

MUD MANAGEMENT FOR SMALL SCALE LIVESTOCK OPERATIONS



If you own livestock on limited acres, especially horses, you have spent time sloshing around in the mud possibly having a boot pulled off. You may think that mud is an unavoidable part of owning livestock on limited acres. But the reality is it doesn't have to be. You are probably asking yourself why should I "clean up" this area for my livestock? Not only is mud unhealthy for your livestock to, it is unsightly, can be bad for the environment, and can be a danger to the caregivers.

Recipe for Mud

So what is mud? One part soil, two parts water, and one part manure. Mud is a mixture of wet, soft earth or earthy matter or mire. The first thing that can cause mud is manure. Manure is great at holding moisture, which is why gardeners love it. It is these same properties that can contribute to muddy livestock areas.

In high traffic areas, horse hooves loosen topsoil and compact the soil below. As the soil becomes more compacted with the constant pounding of horse hooves, rainwater is not able to percolate through the soil and pools on top, mixing with the topsoil to create mud.

The final and most important ingredient for making mud is water. The rainwater that runs off of impervious surfaces like your barn roof

can compound the problem. If the rain isn't directed away from the high traffic areas, you can have a real mud problem.

Unhealthy Environment

Mud creates an unhealthy environment for you and your livestock. Mud can harbor bacteria, fungi, and other pathogens that can cause abscesses, scratches, rain scald, and thrush.

The continued access to wet conditions can damage the hoof structure and cause general unthriftiness in livestock.

Mud is a breeding ground for insects. They are not only annoying to both humans and livestock; they can carry disease and cause allergic reactions in both livestock and humans.

Mud can be unhealthy for both horses and livestock. If horses are feed from muddy ground they can ingest dirt or sand particles with hay or feed. This can lead to colic, a serious digestive disorder that can be fatal to horses.

Animals that continually have to stand in muddy conditions tend to chill quicker than those that do not. Mud can also create slick conditions for both humans and livestock increasing the risk of injury.

When you have a muddy area chances are in the wetter months it will be mud, but in the drier months it becomes dust. Dust is also a potential health risk for your animal's respiratory system and a possible problem for humans working in and around these same conditions. Not to mention the problems that it can cause with neighbors.

Environmental Impact

Muddy conditions can cause an environmental impact. Once soil and manure mix with water to become mud, it can easily be carried to nearby streams or other bodies of water. This sediment and manure can negatively affect the fish and aquatic wildlife in streams, ponds, and lakes. Organic wastes can leach into the groundwater, potentially contaminating the well water you and your horses drink. This type of pollution also violates the Pennsylvania Clean Streams Law.

Help

By now you are probably asking yourself what you can do to solve these problems. Fortunately, there are several management techniques that can help. First, the most effective management technique is to pick up manure in stalls, confinement areas, paddocks, and riding arenas every one to three days. This can also help reduce parasite and insect exposure.

Practice good pasture management. This management technique may take some work. You should create a sacrifice area. This is a small enclosure such as a paddock, corral, or pen that is sacrificed for the benefit of the rest of the pasture(s). Livestock should be confined to this area during the winter months and when the pastures are saturated from rain.

Use a rotational grazing system. By dividing a pasture area into smaller fields and rotating livestock through the paddocks you can encourage more even grazing. The rule of thumb for pasture management is not to graze below three to four inches.

Sacrifice Area

You are probably asking yourself "What is a sacrifice area"? A sacrifice area also known

as a *dry lot, turn out lot, exercise lot, corral, or paddock*. The concept behind a sacrifice area is that you "sacrifice" a small portion of land in order to protect pastures from over use at critical times (winter months, during wet conditions, and at times of slow plant growth). Beside pasture management, sacrifice areas have other management benefits. Livestock can be turnout for exercise when the weather is poor, prevent over grazing of lush green pastures, and can be valuable when you have sick or injured livestock.

Benefits of a Well-Planned Sacrifice Area:

- Hoof friendly surface for better horse health
- Reduction of mud and ice
- Ease of manure removal/management
- Improved aesthetics
- Reduction of manure or soil laden runoff to bodies of water
- Reduction of fly breeding habit
- Improved pastures utilizing the sacrifice area as a management tool

Planning Your Sacrifice Area

First you must consider the space needs of your livestock. The size of this area can range from a double box stall (about 12' x 12') attached to livestock housing, to a long narrow enclosure that allows livestock room to run and play. A good rule of thumb is approximately 20 or 30 feet wide by 100 feet in length will allow horses to trot, 200 feet in length will allow them to gallop. When planning your sacrifice area keep in mind that the larger your sacrifice area the larger the area you will have to clean and the more footing you will need to purchase.

Location is everything when choosing a site for a sacrifice area. The ideal place to build a sacrifice area is on the highest, driest ground, away from wetlands, streams, and other bodies of water. For chore ease, keep the area closest to the barn.

You want to use safe fencing for your sacrifice area. No matter what type of fencing you choose for this area, you may want to reinforce it with some type of electric tape or hot wire. This will prevent livestock from riding the fence down and pushing the fence

out from the bottom. Remember from the livestock's view, the grass is always greener on the other side of the fence.

If you have owned livestock, especially horses you know that if there is something that they can injure themselves on they will. When you building your sacrifice area you will need to "livestock proof" this area. Walk around the sacrifice area a few times looking for problem areas. These areas may include protruding bolt ends, nails, boards, tops of metal t-posts, edges of metal roofs and buildings, hanging wires or cords to name a few common problems. Also remove all machinery and garbage from this area.

When planning your sacrifice area keep in mind that gates should be wide enough for delivery trucks (about 12 feet wide). It may also be to your benefit to have a road or driveway leading into the sacrifice area that will be accessible year round. Remember that the vet, farrier, and delivery vehicles may need to access this area even over the winter.

When choosing the location for your sacrifice area, ask yourself these questions:

- Will the sacrifice area be near your manure pile and hay storage for ease of daily management?
- Can deliveries be made without having to move horses?
- Does livestock have access to fresh water?
- Can livestock be fed without walking through the sacrifice area? This can be very important if you have an inexperienced person taking care of the livestock for you.
- Can livestock be moved with ease?
- Are alleys and paths wide enough for wheelbarrows and other equipment?

Building a Sacrifice Area

Before you are ready to apply the footing material you will need to prepare the base. As with any construction, a good subgrade is the foundation for a successful design. The subgrade needs to be free of debris and vegetation, and needs to be properly compacted. Subgrade strength should be as high as possible to assure good performance

from an all-weather surface. Geotextile fabrics are synthetically engineered materials that were originally developed to provide additional soil stability and to distribute loads over a wider area. Most geotextiles are made from either spun or woven polypropylene material.

Geotextile can provide many of the benefits of concrete and can be installed for about one-third of the initial cost of concrete. Geotextiles perform three main functions:

1. Separation – Geotextiles separate the existing subgrade soil from the lane or pad base material and prevent the base material from mixing with the existing subgrade soil.
2. Load distribution – Geotextile reduces the localized surface loads and redistributes the pressure across the existing subgrade soil to minimize its deflection, which can lead to tire ruts and mud holes under load.
3. Reinforcement – Geotextile reinforces the all-weather surface by providing tension resistance from applied loads, which prevents aggregate separation.

Geotextile fabric is porous so water passes through while soil and rock are held in place. This is the reason geotextile fabric is often referred to as *filter fabric*. The wicking action helps drain areas more quickly. Subsurface tiling may be needed to assist drainage and prevent manure, urine, and silage seepage from entering the groundwater or to maintain strength of the existing subgrade soil. Subgrade strength is maximized by providing good drainage and proper preparation.

Subgrade soil preparation and fabric installation affect performance. Slope animal yard areas to encourage surface water runoff and infiltrated water drainage. The site should be cleared, grubbed, excavated, graded to the appropriate slope, and compacted if necessary. The subgrade surface should be free of topsoil, rocks, roots, debris, depressions, mud, and standing water. Do not place fill material on muddy, frozen, frosty, or icy ground. Fill soil should be suitable for compaction (not topsoil or soil with organic material).

Fabrics

Geotextile fabrics typically are available in rolls from 8 to 12 feet wide. The fabrics are available in several forms with a range of material properties. The term weave simply describes how the textile fabric is produced. Strength characteristics are similar for both forms, but permittivity is higher for nonwoven geotextiles. Permittivity measure's a fabric's ability to pass water. Contact your local Natural Resource Conservation Service (NRCS) or Conservation District for assistance in choosing a geotextile fabric that is best for your needs.

The geotextile should be rolled out as smoothly as possible over the prepared subgrade. To prevent tears, the fabric should not be dragged across the ground. Unroll the fabric and loosely lay the material so it conforms to the surface face. Slack does not distribute loads evenly over the subgrade; at the same time do not overstretch the fabric. At the joints the fabric should overlap at least 18 inches to maintain strength and load distribution.

Footing

You will probably still need to apply some type of footing material in high traffic areas (around watering areas, gates, and walkways) and in sacrifice areas to prevent muddy conditions. The type of livestock you have, will dictate what type of footing material will best meet your needs.

Footing materials can consist of a mixture of gravel, sand, or wood chips. These types of materials can go along way in reducing mud. The purpose of the footing is to build up the area and allow for "good" drainage. Not only is footing an economic benefit but also protects water quality-

There are many products on the market that are designed to help reduce mud and stabilize an area. The most readily available products in Pennsylvania are gravel, sand, and woodchips (hogfuel). If planning to use sand, do not feed livestock on it, this can cause serious digestive problems for the livestock.

Gravel – Gravel (crushed rock) no larger than 5/8" is readily available in Pennsylvania as a footing. This type of footing material is especially useful in high traffic areas – gates, watering, feeding areas. The benefits of gravel are that it will not break down and it drains well. The down side is that gravel can be expensive, but you probably will not have to repeat the application in a few years.

Ideally a two layer footing system works best when working with gravel. It consists of a coarse aggregate base and a finer cover layer. Neither of these materials works well alone. Coarse aggregate does not compact easily; many voids may result leaving the surface uneven and difficult for livestock to walk on. The finer material compacts easily but will move under heavy traffic. When the two materials are used together, the fine material fills in the voids left by the coarse material. The result is a durable, all-weather surface that is acceptable for animals.

Sand – Sand is another useful alternative when trying to eliminate mud. The principals of using sand are similar to those of gravel. If you use sand, do not feed livestock on it. Sand particles can be ingested and cause serious digestive problems for horses.

Woodchips (Hogfuel) - Woodchips or Hogfuel are a good alternative to using gravel. This material is a byproduct of the logging industry. The material is coarse bark and woodchips that are produced when a tree goes through a machine called the hogger.

This material can provide a good surface and through the natural process of decomposition, breaks down the nitrogen in urine and manure. This helps to eliminate urine smell and reduce the amount of nitrogen that could runoff the sacrifice area.

There are some disadvantages to using hogfuel and woodchips. They can hold moisture and tend to be wetter than some other types of footing. And since it is an organic material, it will continue to decompose over time. This means that there will be some yearly repair for this type of footing. You will need to remove the decomposed material and

replace it with new. If you do not remove the old material you can be back where you began with a muddy situation. This material has a tendency to decompose fairly quickly so you will want to avoid using it in any wet areas.

Be picky when purchasing hogfuel. Make sure you know what you are getting before you order the material. Visit the supplier and inspect the type of material that you will be purchasing. Find out what type of wood is in the hogfuel, remember certain types of woods can be toxic to livestock (especially horses).

Installation

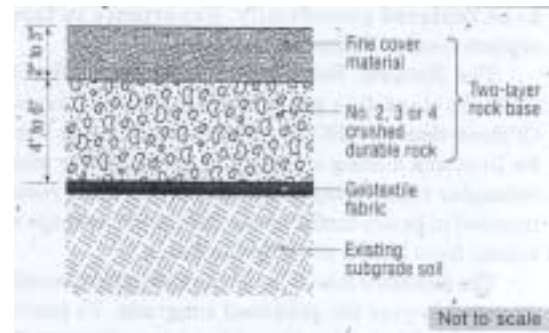
A general rule of thumb is to use at least three inches of footing, preferably six (the more the better). When conquering mud you will need to use at least a 1:1 ratio (if you have six inches of mud you will need at least six inches of footing).

Examples of Common Types of Footing

The following information is for a 36 x 100 foot paddock. The costs are only average costs and may vary greatly depending upon your area and the availability of material.

1. Place fill sand directly on a leveled site. You must have good drainage to use this method. You will need to replace the fill sand every couple of years when the paddock begins to get muddy. The coarser sand works best as a footing. Keep the depth of the sand approximately 4". If the sand is too deep the livestock could injure themselves. Another downside is you do not want to feed from the ground in this type of paddock. The average cost of this footing is approximately \$0.20 square foot.
2. Place six inch layer of $\frac{3}{4}$ " gravel on a prepared surface and four inches of fill sand on top. Some of the gravel may move up into the sand layer, so you will need to keep an eye out for hoof bruising and abscesses or other problems. This works well in an area with a slight slope. The average cost is \$0.40 per square foot.

3. Apply six inches of 1 1/2" minus gravel on prepared surface with six inches of wood chips on top. The wood chips will work down into the gravel and start to break down; you will need to add additional woodchips in a few weeks. If you plan to use only woodchips apply a 12-inch deep layer. The cost of this method is about \$0.40 per square foot.
4. The fourth and final method is the most expensive, but will last the longest. Start by laying down a woven geotextile fabric on leveled surface, spreading a 6 inch layer of $\frac{3}{4}$ " minus gravel and then a 4 inch layer of fill sand or fine gravel. The cost of this method is approximately \$0.55 per square foot.



Other Mud Preventatives

Install Roof Gutters and Downspouts – On a 900 square foot barn (approximately 30' x 30') a one-inch rainstorm produces upwards of 558 gallons of water. Now if all that rainwater runs off your roof and straight into a confinement area, you have one of the key components of making mud. By diverting the water away from this area you will be eliminating a majority of the water that is causing a mud problem.

When installing downspouts be sure to protect them from livestock destroying them. This can be done by covering the downspout with heavy PVC pipe, hot wire, or simply by making the downspout area inaccessible to livestock.

Keep Clean Water Clean – This is the golden environmental rule. It is easier to keep the water clean than to treat it once it has become polluted. When clean water runs through a livestock area it mixes with manure and soil, immediately going from clean to contaminated. When the runoff water carries to the nearest body of water it carries those contaminants with it. However by diverting the clean water from these areas you will be helping to prevent pollution of Pennsylvania's water.

If you are still having a problem after diverting the roof runoff water away from livestock areas, during the next big rain watch where the water is coming from. It may be necessary to cut off all the upslope water and divert it away from the livestock areas using a diversion.

Keep Livestock Out of Stream, Wetlands, and Other Bodies of Water – Fencing livestock out of streams and any other bodies of water will help prevent mud in these areas. Livestock often congregate around water areas and are likely to overgraze the area and trample the streambanks. This area will be an unattractive mud hole in the winter months and can harm aquatic life. Also remember that whatever enters upstream will be coming by your property and livestock can have access to bacteria, pathogens, and disease. If it is necessary for livestock to cross the stream, build a stabilized stream crossing. Contact your local NRCS or Conservation District for information on this best management practice.

Wetlands will also turn into mud holes with the impact of livestock. Many pastures in Pennsylvania have wetlands in them. These areas tend to be one of the only places that are green in a pasture during the harsh months of summer. Wetlands are nature's filter systems for our water. Allowing livestock access to these areas will jeopardize the integrity of the wetland, not allowing it to function as nature intended.

Plant Trees – Trees, through evapotranspiration, "drink" a huge amount of water and they can significantly reduce the

amount of water around livestock facilities. A mature Douglas fir can drink 100-250 gallons of water per day. Evergreens have an added advantage over deciduous trees, which are dormant during the winter months when mud is usually an issue. Other water loving trees include willows, dogwoods, and some poplars. When planting trees make sure that they are protected from chewing and root compaction. Fence trees off at the drip zone (the end of the branches where raindrops roll off). Not only will you be planting trees to control mud but you will also be giving your livestock shade. Avoid planting trees that are toxic to livestock.

With a little planning and management you can have a mud free environment for your livestock and be environmentally friendly.

References:

Healthy Horses, Clean Water; Horses for Clean Water; A Guide to Environmentally Friendly Horsekeeping. Alayne Renee Blickle and Horses for Clean Water. 2000-2001

Horse Environmental Awareness Program (HEAP) USDA, NRCS Connecticut.

The Unmaking of Mud. Alayne Renee Blickle. Equus, December 1999

Equine Barnyard Management. Rutgers Cooperative Extension, New Jersey Agricultural Experiment Station

Using All Weather Geotextile Lanes and Pads. Mid West Plan Design Service. July 1999

Using Geotextile Fabric in Livestock Operations. Land and Water. March/April 1999

Prepared by members of Pennsylvania's Small Scale Livestock Committee.

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