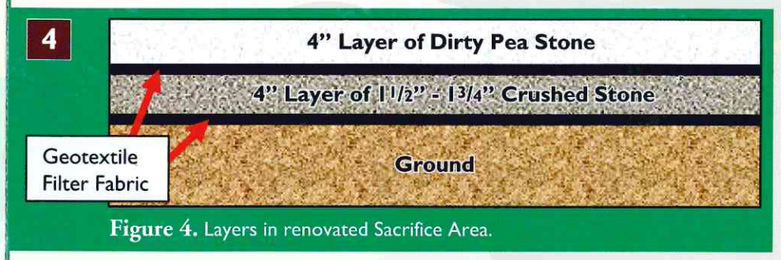


Figure 4. Layers in renovated Sacrifice Area.

Drainpipes: Buried pipes carry water from the lower layer of stone across and under the travel lane to the grass buffer below (south). These are placed at a slight downward angle (one pipe per paddock) at the depth of the crushed stone and with one end at the lowest point of the paddock. They run perpendicularly across the travel lane to the grass buffer below. This allows water to pass through the crushed stone layer to the grass buffer, providing a cleaner path for runoff.

Our French drain is located at the bottom of the grass buffer strip and runs parallel to the travel lane between the grass buffer and the horse barn. It was installed at the time the barn was built to catch and divert the runoff from the paddocks, since the barn is downhill from the paddocks. A typical French drain consists of a buried fabric-wrapped perforated pipe to channel water away from buildings, lanes, and paddocks. The fabric allows water to enter the pipe, but keeps soil from clogging the small perforations. The ditch is usually filled in with large stones to allow water runoff to drain through to the pipe.

Material	Purpose	Cost*
Dirty Pea Stone	To improve footing without mud	$6.00 per ton
Geotextile Fabric: 15'x360' non-woven filter fabric #351	To separate stone layers (Highly recommended)	$300.00 per roll
1½"-1¾" Crushed Stone	To improve water drainage	$7.00 per ton
Drainpipes 4"x13' DR35 PVC solid pipe	To divert water	$10.00 per pipe

**Costs are based on 2005 prices and vary based on geographic location.*

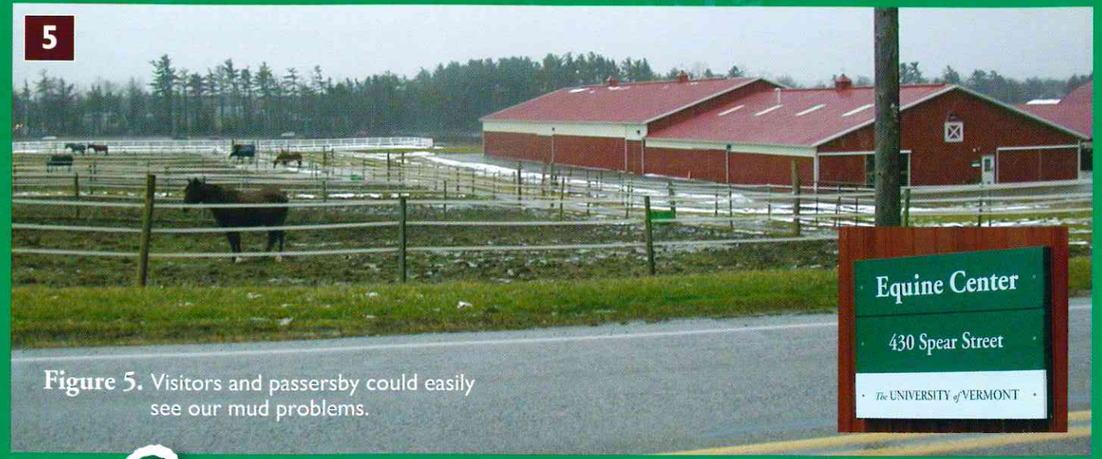


Figure 5. Visitors and passersby could easily see our mud problems.

the Process in Pictures

Figure 6a and b. One sunny day, Bud Carpenter (BCI Construction, Inc.) peeled away about 8 inches of compacted topsoil. The soil was stockpiled and then used elsewhere on the farm.

Figure 7. The 15-foot wide strip of exposed ground was ready for work.

Figure 8. Wrapped geotextile rolls and drainpipes.

Figure 9. Horse Barn Cooperative students put some back into the work as they roll out the first layer – a sheet of geotextile.

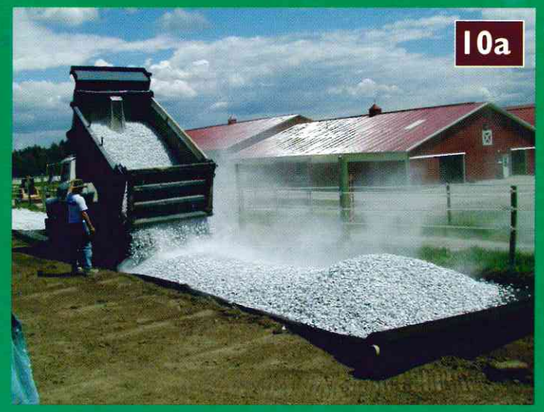


Figure 10a-c. A dump truck load of 1 1/2"-1 3/4" crushed stone is deposited and spread to a 4" thick layer.

Figures 11a and b: A second layer of geotextile fabric (not shown) is rolled over the 1 1/2"-1 3/4" stone and 4" of dirty pea stone is dumped and spread on top of it. Figure 11b shows dirty pea stone (foreground) from the first paddock project that has been through a winter with horses on it. When we did the last three paddocks, we freshened up the first set of renovated paddocks. Note the weathering of a year, but still intact!

Figures 12a-d.
A ditch was dug (CALL before you dig!) across the travel lane at the lowest point of each paddock, and a drainpipe was placed at a slight downward angle. The ditch was filled in with soil and topped with dirty pea stone. Crushed rock was dumped at the grass buffer end of the pipe to allow better diffusion of water as it passes through the buffer to the French drain.

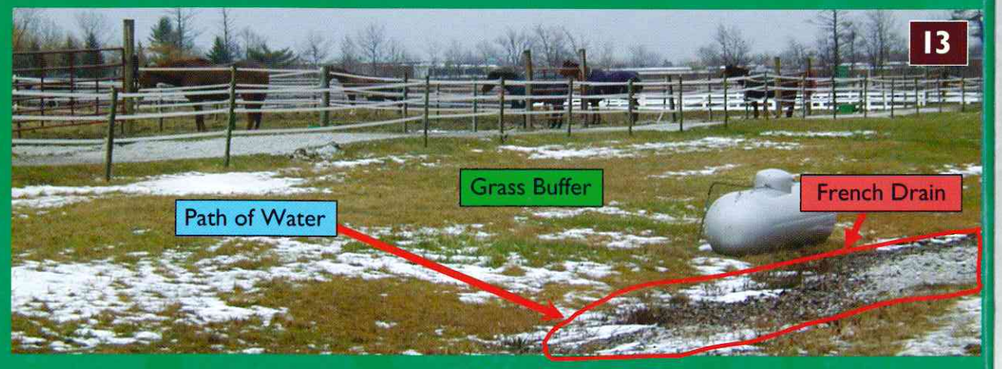


Figure 13.
Water drains from the low point of the sacrifice area. Drainpipe carries water under travel lane to grassed buffer. The grass buffer filters drainage water, and some water infiltrates the soil as it passes over the grassy area. Excess water is carried away in the French drain on the far side of the buffer.

Figure 14.
The layers stand up to traffic – No mud here! Mud is evident in the paddocks without repair. The upper paddocks (muddy ones shown at top of photo) were renovated in May 2005.

Benefits

This project demonstrates responsible land management to avoid potential water quality issues related to horse paddock water runoff.

Land/Water Management: This is proactive management of a high traffic area (feed/water/gate), using water diversion through the rock drainage area to the grass buffer strip across (south) the travel lane. As a result, water doesn't stand on compacted soil or run across the manure. Instead, water is transported under the constructed sacrifice area and filtered by the grass buffer strip located south of paddocks.

Increased Safety for Horses and People: During the fall and spring, the area had been wet and muddy (up to a foot of mud). As a result, horses made deep divots, lost shoes, and could have strained tendons and ligaments in the mud. People also had safety issues such as slipping while handling horses. During the winter, the divots left uneven ground and standing water froze, forming sheets of ice. This had provided a high potential for hoof bruising or abscesses and strains/sprains, and for people slipping and falling while bringing horses in and out of the paddocks. With the installation of the drainage area, these problems have been significantly reduced. The paddocks are now safer for horses and people alike!

Project Outcomes for the Farm

- The UVM Ellen A. Hardacre Equine Facility was used to create a student and extension teaching opportunity, while improving the drainage and water quality issues on site.
- UVM Extension developed a project that included many land and water quality partners to provide an educational event at the facilities which could include the public as well as UVM Horse Cooperative Students.
- The UVM Ellen A. Hardacre Equine Facility now could demonstrate responsible land and water quality management.

Keeping it green on the cheap!!

Putting horses on grass: Horses are happiest on healthy pastures!

If you aren't ready to take the steps described above, the following are some immediate and simple changes that can be added to your horse care routine to make your grass healthier and keep your horse happier. In general, horses that graze more and eat less processed feed are calmer and more agreeable. As an added benefit, many things that make for nicer paddocks usually also mean better care for our environment. In addition, these changes will also help you comply with Vermont's Accepted Agricultural Practices *(see pages 10-11)*.

If your horse is on pasture that looks weedy and muddy, you might want to try some or all of the following:

1. The best way to manage a larger pasture is to divide it into smaller paddocks. Rotate your horse(s) between the paddocks to avoid over-grazing in any one area. A good rule of thumb is to put horses into a paddock when the grass is about 6 to 8 inches tall and take them out when grass is down to about three inches. Horses are selective grazers, meaning they will eat their favorite plants first. They will leave weeds behind to grow. If horses stay in any small paddock for more than three days, they may do some real damage, turning the paddock into a field of weeds and mud! Best results for paddock quality occur when your horses are rotated once or twice a day.

Photo by Gwyneth Harris

2. After taking horses out, try to mow the paddock and break up the manure. Mowing is usually something left to do when the rest of the chore list is done, but if you are having a problem with weeds, mowing can be your best investment. It will help the tasty forage plants out-compete the weeds the horses leave behind. You should try to mow down weeds before they go to seed, stopping future weed growth. Another advantage to mowing is that it will spread out the manure so it breaks down more quickly.

3. When horses are in a paddock, make sure they have adequate water available. There should be 2-10 gallons per horse per day. Water can be provided in a tank, buckets, or even a clean muck bucket, depending upon the number of horses in the paddock.

4. The ideal paddock should have a high quality legume/grass mix. The pasture plants should have high dry matter content – if it is young and green, be sure to introduce your horse to the new grass gradually to avoid colic or laminitis. If you have questions about plant quality, contact your local extension agent, equine expert, or extension agronomist. Also, don't forget to check that the fencing is safe and that there are no toxic plants or weeds present. A good plant and pasture resource is available through the UVM Plant and Soil Science department (http://pss.uvm.edu/vtcrops).

5. Pastures and land differ by soil type. What is going on under the ground will really affect what you see going on at the surface. One really helpful thing you can do to take care of your pastures — and your horses — is to get a soil test to determine the ideal forage mix to grow and any plant nutrients you may want to add to the pasture. You can get your soil tested through the UVM Agricultural Testing Laboratory. Contact your local extension office for a soil test kit or call 800-244-6402 (for Vermont). And remember, if you add any fertilizer, do so several days before your horse returns to that paddock. Avoid over-applying nitrogen; it is unnecessary for pasture growth, an unneeded added expense, and can cause excessive growth that can be unhealthy for your horse and the environment!

6. One of the best, but hardest, things to do is to know when to take your horse(s) off the pasture for the season and put it in a designated sacrifice pasture area. If ground shows between plants, and most plants are down to 1" or less, you should move your horse. Doing this will give your horse somewhere to exercise when the rest of the paddocks are too muddy or icy to be safe and will be beneficial for plants and soil. Wet and muddy pastures are fragile, and horses' hooves will tear them up and compact them, hindering future plant growth and making a mess. Runoff from muddy paddocks may be an eyesore as well as a safety hazard, and could conflict with Accepted Agricultural Practices because it may harm water quality in nearby streams and rivers. Keeping your horse in a sacrifice paddock for the short term will mean better paddocks everywhere else for the long term.

Here are some pointers on sacrifice paddocks:

- A sacrifice paddock can be anywhere from 16' x 16' to 20-30' x 100' – it should be big enough for exercise while the horse is there.
- The paddock should be accessible to the barn, but it shouldn't get a lot of runoff from the barn roof so that it doesn't get too muddy.
- The paddock should be on higher ground. Materials such as wood chips can be added to give your horse better footing.
- You may want to make sure there is a buffer (ideally 10' wide or wider) alongside the sacrifice paddock to filter runoff from the paddock, lanes, or waterways.

You know your horses better than anyone, and you know what will work the best for you and for them. By working with your horses' natural habits, you can keep your pasture and horses in their best condition.

You may want to join other horse owners on a pasture walk to learn more about the do's and don'ts of horse grazing. For a calendar of pasture walks, please check the Center for Sustainable Agriculture website: **http://www.uvm.edu/sustainableagriculture** and click on Pasture Network Program, and then click on Pasture Calendar. For more information on keeping your horses and your pastures happy, please contact the Center for Sustainable Agriculture at 802-656-5459 or call your local extension agent.

Accepted Agricultural Practice (AAP) Facts

Accepted Agricultural Practices or AAPs are regulations designed by the state to help reduce agricultural non-point source water pollution. These rules apply whether you are a business or if you just have a few "backyard" horses.

AAPs include:

- Issues about distance from wells, neighbors, rivers, buffer strips, etc.
- Confinement, feeding, fencing and watering of equines
- Storage and handling of equine waste and byproducts
- Water quality standards
- Field and stream bank stabilizing

We are including selected items that are pertinent to any horse operation in Vermont. If you have any questions, you may want to contact the Vermont Agency of Agriculture, Food, and Markets directly or review the entire set of rules at (See **http://www.vermontagriculture.com/AAP.htm** for complete AAPs). For example:

- No direct discharge of animal waste is allowed into State waters. Agricultural areas must be managed with AAPs.
- Permitting needed for medium farms (150-499 horses), and may soon be a requirement for small farms (<150 horses).

Some AAP Pertinent Pieces and Parts for Horse Owners

The AAPs listed below include new language that is proposed as of 6/21/05.

4.01 Discharges

(b) Barnyards, manure storage areas, animal holding areas and production areas shall be managed or controlled to prevent runoff of wastes to adjoining waters, groundwater or across property boundaries.

(c) Adequate vegetative cover shall be maintained on stream banks by limiting livestock trampling and equipment damage (except at defined crossings) to protect stream banks from excessive erosion.

4.02 Nutrient and Pesticide Storage

(c) Manure stacking sites and storage of fertilizer and other nutrient sources shall not be located within 100 feet of wells or property boundaries unless it can be demonstrated to the Secretary that there is no suitable alternative site. Fertilizers may be stored within 100 feet of wells provided that they are stored in structures suitable for that purpose.

(d) Stacking or storage of manure shall not occur on lands subject to annual overflow from adjacent waters unless it can be demonstrated to the Secretary that no suitable alternative sites exist.

(e) Manure shall not be field stacked on unimproved sites within 100 feet of surface water unless it can be demonstrated to the Secretary that there is no suitable alternative site.

4.07 Construction of Farm Structures

(d) All waste storage facilities constructed or expanded after July 1, 2006 shall be designed and constructed according to USDA Natural Resource Conservation Service standards and specifications or an equivalent standard certified by a professional engineer licensed in the State of Vermont.

4.08 Ground Water Quality

(a) Farm operations shall be conducted so that the concentration of wastes in groundwater do not reach or exceed the primary or secondary groundwater quality enforcement standards identified by Appendix One of the Groundwater Protection Rule and Strategy in accordance with 10 V.S.A. Chapter 48.

(b) Farm operations shall be conducted with the goal to reduce the concentration of wastes in groundwater to the preventive action levels (PALs) of the primary or secondary groundwater quality standards identified by Appendix One of the Groundwater Protection Rule and Strategy when monitoring indicates the presence of these wastes in groundwater that exceed the enforcement standard.

Steps Used for Renovating Our High Traffic Area

1. Determined the desired size, shape, cost, and items needed for the project.
2. Prior to lifting a shovel, called appropriate people to locate and mark water lines, power, and telephone cables. CALL BEFORE YOU DIG!
3. Made arrangements with a contractor to establish cost, timing, materials needed, hauling, etc.
4. Took down electric tape fence (2 lengths) from each paddock to allow adequate width for large equipment to pass through.
5. Used a skid steer with a chain on the bucket to pull out the fence posts (1 per paddock).
6. Removed 8" of topsoil using a skid steer with bucket and loaded it into a dump truck; stockpiled it at another location on the farm for a future use.
7. Rolled out first layer of geotextile fabric.
8. Hauled loads of 1 1/2"-1 3/4" crushed gravel from the local gravel yard.
9. Started spreading and leveling the layer (4" depth) on the paddocks while driver was hauling loads of stone.
10. Rolled out the second layer of geotextile fabric over the crushed stone.
11. Hauled and spread (as above) dirty pea stone over fabric.
12. Drove back and forth over the surface with dump truck and skid steer to pack it down.
13. Dug trenches across the travel lane at the lowest point of each paddock.
14. Put in PVC pipe. Pipe was slightly angled down and away from the paddocks to direct water flow to the grass buffer below.
15. Put in crushed rock at the grass buffer end of the pipe to promote better water diffusion.
16. Filled in trench with soil.
17. Reinstalled fence posts and electric tape was put back in place.
18. Spread grass seed and straw/hay over truck path outside of the paddock area.

Notes on our project...

When we decided to do the partial sacrifice area, we included the width of the geotextile fabric as a consideration for the actual size of the renovated space. We wanted to have the horse handler be able to swing the gate in, bring a horse into the paddock and turn it loose while on the constructed area. The 15' wide roll of geotextile fabric accomplished these desires.

We did not use "drain tile" pipes or perforated pipes in the travel lane because we were more interested in transporting runoff water to the grass buffer, and the travel lane is made of filter fabric and hard packed stone. That would preclude water absorption in that area.

Some of the project was incorporated into both UVM class and UVM Extension activities, so the actual time spent on the project is not cut and dried. The contractor work was done in less than two days, but the hauling of the stone took up a large part of that time. The time spent hauling in stone was greater than the time it took to spread and level the loads (leaving idle time for one of the workers).

We did not put the PVC pipes below the frost line in our project, since the constructed sacrifice layers were less than a foot deep. We know that at a certain point everything will freeze, and the drainage would not occur at that time anyway.

Resources

Harris, Gwyneth, Elements of a Successful Horse Grazing System. Vermont Pasture Network Program.
Contact 802-656-3834 for information.

UVM Extension

http://www.uvm.edu/extension

The University of Vermont Extension

Central/NE Vermont:
802-751-8307

Northwest Vermont:
802-656-5426

Southern Vermont:
802-773-3349

Soil Testing

http://pss.uvm.edu/ag_testing/
802-656-3030
802-244-6402

Other Useful Sites

The Northeast Grazing Guide: Your source of Grazing Information in the Northeast (hosted by University of Maine)
http://www.umaine.edu/grazingguide/

From Rutgers University:
http://www.rcre.rutgers.edu/horsepastures/

King Conservation District Publications website (particularly the mud management, pastures, general livestock, waste management, and soil links).
http://www.kingcd.org/pub.htm

Printed by Paw Print & Mail