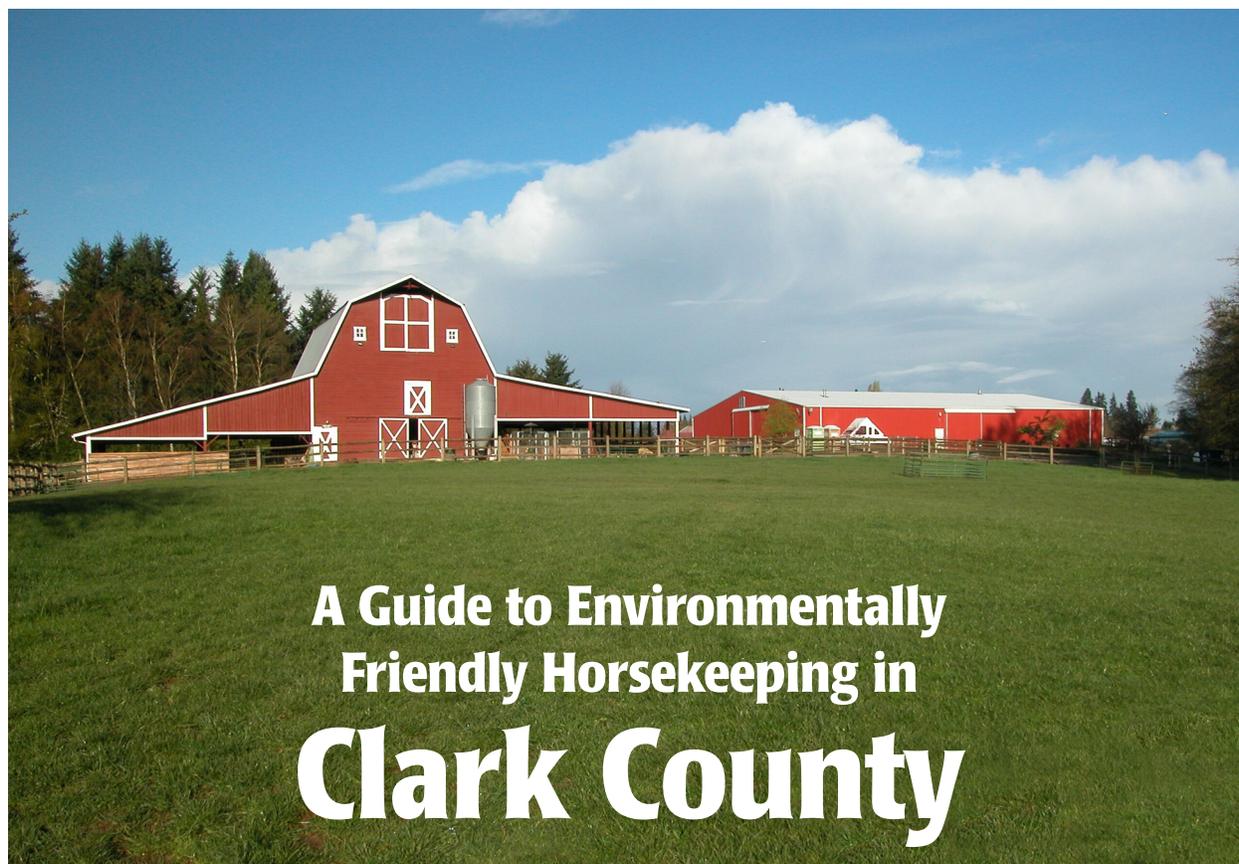




# Healthy Horses, Clean Water



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## A Guide to Environmentally Friendly Horsekeeping in Clark County

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This manual was developed by Horses for Clean Water through a grant administered by the Clark Conservation District. Funding for this project has been provided through a grant to the Department of Ecology from the United States Environmental Protection Agency. The Department of Ecology allocates and administers funding for this project. The contents of this document do not necessarily reflect the views and policies of either the United States Environmental Protection Agency or the Department of Ecology, nor does the mention of trade names or commercial products constitute endorsement or recommendation for their use.



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## What is Horses for Clean Water?

Horses for Clean Water is a program developed *by* horse owners *for* horse owners. Our mission is to help other horse owners manage their land in the best way possible for horse health and the environment. Horses for Clean Water offers workshops, farm tours and educational materials on a wide range of topics including mud management, manure management, pasture management, seeding, composting manure, fencing, weed management, stream fencing and restoration, wildlife enhancement, and more. For education schedules and more information on Horses for Clean Water contact Program Director, Alayne Blickle, at 425-432-6116 or check out the website at: <http://www.horsesforcleanwater.com/> Join Horses for Clean Water and other horse folks for some good, clean horse'n around!

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# Introduction

## The Value of Good Land Management

How you manage the grass in your pastures, deal with mud in confinement areas, and dispose of manure are a few examples of land management on a horse property. Good land management protects horse health and water quality, improves chore-efficiency and prevents disputes with neighbors. Good land management doesn't need to be costly; often a slight change in operations can make a big difference and lead to long-run savings. For example, if you eliminate mud on your property, you eliminate the horse health problems associated with mud *and* the vet bills they incur. A more productive pasture can reduce feed bills. Composting manure can eliminate disposal costs. Better pest management can reduce repairs around the barn. And all of these improvements combined can increase your property value.

## Protecting Our Water

When it rains, the water usually soaks into the ground, evaporates, or flows downhill until it reaches a body of water such as a stream, river, or lake. As this water, or "runoff," travels along the ground, it picks up pollutants in its path and can become contaminated before it reaches a nearby body of water. Pollutants on the ground can also combine with rain and soak through the soil, polluting groundwater. Listed below are some potential pollutants typically found at a horse place.

**Nitrogen.** Manure contains nutrients, such as nitrogen, that help plants to grow. This can be a great thing in our gardens and pastures, but when nutrients from manure end up in our water, it can be a problem. The same nutrients that help plants grow on land also encourage the growth of algae and other aquatic weeds in water. These plants can create unpleasant odors and surface scum, making water unsuitable for recreation. As these plants decompose, they also use up the oxygen in the water that fish and other aquatic life need to survive. Salmon and trout are particularly at risk because they need high levels of oxygen in the water. Nitrogen (in the form of nitrate) in our groundwater is also a problem and can be harmful to humans when consumed at high levels. When nitrogen from manure soaks down through the soil, it can end up contaminating groundwater. Groundwater is the source of drinking water for many people, especially those in rural areas. Excessive amounts of nitrate in drinking water can cause health problems such as blue baby syndrome and may be linked to cancer and birth defects.

**Soil.** Soil may seem harmless enough, but it poses some serious problems in the water. When rain carries soil into streams and lakes, the water becomes cloudy, making it less suitable for recreation and making it difficult for fish to see the insects they prey on for survival. Soil can also smother trout and salmon eggs and cover prime spawning areas. In addition, pollutants are often attached to soil particles and end up in the water along with the soil.

**Bacteria.** Manure contains fecal coliform bacteria, which is found in the intestinal tracts of all warm-blooded animals, including humans. The presence of fecal coliform in drinking water or at swimming sites is evidence that human or animal waste has been or is present. The coliform bacteria may not necessarily produce disease, but it raises concerns because many diseases can be spread through fecal transmission. High levels of fecal coliform can result in the closure of swimming areas and can lead to shellfish bed closures.

## The Good News

In this manual you will learn manure, mud, pasture, stream, and wildlife management techniques that will not only reduce pollutants in our water—these same techniques will also protect your horse's health, make your property more attractive, your chores more efficient, and save you money!

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# Manure Management



## The Benefits of Good Manure Management

Managing manure—pick up, storage, and disposal—is an issue for every horse property owner. One horse produces 40-50 pounds of manure per day and if you don't have a good management plan you can end up with a mountain of manure that's an eyesore, fly magnet, and odor problem for you and your neighbors. Poor manure management can also result in serious water pollution and can impact horse health by raising the risk of parasite re-infestation and by increasing the amount of mud on your property.

In this chapter you'll learn several key steps you can take to protect your horse's health and the environment and even turn manure into an asset. Some of the topics we'll cover are:

- Manure pickup.
- Bedding choices for your horse's stall.
- Choosing the best location for your manure pile.
- Covering your manure pile.
- Composting manure.
- Tips on using and giving away manure and compost.



## The 5 Keys to Good Manure Management

### 1 Clean Up Manure Every One to Three Days

Cleaning up manure in stalls and paddocks every day or at least every three days helps prevent re-infestation after de-worming. Manure often contains parasite eggs that can hatch larvae within 72 hours. The larvae then crawl onto nearby grass and if horses are grazing nearby, they will ingest the parasites. Even if you de-worm your horse on a regular basis, they can become re-infested by eating near manure. By cleaning every one to three days, you help end the cycle of re-infestation.

Removing manure is also one of the best things you can do to prevent mud. Manure is great at holding moisture—by removing manure you'll reduce a prime ingredient for mud. Mud is not only inconvenient, it's also a breeding ground for insects and diseases like abscesses, mud fever, rain scald, and thrush. By cleaning up manure frequently, you'll also help water quality—the less mud and manure that rain-water flows through on its way to the nearest water body, the fewer pollutants the water will carry with it.

### 2 Bed Your Stall Wisely

How you bed your horse's stall and the type of bedding you use can make a big difference in:

- How much money you spend.
- How much bedding you clean out of your horse's stall each day.
- How much storage space you need.
- How quickly your manure pile will compost.



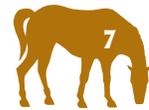
There are some smart bedding choices you can make that will reduce stall waste and save you money. With less bedding in your manure pile, you'll also find that manure will turn into compost *much* faster (we'll talk more about composting later on). Here are a few things you can do to reduce the amount of bedding that goes in and out of your horse's stall.

**Simply use less.** Horses don't need the same kind of fluffy bed we sleep in at home—they just need enough to soak up urine and moisture. You may want to re-evaluate how much bedding you are using now and consider using less. You may be filling your horse's stall with more bedding than they really need.

**Rubber stall mats.** By using rubbers stall mats, you can provide your horse with excellent cushioning without lots of bedding. In fact, many horses don't need any bedding at all when stall mats are used. (And once the bedding is gone, many horses will start urinating outside, since they don't like the "splash-effect" from a stall mat.) You'll also find that stall mats make cleaning much easier because they are more even and flat than a dirt floor. Stall mats are a bit costly at first, but the initial investment will produce long-term savings by reducing the amount of bedding you need to buy. You may also save money on vet bills—stall mats have several advantages when it comes to protecting horse health:

- Stall mats prevent horses from ingesting dirt when eating off the stall floor. When horses ingest dirt, it increases their chances of sand colic.
- Stall mats reduce dust. A dirt floor can increase dust and cause coughing or other breathing problems.
- Stall mats prevent a pawing horse from digging holes in the floor. Pawing can loosen shoes and increase the chance of joint problems.





- The cushioning from stall mats decreases the stress on a horse's legs and reduces hock and knee sores.
- Stall mats provide a barrier, insulating horses from the cold that comes up through the ground.

**Wood pellets.** If you're currently using shavings, straw, or another traditional type of bedding, you may want to give wood pellets a try. Wood pellets are much more absorbent than many other types of bedding. As a result, a small amount of wood pellets will absorb the same amount of moisture as a large amount of shavings. In fact, one study showed that the weight of manure and bedding removed from a stall with wood pellet bedding weighed 15 pounds less than a stall bedded with wood shavings!

With wood pellets you'll use less bedding, buy less bedding, and need a much smaller amount of room for storage. Several bags of wood pellets can last you as long as a truckload of shavings. Wood pellets often have other added benefits, such as reducing dust and odors, and they'll compost faster than shavings.



### Money Saver

If you're looking for an inexpensive substitute for stall mats, you may be able to find second-hand products such as dryer felt or used belting from gravel or paper companies for free or at a low cost. These belts generally come in long rolls that can be cut down to size for your horse's stall.



## Cleaning with Wood Pellets

When you use wood pellets, your cleaning process will be a little bit different. Here's how:

### Step #1

Start by emptying 2 or 3 bags into a clean stall. Your horse's hooves and the moisture from the air will break the pellets into fine sawdust.

### Step #2 (Optional)

If you'd like to turn the pellets into sawdust right away, you can spray them with a little water.

### Step #3

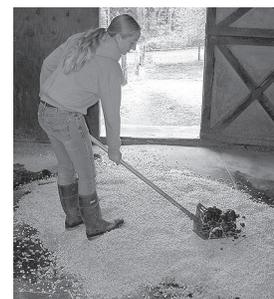
Cleaning the stall will be more like cleaning a cat's litter box; remove any manure but leave as much bedding as possible. Only take out the sopping wet portions and then remix the damp bedding with the rest of the dry bedding in the stall until you can't tell what was damp and what was dry.



Step #1



Step #2



Step #3

*Two bags of wood pellets in a stall can last a couple of weeks and sometimes more!*





### 3 Choose the Right Location for Your Manure Pile

**High and dry.** When choosing a place to store your manure, look for a high, dry, level area. If you store your manure at the bottom of a hill or in a wet area, you're going to end up with a big messy pile of mush. A dry, level area is especially important when it comes to accessing the pile with any kind of heavy equipment such as a tractor or truck. Equipment needs dry, level ground (ideally cement or gravel) for turning around and positioning.

**Convenient.** Choose a location for your manure pile that's close to your stall and paddock areas. This will make cleaning easier and less time consuming—which will increase the chance that you'll clean more frequently!

**Away from horses.** Decrease parasite re-infestation by storing manure outside of pastures or other locations where horses may be grazing nearby.

**Keep away from water.** Store manure away from streams, ditches, wetlands or other water to avoid mud problems and pollution. The exact buffer zones required between your manure pile and nearby water sources and residences will vary depending on where you live. Contact the Clark Conservation District or Natural Resources Conservation Service for more information.

### 4 Cover Your Manure Pile

When a manure pile is left uncovered, there is nothing to keep the rain out. When it rains, rainwater seeps through the manure and comes out contaminated with nutrients and bacteria. The best way to keep rainwater from becoming contaminated is to cover your manure pile. There are several ways to cover your manure pile, from a simple pinned-down tarp to a storage area with a roof. Covering your manure pile is also a key step in composting. Keep reading to learn how to turn your manure pile into compost.



### 5 Have a Plan for Your Manure or Compost

Since horses produce about 45 pounds of manure a day, it is important to have an idea of what you're going to do with all that manure before it turns into a mountain. When you compost, a pile of manure will shrink in size by about half—so if you're not already composting, it can really help you reduce the amount of manure you have to manage.

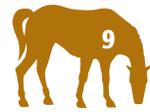
#### Put manure and compost to work.

You can use compost or manure in your garden and landscape or spread it on your pastures during the growing season (April-September). If you use fresh manure on pastures, be sure to maintain a good de-worming program. Also be aware that if uncomposted stall waste with lots of bedding is spread on pastures, it can rob nitrogen from the soil and turn grass yellow. One way to make use of stall

#### *The Benefits of Composting*

- Reduces flies by killing larvae and eliminating their breeding ground.
- Reduces odors—a manure pile that is composting will smell warm and earthy.
- Kills worm eggs, weed seeds, and pathogens that can cause disease.
- Creates a valuable soil amendment to use on your own property, give away, or sell to others.
- Composting also reduces the size of the pile you started with by about 50 percent! For example, if you start with a six-foot high pile, you'll end up with about three feet of compost.





waste with lots of bedding is to use it as a mulch around your landscape. If you don't have a use for mulch on your property, consider contacting local orchards or tree farms who may be interested in putting it to use.

**Spreading manure and compost on pastures.** When spreading manure or compost on pastures, you can use a manure spreader or simply spread it with a shovel from the back of a pickup truck. If you'd like to use a manure spreader but do not own one, the Clark Conservation District has one available for use to landowners within the District, free of charge. It is ground-driven (no need for a PTO) and can be pulled behind a garden tractor with at least 14 horsepower or a vehicle weighing at least 1,000 pounds. The spreader can hold approximately 62 cubic feet of manure. It is available both during the week and for check out over the weekend on a first come, first served basis. (See the Resource section for Clark Conservation District contact information.)



When spreading manure and compost, you don't want to spread it very thick, just a sprinkling (about 1/4 inch) each time. If you spread it too thick, it will smother the grass. Give the compost or manure enough time to work its way into the soil before spreading any more—and spread no more than 3 to 4 inches per year in the same location. Only spread during the growing season (April-September) when your grass plants can put the nutrients to work. If you spread during the winter, the rain will just wash the nutrients into nearby streams, rivers and lakes. For more information on applying compost to pastures, see the Pasture Management chapter of this manual.

**Give it away.** If you're not saving your manure or compost for your own use, giving it away can be a very effective disposal option. The Clark Conservation District (see Resource section for contact information) has a manure exchange program where you can get connected with people in the county who have a use for your horse manure. The Conservation District gathers information including the type of bedding you use, manure to bedding ratio, age of the manure, months of the year when it is accessible, whether a loader is available, and the part of the county where your farm is located. The goal of the program is to provide this list of landowners to others in the community who could put your manure to good use. The Conservation District often advertises the service in the local newspapers and other publications as well as at community events. And best of all, the service is free!

### **Testimonial**

*"Composting on a small place has proven to be a great asset. We set up a small two-bin system which takes care of all of the manure from our one horse. We use all of the composted manure in our herb, vegetable and flower gardens as well as on our lawn. At times, we wish we had more compost for the whole pasture, too! Setting up the two-bin system in a chore-efficient location was key to making composting easy and fun to do. We highly recommend it for even the smallest farm! Don't give away that black gold, keep it at home and use it to make your own place even greener!"*

**Liz & Ben Clark, Enumclaw, WA**





In addition to the manure exchange program, here are some things you can do to make your give-away system as effective as possible:

- **Make your pile easy to access.** If your pile is in a location where people can simply drive up and take what they want, when they want, you'll get rid of a lot more than if you have to arrange a meeting time and let them in.
- **Make your stall waste attractive to gardeners.** Many gardeners prefer either compost or manure with very little bedding. The more desirable your product, is the easier it will be for you to give it away.
- **Advertise.** Post a "free manure" sign where people can see it from the road. Advertise by word of mouth: talk to all your non-horse neighbors and friends who would love some free fertilizer for their garden. Put an announcement in local newsletters and newspapers—many papers will let you advertise free stuff at no charge. Advertise during the spring and fall when gardeners are most likely to be adding manure and compost to their gardens.
- **Take it to the source.** If your manure is composted and you have the equipment to load and haul it, check with community gardens, local garden clubs, nurseries, landscapers, tree farms, and topsoil businesses for takers. You may even be able to make some money selling your compost if you're able to deliver it.

### Money Saver

Most feed stores carry wood pellets but you can also use the wood stove pellets that are sold at your local hardware or grocery store. Just be sure to check the list of ingredients and make sure they are 100% wood and that they don't contain any glues or chemicals.

### Composting Space Requirements

When planning out your composting system, here are a few things to consider:

- For a backyard composting system with one to five horses (without the use of a tractor or heavy equipment) use two to three 8' x 8' x 4' foot bins.
- If you are going to use a tractor to turn your compost piles, plan on two to three 8' x 8' x 4' piles for one to five horses. When using a tractor, it helps to place the piles on a cement pad. This makes it easier for the bucket to scrape the surface and keeps the tractor tires from tearing up the ground. A 30' x 30' foot area will house three piles with some room to move.
- For larger composting systems (five horses or more) where heavy equipment will be used, you may want to consider two three-sided cement bins approximately 16' x 16' or 35' x 35'.

## Composting Horse Manure and Stall Waste

### What Is Composting?

All organic matter, including manure and bedding, eventually decomposes. Composting just speeds up the process by providing an ideal environment for bacteria and other microorganisms to assist with decomposition. As the manure is broken down, a tremendous amount of heat is given off, destroying weed seeds, fly larvae, and pathogens (organisms that can produce an infection or disease). Finished compost is a crumbly, earthy-smelling, dark material that is an excellent soil amendment for your garden, landscape, and pastures.





## Composting Essentials

Note: Be sure to locate your manure/compost pile in a convenient location (close to stalls and paddocks) that is on high, dry, level ground away from streams, ditches, wetlands, or other water bodies. Once you have chosen a good location, it's time to get started. Here is what you need to do to make compost happen:

### *Use compost bins or a tractor to build your manure pile at least 3 feet high.*

In order for a pile of manure to start building heat and begin the composting process, the pile needs to be at least 3 feet high. Compost bins can be helpful for building and containing your manure (see design and supply list on page 12 & 13). However, if you don't want to build bins, a tractor can be used to stack up the manure at least three feet high.

If you do decide to build compost bins, consider how many you'll need. Two bins will usually be adequate for one to five horses but you can add a third for convenience. Pile manure into the first bin until it is full, then leave it alone to compost and start filling the second bin. In two to four months the first bin should be done composting and ready to use or give away. For convenience, or if you have several horses, you may want to consider going to three bins. This allows one bin for daily manure pickup, a second bin full and in the composting stage, and a third bin with finished compost to be removed and used at your leisure.

### *Keep the pile covered!*

Covering your pile is one of the most important things you can do to help with the composting process. This prevents the manure from getting too wet in the winter and too dry in the summer. When a manure pile gets too wet or too dry, it can stop the composting process. A compost pile that is too wet will also begin to smell.

Compost should stay about as damp as a wrung-out sponge, damp but not dripping. If you squeeze a handful it in your hand, you should only be able to squeeze out a drop or two. In the summer you may need to add some water to keep the pile from getting too dry. The easiest way to do this is to just water down wheelbarrow loads before adding them to the pile.

### *Get air into the pile.*

The microorganisms in your compost pile need oxygen to breathe while breaking down the manure. That's why it's essential for air to reach all areas of the pile. An easy way to get air into the pile is to insert a couple of five-foot PVC pipes into the center of the pile like chimneys. You can buy PVC pipes with holes in them or use a drill to put some holes in the pipes (approximately a half inch in diameter at six-inch intervals).

### **Tip: Another Reason to Reduce Bedding!**

A pile of manure, without bedding, will compost very quickly. But as soon as you start to add bedding to the pile, you slow down the composting process. The more bedding you add, the longer your pile will take to compost. Certain types of bedding will also compost faster than others. For example, large wood chips will take longer to compost than shavings. And wood pellets (which break down into a very fine material) will compost even faster than shavings.

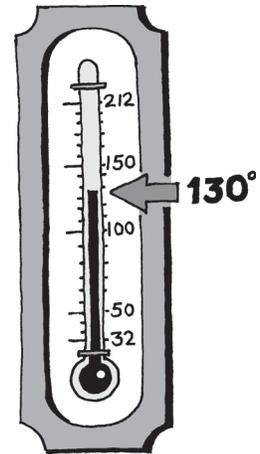




If you have a tractor, you can also get air into the pile by occasionally turning the manure. If you are able to do this, you can dramatically increase the speed of composting. Turning the pile also helps get the manure on the outside into the center where the heat from the composting process can kill parasites and weeds.

### Finished compost

At least several days of pile temperatures above 130 degrees are recommended to destroy pathogens and weed seeds. You can buy a long-stemmed compost thermometer at local nurseries or home and garden stores to monitor your compost piles. If you don't have too much bedding in your manure pile, it will take about two to four months for the pile to compost. You will know your compost is ready when the material smells earthy and looks evenly textured and crumbly like dirt or a commercial potting-soil mixture.

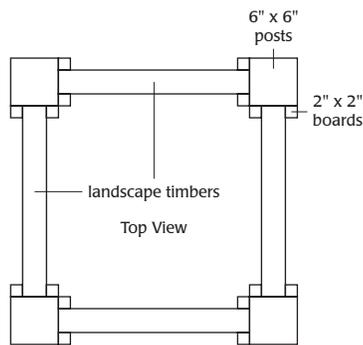


## Building a Manure Composting System

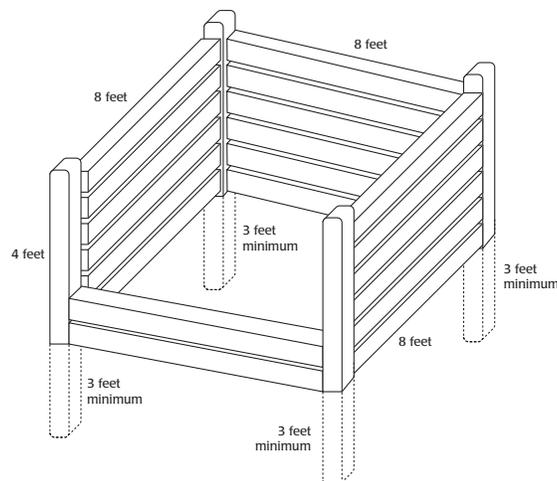
For two 4'x8'x8' bins, the following list of equipment and supplies are needed:

SUPPLIES	EQUIPMENT
70 - 8' landscape timbers (or similar wood)	drill & bit (1/4" - 5" long)
140 - 5/16" x 5 1/2" lag screws	ratchet & socket set
plastic sheet or tarp to cover top	power or hand saw
6" x 6" x 8' posts	carpenter's level
2" x 2" support boards	post hole digger
	tamping rod or similar tool

NOTE: number of timbers and lag screws will depend on the width of the timbers you purchase and how tall you wish to make your bins.



Walls slide in place like a foaling stall. Repeat design for 2 or 3 bin system.



### *Troubleshooting the Compost Process*

<b>Symptom</b>	<b>Problem</b>	<b>Solution</b>
The compost has a bad odor.	Not enough air.	Turn the pile, add more PVC pipes.
The compost has a bad odor and is soggy.	Not enough air and too wet.	Mix in dry ingredients like straw or shavings, add PVC pipes, and cover with a tarp.
The inside of the pile is dry.	Not enough water.	Add water when turning the pile.
The compost is damp and warm in the middle but nowhere else.	Pile is too small.	Collect more raw material and mix it into the old ingredients. Piles smaller than three feet square have trouble holding heat.
The pile is damp and smells fine, but is not heating up.	Too many shavings, wood chips, or bedding and not enough manure.	Mix in a nitrogen source—straight manure, fresh grass clippings, bloodmeal, chicken manure, or nitrogen fertilizer.

### **Other Types of Composting Systems**

For larger facilities with more than five horses, there are a number of composting systems available that generally require more equipment and a greater initial investment. However, this investment can turn into a significant savings when compared with disposal costs.

The “Aerated Static Pile Method” is one composting solution for a medium to large horse operation. This method uses an aeration system—usually a system of perforated pipes connected to a blower—placed under the compost pile to periodically blow or draw air into the pile. A simple on/off timer is used to control the aeration rate. A typical setting might be 3 minutes on and 12 minutes off, running 24 hours a day, 7 days a week for 30 days or more. Adjusting the frequency and duration of airflow into the pile controls the temperature. This process generally provides more direct control of composting and permits larger piles.

Contact the Clark Conservation District or Natural Resources Conservation Service for more information on the system described above and other composting systems. There are also a growing number of businesses that can help you decide what composting system would be best for your facility, help you get a system in place, manage it for you, and find a market for your compost.

*See the Resources section for Clark Conservation District contact information.*





# Mud Management



## The Benefits of Reducing Mud

Mud is not only inconvenient and unpleasant, it can also have a big impact on the environment and horse health. When rain travels across muddy areas it picks up soil and carries it to nearby streams and lakes. Soil can smother fish eggs, destroy habitat for insects (a food source for fish), and cover prime spawning areas. Mud can also be harmful to your horse's health. Mud increases a horse's chance of colic, abscesses, scratches, rain scald, and thrush; it can be damaging to hoof structure; it's a breeding ground for insects; and it creates slick, unsafe footing. And muddy spots in winter become dust in the summer, which can be damaging to your horse's fragile respiratory system and it may be a concern for you and your neighbors as well.

If mud is an issue on your property (and it is for many), you may be under the impression that mud is an unavoidable part of having horses. But it doesn't have to be! In this chapter you'll learn several key steps you can take to reduce and even eliminate mud. Some of the topics we'll cover are:

- Manure pickup.
- Creating a sacrifice area.
- Footing.
- Gutters and downspouts.
- Planting trees.
- Fencing horses out of streams and wetlands.

## The 6 Keys to Mud Management

### 1 Clean Up Manure Every One to Three Days

Even though we already covered this in the Manure chapter, it bears repeating! Cleaning up manure in stalls and paddocks every day or at least every three days is probably the single most important aspect of eliminating mud. Manure is great at holding moisture—by removing manure you'll reduce a prime ingredient for mud.



### 2 Create a Sacrifice Area

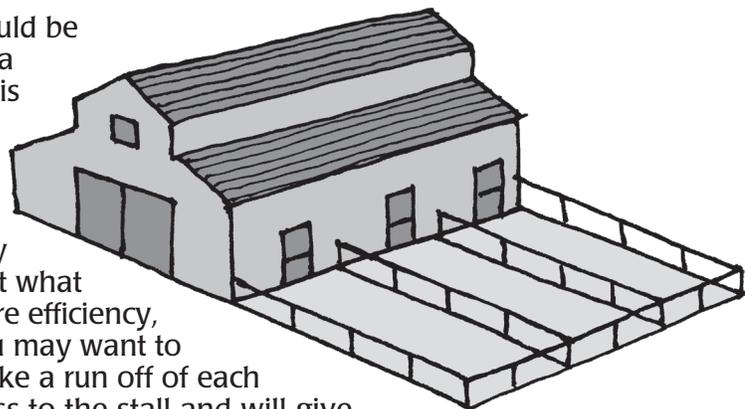
Keeping horses off rain-soaked or frozen pasture is critical if you want to maintain healthy grass plants. During the winter, plants stop growing and horses will continue to graze pastures down until little grass is left. Soon you'll be left with bare spots that will turn to mud as soon as it starts to rain. Another reason to keep horses off pastures during the winter is to keep the soil from becoming compacted. When horses step on wet, soggy pastures, the soil is pressed down, squeezing out the space between soil particles and eliminating the pockets of air that allow roots to grow and water to penetrate.

Instead of giving your horse access to the entire pasture during the winter and early spring, create a winter paddock. A winter paddock, also called a sacrifice area, is a small enclosure such as a paddock, corral, or pen that gives your horse a chance to get outside during the winter without damaging your pastures. It is called a sacrifice area because you are giving up the use of that small portion of land as a grassy area to benefit the rest of your pastures. Horses should be removed from pastures and confined to a sacrifice area through most or all of the winter and early spring.



*When creating a sacrifice area, here are some things to keep in mind:*

**Location.** Careful consideration should be given when choosing the location of a confinement area. Choose a site that is slightly elevated with dry, well-drained soil. Try to choose an area as far away as possible from wetlands, streams, or ditches—a minimum of 25 to 50 feet is generally recommended, but be sure to find out what your local ordinances require. For chore efficiency, keep the area close to your barn. You may want to have one paddock per horse set up like a run off of each stall. This will allow horses free access to the stall and will give you a clean, dry, convenient place to feed.





**Size.** Sacrifice areas should be at least 20 feet wide by 20 feet long. If you want to give your horse enough room to trot, you can extend the length to about 100 feet.

**Accessibility.** Keep in mind that gates need to be wide enough for delivery trucks—12 feet wide is usually adequate. It's also important to have a road or driveway leading into your sacrifice area that will be accessible year-round. Remember that the veterinarian, farrier and delivery vehicles will need easy access, even in the winter months. Be sure that your road or driveway won't be too muddy or narrow, that you'll be able to clear it of snow if necessary, and that there aren't any low-hanging wires or tree branches.

**Buffers.** Sacrifice areas should be surrounded by a buffer of grass, trees, or shrubs. This vegetative buffer will naturally filter rainwater contaminated with soil and nutrients from manure. Depending on where you live and whether you have a stream on your property, a minimum buffer width may be required. For more information, contact Clark County Community Development (see the Resources listed at the end of this manual for contact information).

**Accident Prevention.** Be sure that there are no protruding objects like bolt ends, nails, boards, or the tops of metal T-posts. Also watch out for the corners of roofs and the bottom edges of metal building materials. Look for any hanging wires or cords and remove any garbage or machinery in the area.

**Safe fencing.** Choose the very safest fencing you can for your horse's sacrifice area. Whatever fencing you choose, you may want to add some electric tape or hot wire. Horses can damage many kinds of fencing but they will usually leave electric fencing alone. There are many kinds of fencing and the chart below describes the advantages and disadvantages of just a few. The important thing is to check for safety, durability, maintenance requirements, ease of installation, and cost before making a choice.

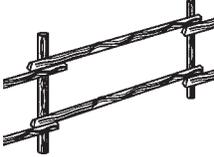
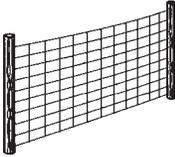
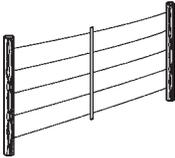
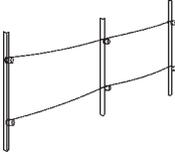
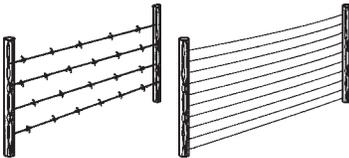


### ***Chore Efficiency Tips for Confinement Areas***

Here are a few more things to consider when planning your confinement area:

- Is the area close to your manure pile and feed storage for ease of daily chores?
- Can deliveries be made without moving horses or will people have to drive through a pasture to get to your confinement area?
- Do your animals have easy access to fresh water?
- Can you move horses to pasture areas or elsewhere with ease?
- Are alleys and paths wide enough for wheelbarrows or any other equipment you expect to use?



Fencing Type	Advantages	Disadvantages
<b>Wood Fencing</b> 	<p>General comments: Paint or stain needs to be non-toxic. Boards need to be secured on the inside (horse side), preferably bolted rather than nailed.</p>	<p>Visually attractive</p>
<b>Wire Mesh</b> 	<p>General comments: There are a variety of sizes and types of wire mesh.</p>	<p>Diamond V-mesh is the strongest and safest design. 2" x 4" wire mesh (often called "no-climb" or Horse Fencing) is also very safe and is one of the most popular and affordable types of wire fencing. Both Diamond V-mesh and 2" x 4" are safe to use with foals and young horses.</p>
<b>High Tensile Electric (New Zealand Style)</b> 	<p>Inexpensive and requires little maintenance.</p>	<p>Hard for horses to see. Dangerous if improperly installed or if there is a power outage.</p>
<b>Electric</b> 	<p>Lightweight and easy to move for pasture rotation. Inexpensive.</p>	<p>Requires a power source. Not very durable. Not a physical barrier. Not recommended for perimeters.</p>
<b>Barbed Wire and Smooth Wire</b> 	<p>Not recommended for horses. Too hard for horses to see. Can easily cut and injure a horse.</p>	



### 3 Use Footing Materials

Footing materials such as gravel and hogfuel (chipped or shredded wood) can significantly reduce mud in sacrifice areas. It can also be useful in other high-traffic spots such as the area in front of stalls and around gates or water troughs. Footing keeps horses up and out of the dirt and allows rain-water to drain through.

Although there are many products that can be used as footing materials, you'll find gravel and hogfuel most commonly used in the Northwest. Sand can also work, but it should never be used in an area where horses will be eating. Ingesting sand can result in serious sand colic problems.



**Hogfuel.** Through natural decomposition, hogfuel breaks down the nitrogen in urine and manure, which helps eliminate urine smell and reduces the amount of nitrogen that could run off into streams. However, hogfuel does have some disadvantages. Hogfuel holds moisture and tends to be wetter than some other types of footings. And since it is organic, it will continue to decompose over time. This means that you'll need to get more to replace the hogfuel that has broken down—although you'll probably never have to get as much as the first year's amount. As hogfuel breaks down, it can turn to mud once water is added. To prevent this, each year plan to remove the hogfuel that has decomposed into fine material before you bring in a new load. You can do this with a shovel or the aid of a tractor and bucket, depending on the amount you have. Remove the old material during the dry months and add it to your compost pile.

*Note: Because of hogfuel's tendency to decompose fairly quickly, avoid using it in very wet areas or very organic soils where it will just turn into muck.*

Hogfuel around the Northwest is usually made from a combination of cedar, fir, and hemlock. Cedar will last longer because of its natural ability to repel insects. However, it may hold a bit more moisture than other types of wood. Be aware that a very small percentage of horses may be allergic (skin sensitivity) to cedar. To test this beforehand, try a bag of cedar shavings as bedding for a week to see how your horse does.



#### **Tips for Purchasing Hogfuel**

Hogfuel products vary widely so be sure you are getting what you want before you order.

- Visit the supplier and inspect the type of hogfuel you would be purchasing or, even better, visit facilities where the hogfuel is being used and ask the owner how effective it has been.
- Make sure the kind of wood in the hogfuel is safe—many landscaping trees can be toxic to horses.
- Look at the size of the wood chips in the hogfuel to be sure that they are not too large or too small. If the chips are too big it can make it difficult to pick up manure. Hogfuel chips that are too small will decompose quickly.
- Be sure that there are no nails, metal, or other foreign objects in the material and be home on delivery day to be sure that you get what you ordered!





## Footing Supplement:

### *Using Geotextile Fabric to Increase the Effectiveness of Your Footing*

To enhance the effectiveness of your footing, you can first lay down some type of geotextile fabric and then put your footing material on top. Geotextile fabric can be used as a layer between soil and gravel (or other footing materials) to provide a barrier that keeps them separate and prevents them from mixing. This separation helps the gravel maintain its position, improves drainage and increases the load bearing capacity of the site. Drainage is improved because soil is not able to fill the spaces in the gravel layer. The fabric is permeable and still allows water to pass through it, therefore it does not restrict the movement of water.

**Purchasing and Storage.** Geotextile fabric can be purchased through hardware, farm and garden supply stores, construction material companies, and drainage supply companies. The fabric comes in rolls much like carpet, typically 8 to 15 feet wide and 120 to 450 feet in length. The rolls should be stored in a dry location until installation—the fabric is much like a sponge and can easily become waterlogged. The fabric should also be kept out of the sun until installation. Geotextile fabric is a petrochemical-based polymer that will resist decomposition by bacterial or fungal action, however, these fabrics are susceptible to deterioration from ultraviolet light.

**Woven and Nonwoven Fabrics.** There are many different types of geotextile fabrics. Woven and nonwoven are both commonly used in confinement areas and are similar in strength, but water will pass more easily through nonwoven geotextiles. Geotextile fabric is available in weights ranging from 3.5 to 18 ounces per square yard. The proper weight range for high-traffic area applications for the nonwoven fabric is generally 5 to 6 ounces per square yard. With the proper drainage and pore size, woven geotextile fabrics can also be used. Contact the Clark Conservation District for assistance in choosing a geotextile fabric that is best for your needs.

**Installation.** Once you've selected the proper fabric for your situation, the best time to install it is when the soil at the site is dry. Here are some tips on installation:

- 1 Clear the area of any sharp objects, stumps, or debris. Remove old footing material and/or manure that has accumulated in the confinement area.
- 2 Scrape until firm ground is reached. If possible, grade the existing soil surface to enhance water movement.
- 3 Unroll the geotextile fabric as smoothly as possible. To prevent tears, the fabric should not be dragged across the ground. At the joints, fabric should overlap at least 12 to 18 inches. The fabric also needs to extend beyond the fence lines so that horses cannot grab or paw up loose ends. Anchor fabric with 6-inch staples or spikes.
- 4 Place the gravel (or other footing material) on the fabric. The footing material should be spread in the same direction as the geotextile fabric overlap to avoid separation between the two pieces of fabric.
- 5 It is best to back dump when unloading and spreading gravel on the fabric with a truck. (It is okay to drive on geotextile fabric, but be careful—tires can pull the fabric and cause wrinkling.) Complete the final spreading and smoothing by hand or with earthmoving equipment like a dozer, front-end loader, skid loader or scraper.

**Maintenance.** Since geotextile fabric provides separation between soil and gravel, you will not need to add footing material nearly as often as you would otherwise. Once you've gone through the effort to add geotextile fabric, maintain the integrity of your footing material by cleaning up manure often—on a daily basis, if at all possible.



**Gravel.** Gravel (crushed rock) is another good footing to consider. It is especially useful in the highest traffic areas, such as in front of stalls, gates, and watering points. It won't break down like hogfuel does and it drains well. Gravel is roughly two to three times as expensive as hogfuel but you won't have to replace it nearly as often. Purchase gravel that is **no larger than 5/8-inch minus**. Horses don't mind standing on the 5/8-inch size and you can still pick up manure (the pieces of gravel fall through the tines of the manure fork easily). If you use gravel larger than 5/8-inch, you'll find that it is difficult to pick up manure and horses are uncomfortable standing on it.



It is best to put down a layer of geotextile fabric before spreading your gravel (see the Footing Supplement on the previous page to learn more about geotextile fabrics). By adding a layer of geotextile fabric between the ground and your gravel, you create a barrier that prevents the mixing of soil and gravel. This improves the effectiveness of your footing and reduces the need to add more gravel in the future.

You can also try a combination of footing types in your confinement area. For example, gravel in the section that gets the most traffic (often in front of a stall or shelter) and hogfuel in the rest.

	Advantages	Disadvantages
<b>Hogfuel</b>	Less expensive than gravel. Naturally reduces the smell of urine.	Not as effective as gravel at keeping an area dry. Will break down and need to be replaced.
<b>Gravel</b>	More effective at keeping an area dry. Lasts a long time and will not need to be replaced as often.	More expensive. Will not naturally reduce the smell of urine.

**Other Materials.** There are a lot of other potential footing materials available. Second-hand products such as dryer felt or used belting from gravel or paper companies are often available for free or at a low cost. These products can work as mats for wash racks, aisle ways, or feeding areas. Old, jute-based carpet turned upside down can also work for smaller areas. Rubber stall mats or trailer mats are more pricey but very useful and durable.

**How Deep?** Gravel footing needs to be at least 8 to 12 inches deep—more is better when it comes to footing. Hogfuel footing should be 12 to 24 inches deep.

**When to Buy.** No matter what type of footing you decide on, it is best to get it during the summer when the ground is dry. Dry ground makes delivery easier (picture a big truck tearing up a rain-soaked pasture or going down a slippery hill in the middle of a downpour) and you'll avoid competing with all the other customers who waited until the last minute. Footing applied when the ground is dry will also be much more effective at preventing mud than footing added after the mud is already there. Summer is an especially good time to purchase hogfuel: wood products are more readily available in the summer since there is less of a demand for it as power plant fuel and when burning bans are on, contractors are often looking for cost-effective ways to get rid of stump grindings.



## 4 Install Gutters & Downspouts

If you want to reduce mud, one of the most important things for you to consider is how you are handling the rainwater that runs off the roof of your barn and out-buildings. Even if these buildings are relatively small, hundreds of gallons of water run off every time it rains. During a one-inch rainstorm approximately 558 gallons of water will run off a 900-square-foot barn (approximately 30' x 30'). If this water runs off the roof and straight into confinement areas, it can really increase your mud problems.

**Divert rainwater.** By installing gutters and downspouts on your barn and other buildings, you can divert rainwater away from your sacrifice areas and other high-traffic spots. Decreasing the amount of water that reaches these areas will greatly reduce mud. Divert clean rainwater to stock watering tanks, rain barrels, an undisturbed area of your pasture, or other vegetated areas. Be sure to protect downspouts so horses don't destroy them. This can be done with heavy PVC pipe, hot wire, or by simply making the downspout area inaccessible to horses.

**Other ways to divert water.** After you have your gutters and downspouts installed, watch where the water travels during the next big rain. If rainwater is flowing into your confinement areas, you may want to look at other ways for redirecting this water. Installing a French drain—a trench loosely filled with coarse gravel—is one way to redirect water. The gaps between the stones serve as a passageway for water and lead to an outlet, such as a grassy area. Other structures such as water bars (like a speed bump for water), swales (grass-lined channels), or dry wells (pits lined with gravel) can also help keep rainwater out of your confinement areas. Contact the Clark Conservation District or Natural Resources Conservation Service for more information on each of these techniques.

### *Keep Clean Water Clean*

When clean rainwater runs off a roof and through a confinement area, it mixes with manure and soil, instantly going from clean to contaminated. As that water travels to the nearest waterbody, it will carry those contaminants with it. By diverting rainwater away from confinement areas, you will keep clean water clean.



## 5 Plant Trees

Trees drink a huge amount of water and they can significantly reduce the amount of water around your horse facility. A mature Douglas fir can drink 100-250 gallons per day. Evergreens have the added advantage that they keep on using water in the winter when deciduous trees are dormant. Planting water-loving natives like willow, cottonwood, red osier dogwood, and hybrid poplars along the outside of sacrifice areas can help keep the area drier. Trees planted inside pastures and paddocks will need protection from chewing and root compaction. Fence off these trees along their drip zones (the ends of the branches where the raindrops roll off). Consider planting new trees where horses can't reach them. By planting trees you will also provide shade for horses and habitat for wildlife. Be aware that some fruit trees and ornamental landscaping trees may be toxic to horses.



*For more information on toxic plants, see the Pasture Management section.*





## 6 Fence Horses Out of Streams and Wetlands

Fencing horses out of streams (or any other waterbodies on your property) and wetlands will also prevent mud. Horses often congregate around watering areas and are likely to overgraze the area and trample streamside vegetation. The loss of vegetation and addition of manure will lead to an unattractive mud hole in winter and harm fish downstream. Easy, cost-effective watering systems are available that can provide water sources away from streams. You can also build water crossings and watering points to limit the amount of access horses have. For more information, contact the Clark Conservation District or the Washington Department of Fish and Wildlife (see the Resources section for contact information).



Wetlands will also turn to mud with the impact of horses. The pounding of heavy horse hooves on wet soils compacts the ground, suffocating plant roots and preventing water from soaking into the ground. This, and contamination by manure, can cause serious damage to wetlands. Wetlands are nature's filter systems for our water and can also help to reduce flooding.

*For more information, see the Stream and Wetland Management chapter.*





# Pasture Management



## The Benefits of Good Pasture Management

A healthy pasture provides horses with high quality, nutritious feed at a low cost and there are several other benefits to horse health. A pasture full of grass (rather than bare dirt) means less mud in winter, less dust in summer, and fewer weeds in the spring. As a result, you reduce a horse's chance of getting colic from eating dirt or developing respiratory problems from breathing dust. You also reduce a horse's chance of eating weeds that may be toxic—weeds are less likely to crowd their way into a healthy pasture and horses are less likely to eat weeds when there is plenty of grass available. A healthy pasture also protects water quality by anchoring soil in place and absorbing nutrients that would otherwise run off into nearby streams and lakes.

In this chapter you'll learn several key steps you can take to build healthy pastures. Some of the topics we'll cover are:

- Sacrifice areas.
- Rotational grazing.
- Mowing and dragging.
- Soil testing.
- Spreading compost, fertilizer, and lime.
- Weed control.



## The 7 Keys to Good Pasture Management

### 1 Create Sacrifice Areas

As we discussed in the mud chapter, the most important aspect of managing pastures is the time you take horses off the pasture. Keeping horses off, or at least limiting their time on pastures during the winter and early spring is critical if you want to maintain healthy grass plants. Because grass plants are not growing during the winter, they can quickly become overgrazed and soggy winter soils are easily compacted by the weight of horses, suffocating the roots of grass plants.

A simple test for sogginess is to walk out in your fields and see if you leave a footprint; if you do, you know that it is too wet and that your horse will be sure to compact the soil. If you do turn horses out on pastures during winter months, at least limit the amount of time to reduce compaction and overgrazing.



### 2 Never Allow Grazing Below 3 Inches

This is the golden rule of pasture management: Never allow grass to be grazed shorter than three inches. Consider the bottom three inches of the grass blade an energy collector that needs to be left for the plant. Like all plants, grass plants need their leaves to gather energy from the sun. When grass is grazed below three inches, the plant takes food from its roots in order to survive. If a grass plant is not given the chance to re-grow, it will continue to take food from its roots, which become shorter and shorter. Eventually the roots will be gone and the plant will die.

When most of the grass in your pastures has been grazed down to about three inches, it is important to remove horses from the area so the grass has a chance to re-grow to about six or eight inches. (This usually takes two to six weeks during the growing season.) You can move your horses back into their sacrifice area during this time or move them onto a new section of pasture. Rotating horses from pasture to pasture is referred to as rotational grazing, which brings us to...

#### Note

Remember to keep horses off all pastures during the winter when the grass isn't growing! Another time to keep horses off pastures is during droughts. When there isn't enough water grass plants will stop growing—if grass isn't growing, horses may overgraze the pasture.

### 3 Use a Rotational Grazing System

Horses are very selective when it comes to grazing. If you let horses out onto a large pasture to graze, they will often eat the short, tender grass down to the ground and as soon as it re-grows, they will go back and eat it down to the ground again. As a result you'll end up with patches that are overgrazed and other patches where grass has become tall, tough, and unpalatable to horses.

By dividing a pasture area into smaller areas and rotating horses through them, you can use your horses as lawnmowers and encourage them to graze more evenly. Once horses have grazed the majority of the grass in a pasture down to three or four inches, rotate them on to the next pasture. You can put horses back on pastures when the grass has re-grown to about six to eight inches. This usually takes two to six weeks during the growing season (April to September).

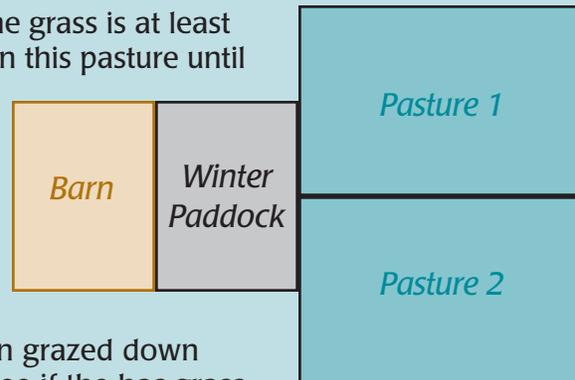


## Rotational Grazing in 3 Simple Steps

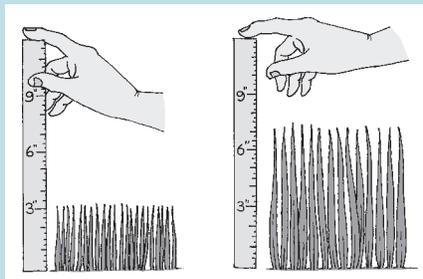
**Step 1** Put your horse in Pasture 1 (where the grass is at least six inches tall). Let your horse graze in this pasture until most of the grass is about three inches tall.

**Step 2** Move your horse into Pasture 2. Again, let your horse graze in this pasture until most of the grass is about three inches tall.

**Step 3** Once the grass in Pasture 2 has been grazed down to three inches, check Pasture 1 to see if the has grass has re-grown to at least six inches. (This usually takes two to six weeks during the spring, summer, and fall.) If it has, you can move your horse back into Pasture 1. If it hasn't, move your horse to your winter paddock until the grass has re-grown to at least six inches.



*Move horses off the pasture when the grass has been eaten down to about 3 to 4 inches tall.*



*Begin grazing when grass is about 6 to 8 inches tall.*

**Limited space.** Not everyone has endless fields of grass and horses may graze down all your available pasture to three inches. At this point you can use sacrifice areas until the grass has had time to grow back to six or eight inches. You can also lengthen the lifespan of your pasture by letting horses graze for shorter periods of time. This is always a good idea when you first start allowing horses to graze pasture in the spring—too much grass can cause serious health problems, especially in the spring when pastures are particularly rich. Begin pasture grazing time gradually, starting with about an hour at a time and work up to several hours (or less, if your grass is limited) over a period of weeks.



### Limit Spring Grazing

Remember to limit turnout time when horses begin grazing in the spring and early summer. Too much grass can cause very serious horse health problems, especially in the spring when grasses are rich and lush. Increase grazing gradually. Start with about an hour at a time, and work up to several hours over a period of several weeks. If you have any questions about how much grazing time is safe for your horse, consult your veterinarian for their recommendations.



**Fencing.** When using a rotational grazing system, you can separate grazing paddocks with permanent or temporary (usually electric) fencing. It is generally easiest to



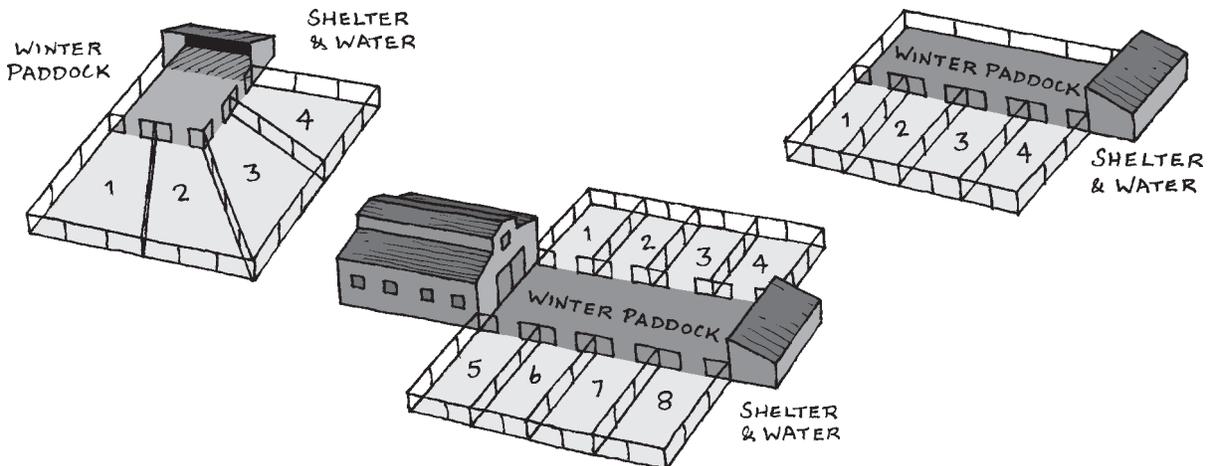
establish as many permanent grazing paddocks as you think you'll need—you can always hook up temporary electric wire or tape if you need to subdivide further. However, if you want to keep fencing costs down you can also move temporary fencing with the horses as you switch them from one grazing area to another. As a first step towards a rotational grazing system, you may want to first try dividing an existing large pasture in half and alternate grazing. Then try further subdividing after gaining some experience. Portable electric fencing is lightweight, inexpensive, and easy to move for pasture rotation. High tensile electric fence or New Zealand style fencing is also inexpensive and requires little maintenance.

**Plan your pastures.** Try fencing pastures according to how wet they are. In the spring, let horses onto the higher, dry areas first. Save the wetter areas until later in the summer when they dry out. Make sure pasture areas are large enough for horses to run and that gates are placed so that horses can be easily led from stall to pasture and back.



**Water.** Remember to have a source of water for each pasture. You can have separate water sources for each pasture or a single water source that is accessible from more than one pasture. Also try to divide pastures in such a way that horses can have access to shade or shelter, especially if they will be confined to these areas for more than a few hours.

### Sample Designs of Multiple Pastures



## 4 Mow, Drag, and Spread Compost After Grazing

**Mowing.** Rotational grazing encourages horses to graze a pasture more evenly but you'll probably find that some grass has been left untouched. Once grass has gotten too tall, horses often won't eat it because it is too tough. After your horses have finished grazing a pasture, mow all of the grass down to four or five inches. Mowing your pastures cuts all of the plants to the same height, stimulating equal growth, cutting weeds before they have a chance to go to seed, and preventing grass plants from getting too tall and tough to be appetizing to horses.



**Dragging.** After mowing, drag your pastures to break up and spread manure piles evenly throughout the area. This will help make the nutrients in the manure available throughout the pasture and keep the piles from smothering grass plants. Dragging can be done with a harrow (a tool specifically for this purpose) or homemade devices such as a chain link fence or an old bedspring. You can drag your harrow around the pasture with a riding lawn mower, tractor, or pickup truck.



**Spreading compost.** Spreading composted manure on pastures can improve the health of your grass and help you eliminate any manure storage problems you might have. Once horses have grazed a pasture down to three inches and you have done your mowing and dragging, apply your compost. You can use a conventional manure spreader (wagons with a mechanical apparatus designed to distribute manure) or simply spread it with a shovel from the back of a pickup truck or riding lawn mower. You don't want to spread it very thick—just a sprinkling—to avoid smothering the grass. As a rule of thumb, apply approximately  $\frac{1}{4}$  inch at a time and no more than 3 to 4 inches per year in the same location. By the time the grass has had a chance to grow back to six or eight inches, the compost will have worked its way into the soil and the pasture will be ready for grazing again.



If you plan to spread fresh manure instead of compost, be sure to maintain a good deworming program. After spreading manure on a pasture, let it age for a couple of weeks to a month before allowing horses to graze in that area. Aging the manure DOES NOT kill worm eggs; instead it allows the manure to decompose enough so that horses will be willing to graze—since horses naturally avoid grazing in areas with fresh manure. If your stall waste contains a lot of shavings (or other bedding) it is best to use it as a mulch in your landscaping rather than spreading it on your pastures. Applying stall waste with too much bedding may actually slow growth and cause yellowing of your grass plants.

**Note:** Only spread manure and compost during the growing season (April-September) when the nutrients will be absorbed by grass plants instead of being washed into nearby streams and lakes. The best time of year to spread manure is early in the growing season since 50% of grass growth occurs by the end of June.





## 5 Soil Test Before Fertilizing

Fertilizer is almost always overused and may not be needed at all. Just because it is spring doesn't mean it's time to fertilize. If you apply fertilizer and your pasture grass doesn't need it, you've just wasted your time and money and the excess fertilizer will most likely be washed into nearby streams and lakes. Besides being damaging to the environment, the cost of purchasing fertilizer year after year can really add up and the time you spend spreading it could be better spent on other activities around your horse farm.

The best way to find out if your pastures actually need to be fertilized is to get a soil test. By finding out what your soil needs you will be able to choose a fertilizer with the right amount of nitrogen, phosphorous, and potassium. Many fertilizers are high in nitrogen and that may not be what your grass plants need. Nitrogen promotes plant growth but in the spring most plants are going to grow vigorously on their own. Soil testing is relatively inexpensive and you can get a list of soil testing labs from the Clark Conservation District or see the Resources section of this manual. The Conservation District should also be able to give you some hints on the best way to take a soil sample. If you do find that you need to fertilize, fertilizing in mid-spring and/or late fall should be plenty.

## 6 Spread Lime

While using fertilizer may be unnecessary, using lime is crucial. Most soils in the Northwest are acidic and if the pH is wrong, many of the nutrients in the soil cannot be used by the plant. In fact, overusing fertilizer can further acidify the soil. Using lime supplies calcium and magnesium and it will increase the effectiveness of any fertilizers you apply. Lime will encourage the activity of soil bacteria, thus releasing valuable nutrients such as nitrogen, phosphorus, and sulfur already in the soil. After you spread lime, it may look like you just fertilized because you have suddenly made the nitrogen and other nutrients available to your grass plants.

### *More Pasture Tips*

- **Aerating.** If soils are compacted you may want to aerate in the spring or early summer when grasses are actively growing and fill in rapidly. Aerators can be rented from farm equipment suppliers; you may even be able to borrow one from a local golf course.
- **Apply a green Band-Aid.** Scatter pasture grass seed over bare spots and pat firmly into the soil. A bare spot in the summer is mud in the winter and weeds next spring.
- **A note on renovation.** In Western Washington even worn down pastures rebound under good pasture management. Establishing a rotational grazing system, mowing and dragging, spreading compost, overseeding, soil testing, and liming should always be tried before renovating a pasture. If you don't have a rotational grazing system and good pasture management practices, renovating is likely to be a waste of time and money.





## 7 Control Weeds

It is important to regularly survey your property for weeds, particularly those that are poisonous to horses. Weeds can spread rapidly and push out the grass plants you want. Be especially watchful at the beginning of the growing season when weeds sprout faster than grass and at the end of the growing season when grazed areas are more barren, leaving horses fewer forage options. Because it is hard to always catch weeds before they spread, prevention is the best weed management policy.

**Weed prevention.** Good pasture management is the best weed control—healthy grass will prevent weeds from pushing their way in and will also keep horses from being tempted to nibble on weeds when they do pop up. Make sure that the hay you buy is weed-seed-free, use certified grass seed on your property, and mow pastures regularly before weeds have a chance to go to seed.

**Minimize herbicide use.** Whenever possible—and especially near wetlands and waterways such as ditches and streams—remove weeds by hand rather than with chemicals. Chemical herbicides may be harmful to horses and can be very toxic to fish and other aquatic life. It is easy for chemicals sprayed on weeds to wash off in the rain and travel into our water. If you decide to use herbicides, be sure the product you are using is effective for the weed you are trying to control. Only spray areas with weeds and be aware of wind drift. Don't think that if a little is good, a lot is better—you could do serious damage to your land and the environment. Always read and follow directions carefully.

**Toxic weeds.** Some of the plants found in Western Washington that can be toxic to horses are listed in the table on pages 32 and 33. Be aware that many landscaping plants and fruit trees can also be toxic to horses. Contact the Clark Conservation District or Clark County Weed Management for help identifying the weeds on your property.





Species Location/Season	Toxin & Toxic Dose	Symptoms	Comments
<b>Buttercup, creeping</b> ( <i>Ranunculus repens</i> ) Moist soils	Protoanemonin Very large	Inflammation and narcosis	Rarely eaten unless pasture overgrazed
<b>Camas, death</b> ( <i>Zigadenus venenosus</i> ) Spring	Steroidal, glycosidal, alkaloid Less than 9 pounds	Salivation, weakness, respiratory difficulty, nausea, convulsions, coma	Deadly, easily confused with edible camas after bloom
<b>Fern, bracken</b> ( <i>Pteridium aquilinum</i> ) Fall, when pastures overgrazed	Thiaminase Cumulative large quantities	Appetite loss, timid, stupified, incoordination	
<b>Fiddleneck</b> ( <i>Amsinckia sp.</i> ) Overgrazed pastures	Pyrrolizidine Single dose 20 pounds or cumulative	Liver damage & failure, depression, dermatitis, incoordination, death	Similar poison to Tansy Ragwort
<b>Foxglove</b> ( <i>Digitalis purpurea</i> ) Acid soils	Digitoxin & other glycosides	Contracted pupils, labored breathing, Very toxic (1/4 pound)	Rarely eaten fresh, dangerous in hay convulsions, death
<b>Hemlock, poison</b> ( <i>Conium maculatum</i> ) Ditches, moist disturbed areas	Coniine and other alkaloids Very toxic (5-10 pounds)	Narcosis, paralysis, death	Hay MAY be somewhat less toxic as the poison will slowly evaporate
<b>Hemlock, water</b> ( <i>Cicuta douglasii</i> ) Low, wet areas; in spring roots pull out of ground easily	Cicutoxin Very toxic (.2 to .8 pounds)	Teeth grinding, muscle spasms, respiratory failure, death	Roots and stem base most toxic. The most poisonous plant known in North America
<b>Horsetail</b> ( <i>Equisetum arvense</i> ) Moist areas	Thiaminase Large quantities cumulative	Thiamine deficiency causes appetite loss, incoordination	Poisoning occurs when dry plants are fed in hay





Species Location/Season	Toxin & Toxic Dose	Symptoms	Comments
<b>Knapweed, Russian &amp; Yellowstar thistle</b> ( <i>Centaurca spp.</i> ) Disturbed areas	Cumulative (600 pounds?)	Brain deterioration resulting in "Chewing disease"	Can eventually cause death by starvation
<b>Larkspur</b> ( <i>Delphinium spp.</i> )	Alkaloids-delphinine Very toxic (1 pound)	Constipation, bloat, depression, paralysis	Deadly
<b>Lupine</b> ( <i>Lupinus spp.</i> )	Alkaloids-lupinine 600 to 800 pounds	Spasms, cerebral excitement & death	Can cause birth defects if eaten during pregnancy
<b>Nightshade, black</b> ( <i>Solanum spp.</i> ) Late summer, early fall, fencerows	Alkaloid-solanine 1 to 10 pounds	Diarrhea, convulsions, incoordination, death	
<b>Oak</b> ( <i>Ouercus spp.</i> )	Tannins Very large	Constipation, blood in urine	Leaves can cause problems, acorn poisoning more common
<b>Ragwort, tansy &amp; Common groundsel</b> ( <i>Seneclo spp.</i> )	Alkaloid-pyrrolizidine	Liver lesions, weakness, staggering, death	Liver damage is permanent. Normally avoided when fresh, eaten in hay or when wilted.
<b>Rhododendron</b> ( <i>Rhododendron spp.</i> )	Glycosides Small	Vomiting, vertigo, death from respiratory failure	
<b>Yew</b> ( <i>Taxus spp.</i> )	Alkaloid-taxine 1 to 10 pounds	Gastroenteritis, labored breathing, trembling, collapse	Rarely eaten fresh, dangerous in hay

Excerpted from: Pasture Management for Horses and Ponies, Gillian McCarthy; and *Plants that Poison Livestock in Thurston County*, Thurston County Noxious Weed Control Agency.

**See the Resources section for information on obtaining a more complete list of toxic plants.**



### The Low-Down on Pasture Equipment for the Small Horse Farm

- Lawnmowers** Since you only need to mow your pastures two to three times per year (after horses have completed grazing the area), a traditional upright lawnmower or riding lawnmower is very effective for the small farm. If you have three acres or less, you'll probably be able to use a traditional lawnmower. For those with about three to five acres, a riding lawnmower may be your best bet. Riding lawnmowers can actually be an advantage over larger equipment like a tractor—they are much more maneuverable and can make tight corners and frequent turns with ease. They're also great for other uses around the small farm. Riding lawnmowers (16 to 18 horsepower) can pull other farming implements like small harrows, manure spreaders, and seed spreaders. Whether you use a traditional upright lawnmower or a riding lawnmower, set your mower as high as it will go—at least four inches, five or six is even better. Also use a mulching mower if possible. The grass clippings left on your pastures will act as a natural fertilizer and it will save you the trouble of hauling and disposing of the clippings.
- Harrows** Harrows are used for spreading out manure piles in pastures and can also be used to smooth arena surfaces. For small areas, harrowing can be accomplished manually with a manure fork. You can make a basic harrow by attaching a piece of chain-link fencing (about 6' x 6') to two boards, one on each end. Add two tires tied down for weight. An old metal bedspring or gate can work as a harrow also. If you want to buy the real thing, a wide variety of harrows can be purchased from farm and tractor supply stores and catalogues or at farm auctions; you can also look for ads in the back of horse or farm magazines, or in Capital Press.



- Manure spreaders** A small, ground-driven manure spreader can make the job of spreading your manure or compost throughout your pastures a lot easier. There are many varieties of manure spreaders and finding the right one for you and your situation will probably take some looking around. When shopping around, be sure the spreader is a size your riding lawnmower or truck can handle and that it's not too big or long to maneuver around your pasture areas, especially the corners. And most importantly, make sure the spreader is adapted for horse manure or composted horse manure and not cow manure. Cow manure is softer and breaks apart more easily (more "pie" shaped) which makes a difference in how the tines in the spreader are structured.




- Utility trailer** A small utility trailer is great for hauling hay bales, water, fencing, tools, trees to be planted, even garbage cans (a long haul to the end of the driveway for many in rural areas). There are a lot of different types and sizes of trailers on the market—again, just be sure to get one that can be pulled by whatever vehicle you plan to use and easily maneuvered in the space you have.



# *Stream & Wetland Management*



## **The Benefits of Stream and Wetland Protection**

If you have a stream, wetland, or even just a ditch on your property, the way you manage your land has an especially large impact on water quality, fish and other aquatic life. Many people do not realize that ditches are an important part of the stream system—a significant amount of water enters streams through these waterways. Many farm ditches are old stream channels that still have fish living in them at some time during the year. Fish seek out ditches for protection and food during the rainy season.

Wetlands are another vital part of the stream system. Wetlands act like a giant sponge, soaking up water and slowly releasing it, reducing flooding and erosion. Wetlands also act as a filter, removing pollutants from the water as it passes through the vegetation. Since wetlands often connect to streams or groundwater sources, their ability to filter pollutants is important to water quality throughout the watershed. The water that soaks through wetlands often recharges aquifers, a source of water for many rural wells. Wetlands also provide important habitat for wildlife.

In this chapter you'll learn several ways to protect streams and wetlands. Some of the topics we'll cover are:

- How to identify healthy streams.
- Limiting horse access.
- Choosing confinement and manure storage areas.
- Planting trees and shrubs along streambanks.

## The 4 Keys to Stream and Wetland Management

### 1 Understand the Importance of Streamside Vegetation

A healthy stream will have a wide buffer of trees and shrubs growing on the stream bank. There are several reasons why this vegetation is so important:

- **Cool water.** Trees and shrubs along streams provide shade and keep water temperatures cool. When water temperatures rise, oxygen levels decrease—the warmer the water, the less oxygen. Fish need oxygen in the water to survive and when water temperatures rise, fish can die. Warm water also leads to excessive growth of algae, creating unsightly surface scum and odors.
- **Fish food.** Insects living in trees and shrubs fall into the stream, providing a food source for fish. The leaves that fall into the stream also provide food to insects already living in the water and these insects are another food source for fish.
- **Filtering.** When contaminated water flows through a buffer of healthy vegetation, the plants absorb the pollutants, filtering the water before it reaches the stream.
- **Erosion control.** The roots of trees and shrubs prevent erosion by holding the streambank in place. When soil erodes into streams, it can clog fish gills, cover spawning beds, smother fish eggs, and make it hard for fish to see their prey.
- **Wildlife habitat.** Vegetation provides food, nesting, and hiding places for turtles, beaver, river otter, eagles, frogs, waterfowl, and other kinds of wildlife.



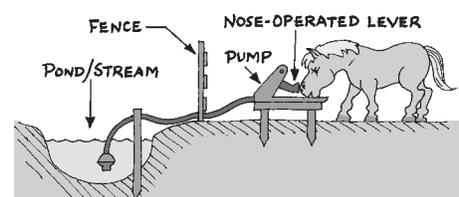
### 2 Limit Horse Access To Streams and Wetlands

Horses can contaminate streams and wetlands with manure and urine and trample the existing vegetation. It is very important for the health of streams and wetlands to fence horses out of these areas completely or to at least limit access. Check with the Clark Conservation District for more information—they may even be able to provide you with financial assistance for stream fencing and planting projects.

**Provide alternate watering sources.** If you are unable to fence off streams, you can at least provide off-stream watering. Horses like to spend a lot of time near their water source and if a stream is their source of water, they can do a lot of damage to streamside vegetation. Water can be pumped or gravity fed to a stock tank placed away from the stream—no electricity required. Ram pumps use the force of the water coming downstream to pump water into a holding reservoir. Pasture pumps use a hose that is operated by the horse and can pump water about 125 feet away from the stream and 25 feet uphill. Both systems are relatively inexpensive and pasture pumps can be moved up and down the stream as needed.

#### Do you have a wetland on your property?

Sometimes it can be difficult to tell if a portion of your



property would be considered a wetland. Wetlands often remain soggy or have standing water during the driest months of the year—but not always. Wetlands may only stay soggy down in the plant’s root zones, which can be 12 inches below the surface of your pasture. One way to help you identify a wetland area is to look for plants like skunk cabbage, cattails, and spirea. Areas with soft rushes, horsetail, and creeping buttercup may also be wetlands.

**Protect when wet.** When horses are allowed access to wet pastures they compact the soil, damage vegetation, and can destroy a wetland’s ability to act as a filter. Allowing horses to graze in wet areas will also eventually turn your green field into a muddy pasture. The end result is the loss of a valuable resource in exchange for a muddy mess that isn’t much use as a grazing area and is a breeding ground for insects and disease. To avoid this, keep horses off pastures whenever the soil is soggy—this may be for most or all of the year for wetland areas.

### Cost-Share Funding

If you are planning a stream fencing or planting project, check with the Clark Conservation District to see if they have funding available to help you cover the expenses. Conservation districts often have money available called “cost-share” that can help you pay 50 to 75% of the cost of a stream protection project.

### 3 Plant Native Trees and Shrubs

If grass is the only vegetation you have along your streambanks, you may want to consider doing a little planting (after you have done some fencing!) Native plants take very little maintenance, are naturally resistant to pests and disease, and provide great erosion control and habitat for wildlife. The chart below shows some trees, shrubs, and groundcovers that are especially adapted for planting in Southwest Washington. Because we do not have enough room to go into detail about which plants are best for your site and how and when to plant them, please contact the Clark Conservation District or see the Resources section for contacts, books, and web sites that can provide you with more information.



Trees	Large Shrubs & Small Trees	Small Shrubs	Groundcover
Bigleaf maple	Black hawthorn	Tall Oregon grape	Short Oregon Grape
Oregon ash	Serviceberry	Nootka rose	Sword fern
Grand fir	Oceanspray	Red flowering currant	Kinnikinnick
Western hemlock	Red elderberry	Snowberry	Salal
Western red cedar	Red osier dogwood	Mock orange	
Red alder	Vine maple	Indian plum	
Douglas fir	Oregon White Oak	Pacific ninebark	
	Pacific Crabapple	Beaked Hazelnut	

**\* Note: Some of these plants are toxic to livestock. Always check with your veterinarian before planting anything that your horses will be able to reach.**



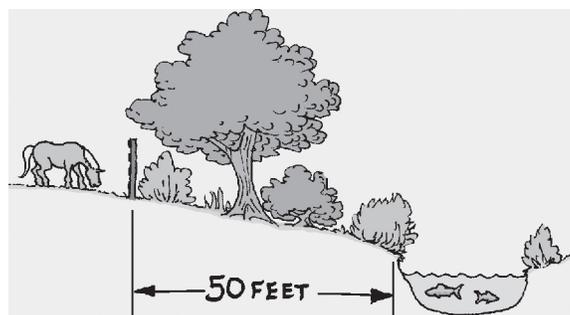
## 4 Choose Confinement and Storage Areas With Care

Locate confinement areas (such as paddocks or sacrifice areas) and manure piles as far away as possible from wetlands, streams, and other waterbodies. Maintain a healthy section or “buffer strip” of grass or other vegetation downslope of confinement areas and manure storage areas. This buffer strip will help to filter out nutrients from water before it reaches streams and wetlands. The buffer required by law will vary depending on where you live. But to give you an idea of what may be required, here are some commonly recommended separation distances between sensitive areas and manure piles or confinement areas:



Sensitive Area	Minimum separation distance (feet)
Property line	50 (ideal 500)
Residence or place of business	200 (ideal 2,000)
Private well or other potable water source	100
Wetlands or surface water (streams, ponds, lakes)	100
Drainage ditch or subsurface drainage pipe discharging to a natural water course	25
Water table (seasonal high)	3

(Source: *Field Guide to On-Farm Composting; Natural Resource, Agriculture, and Engineering Service*)



# “Wild-Land” Management



## The Benefits of Wildlife Enhancement

As Washington becomes more and more developed, horse places can provide important natural open spaces that are a haven for wildlife. Making your place wildlife-friendly can increase the enjoyment you get from your horse place and it also has benefits for your horses. For example, by attracting birds and bats, you can significantly reduce your insect population. One swallow consumes about 6,000 soft-bodied insects per day while bats can eat more than 5,000 a night! Bats also eat agricultural pests such as corn borers, cutworm moths, potato beetles, and grasshoppers. By attracting hawks and owls, you'll also have a natural form of rodent control.

In this chapter we'll talk about the things you can do to attract the wildlife you want and eliminate habitat for the pests you don't want. Some of the topics we'll cover include:

- Providing water and shelter (such as nest boxes, bat houses, brush piles, and rock piles).
- Planting native trees and shrubs.
- The importance of snags and downed trees.
- Pest Prevention.
- Fly predators and other natural, non-toxic forms of fly control.



## The 7 Keys to Wildlife Enhancement

### 1 Provide Water

Water is essential for all wildlife and can be supplied in a stock tank, birdbath, small pond, or a shallow dish. Simply placing a half-barrel under your roof downspout can do the job. Be sure to empty water and refill it regularly, especially in the summer. Mosquitoes lay their eggs in stagnant water, but if you empty the water about once a week, the eggs won't have time to hatch.

You can also place a floating board as a "dock" in your water source to allow safe exit for birds or small animals. If you are lucky enough to have a natural pond, stream, or wetland on your property, make sure to preserve or restore these areas. As discussed in the previous chapter, fencing horses out of these areas is key.



### 2 Plant a Variety of Native Trees and Shrubs

Since native plants have naturally evolved to survive in our region's climate, they are more disease-resistant and require less watering and maintenance than non-natives. As a result, they are a beautiful, low-maintenance addition to any landscape and they have the added benefit of providing wildlife with food and shelter. A few natives that attract birds, butterflies, and other wildlife are beaked hazelnut, bitter cherry, black hawthorn, Oregon grape, pacific crabapple, pacific serviceberry, red elderberry, red huckleberry, red osier dogwood, and salmonberry. See the Resources section for contacts that can give you more information on native plants.

**Variety.** Provide a variety of vegetation types of varying heights, such as tall grasses, groundcovers, shrubs, and trees. The different heights and varieties of plants will provide habitat for the varying needs of birds and other wildlife. Make sure to include at least one good clump of evergreen trees and shrubs to provide year-round protective cover from weather and predators. Trees planted inside pastures and paddocks will probably need protection from chewing and root compaction. Fence off trees outside their drip zone—the area at the ends of the branches where raindrops roll off. Consider planting new trees where horses can't reach them.

**Hedgerows.** Plant shrubs or bushes along fence lines, in corners of pastures, along driveways, and in clumps in your pastures. Small animals and birds travel along these protected areas and use them for food and shelter. Native plants like hawthorn, serviceberry, Oregon grape, and native roses can be planted to form good hedgerows.

**Woodlots.** Planting trees can provide you with a timber crop, firewood, windbreaks, dust barriers, shelter and shade for horses, mud control (since they soak up so much water),



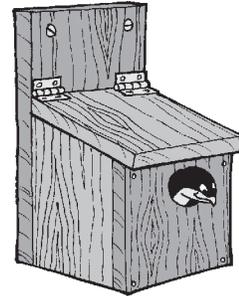
and a buffer between neighbors. When properly placed, trees can also help save on heating and cooling costs for your buildings. (Note: If you plan to log trees, wait until mid-July to help avoid disturbing nesting birds.)

### 3 Hang Nest Boxes and Bat Houses

By attracting birds and bats, you can make a huge dent in the numbers of insects around your property. When hanging nest boxes for birds, be aware that different types of boxes will attract different types of birds—make sure you use the right box to attract the birds you want to have around. Contact your local Audubon chapter or your local bird supply store for help (see the Resources section for contact information). (Note: Remember to empty bird nest boxes each fall!)

#### Did you know?

Swallows (a species of bird) eat about 6,000 insects a day and bats can eat more than 5,000 insects a night!



Bat houses can be placed up high on a barn, pole, tree, or house facing south or southwest. It is best to put bat houses up by early April—but be patient, it can take up to two years for a bat colony to find your box. If you are concerned about rabies carried by bats (or any wild, warm-blooded animal), consult your veterinarian for more information.

### 4 Build Brush Piles and Rock Piles

When gathering downed branches from storms, stack them in a corner or unused area of your pasture. Brush piles make excellent homes for small mammals, amphibians, reptiles, and small birds. You can also create rock piles with the rocks removed from paddocks and pastures. If you have pieces of PVC pipe, place them at the bottom to create hiding spaces. Rock piles provide great habitat for toads, field mice, snakes, and weasels. Locate brush and rock piles away from any of your buildings to prevent these structures from becoming wildlife habitat!

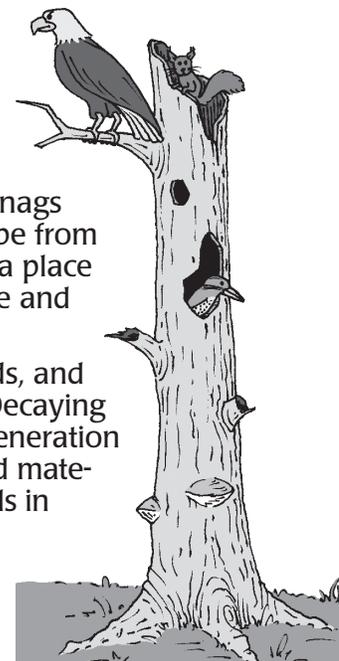


### 5 Leave Snags and Downed Trees

Snags—dead or dying trees that are still standing—are important for many kinds of wildlife. Snags provide birds like woodpeckers and chickadees with insects to eat and creatures such as salamanders, tree frogs, and bats find shelter under the loose bark. The holes in snags provide owls, nuthatches, swallows, and wrens with a place to escape from bad weather, build nests, and raise their young. Snags also provide a place for eagles, hawks, and owls to perch while they are hunting for mice and other rodents on the ground.

Downed logs are also important wildlife habitat. Salamanders, lizards, and many beneficial insects depend on downed trees in their lifecycle. Decaying logs also act as “nurse logs” for new seedlings, providing the next generation of trees with a place to grow. By some estimates, the removal of dead material from forests can mean a loss of habitat for up to 1/5 of the animals in the ecosystem!

You should never allow dead wood to rest against your home and any trees that may be a danger to your horses or your buildings should be removed. Otherwise, it is safe to allow standing dead



trees and downed logs to remain on your property. As long as the snags are a reasonable distance from your buildings, there is no risk of damage by termites or other pests, and this will be a tremendous help to wildlife.

## 6 Discourage Pests by Eliminating Their Habitat

Certain kinds of wildlife may not be as welcome around your horse property. To discourage unwanted visitors, here are some ways to eliminate their habitat:

**Opossums.** These non-natives can be the carriers of Equine Protozoal Myelitis (EPM), a disease that can affect horses. To discourage opossums, raccoons, and coyotes put cat and dog food where pests cannot reach it, particularly at night. Also, do not compost human food scraps (such as meat, fats, bones, or dairy products) in the manure compost pile. Even fruits and vegetables in an uncovered compost bin might become an attractant.

**Rodents.** Mice and rats can cause hundreds of dollars worth of damage per year in feed loss and structural damage. They can also carry very serious diseases for humans and livestock. Keep things such as old feedbags and cardboard boxes picked up and put away to eliminate nesting areas and food supply. Items such as towels, horse blankets, and saddle pads should be stored in covered containers like trunks when not in use. Store feed in aluminum garbage cans with secure lids. Pick up cat and dog food and water at night and clean up any other feed or spilled grain. Having a mousing cat “on staff” in your barn can help with rodent control also.



**Starlings.** These non-native birds destroy nests and out-compete native species of birds. Like opossums, they are a possible carrier of the EPM disease. You can avoid starling problems with your bird boxes by having the holes made for the correct size of bird you want to attract. You can also attach “starling guards” on the roof of nest boxes. These aluminum pieces shield the opening and keep starlings from getting in or reaching inside. You can also buy bird feeders with guards that prevent larger birds like starlings from reaching the food.

**Yellow jackets.** These summertime pests can be discouraged by keeping garbage in tightly sealed containers and keeping kitchen scraps out of your manure pile.

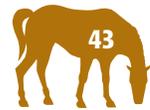
**Deer and elk.** Avoid planting certain types of trees, such as cedar, that attract deer. Try to plant varieties that deer and elk typically won't touch, such as herbs, succulents, lavender, foxglove, ferns, red flowering current, Oregon grape, and rhododendrons. Protect young trees with fencing or wire cones, or simply plant more than you'll need and assume that some young trees will be lost to browsing.

## 7 Use Non-Toxic Fly Control Methods

Flies and insects can be a big problem around a horse place but chemical insecticides can end up harming more than the pest you are trying to eliminate. These chemicals can kill the good bugs and bug-eating birds that get rid of pests. Insecticides and pesticides can also cause harm if they are rinsed off by rainwater and carried into nearby streams and lakes. If you decide to use chemical pesticides, look for non-toxic varieties and always read and follow the directions carefully. Here are some other ways you can control insects naturally:

**Manure and mud management.** Practicing good manure management (like picking up manure regularly and covering your manure pile) and taking steps to eliminate mud on your property will help significantly in reducing breeding grounds for insects.





**Birds and bats.** As mentioned earlier, encouraging birds and bats on your property can do wonders for reducing insect populations.

**Fly predators.** Fortunately, there are some good bugs out there that will help you fight the bad guys. Fly predators (also called fly parasites) are gnat-sized, nocturnal wasps that lay their eggs in the developing pupae of flies. The eggs of the parasite then hatch into larvae and feed on the inside of the pupae. One fly parasite can destroy as many as 50 fly pupae! Fly parasites do not harm humans or animals in any way—in fact, you won't even notice their presence but they can be extremely effective in reducing and nearly eliminating the fly population. For best results, release the parasites in spring before the fly population becomes a problem. There are many companies that sell fly parasites—look on the web, in farm supply catalogs, or at your local garden store. For more information, see the Resources section for some fly predator suppliers.

**Traps.** Several types of insect traps can also be useful. One of the cheapest and easiest is flypaper or tape. Pheromone traps are jars with one-way lids that can be placed in barn areas. The traps contain pheromone solution, a natural substance that attracts flies. Lured into the trap by the pheromones, the flies and yellow jackets are trapped and die. Traps are sold by different companies under names like Trap-A-Fly, Venus Fly Trap, and Fly Terminator. Check farm and horse supply catalogs.

**Physical controls.** If you've still got flies around, fly masks can help keep horses comfortable. For horses that have allergies to *Culicoides* (“no-see-ums”), try putting a fan in their stall—the air current will be too strong for no-see-ums to fly through.





# Horses and the Law



## Important Contacts for Rural Landowners

We hope that this manual has provided you with practical steps that will help you to protect water quality *and* the health of your horses. Because fish populations are rapidly declining throughout the Northwest, the National Marine Fisheries Service has listed several fish species as threatened under the Endangered Species Act. In Clark County, these include Chinook, chum, steelhead, and bull trout. Cutthroat trout might be listed in the near future. Unless immediate steps are taken to reverse their decline, these fish will next be listed as endangered, meaning extinction is likely soon. The decline of these fish populations is just one of many indications that our water needs our protection.

Because many of our activities can affect the quality of our water, we need to take precautions to reduce negative impacts. Below are some contacts you should be aware of as a rural landowner.



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## What You Need To Know As A Rural Landowner

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### Building Codes and Permits

Before building, contact your city or county planning department for zoning requirements and permits.

Clark County Department of Community Development  
Customer Service Permit Center  
360-397-2375

<http://www.clark.wa.gov/commdev/>

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### Clearing and Grading Permits

Before you clear any land, especially near creeks or wetlands, you'll need to find out if a Habitat Permit review is required.

Clark County Department of Community Development  
360-397-2375

<http://www.clark.wa.gov/commdev/>

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### Buried Utilities

Washington law requires that you notify utility companies no less than two days and no more than 10 days before you start to dig.

Northwest Utilities Notification Center  
811

<http://www.callbeforeyoudig.org/>

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### Floodplain Protection

Permits may be required for work within a 100-year floodplain. Insurance and financing may be restricted.

Clark County Department of Community Development  
360-397-2375

<http://www.clark.wa.gov/commdev/>

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### Forest Practices

The Forest Practices Act requires permits for many activities on wooded land such as harvesting, reforestation, road building, salvaging trees, and applying chemicals. Check for requirements and exemptions.

Washington State Department of Natural Resources  
360-577-2025

<http://www.dnr.wa.gov/>

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### Open Burning

Permits may be required, often at no charge. Bans occur during the fire hazard or air pollution periods.

Southwest Clean Air Agency  
360-574-3058

<http://www.swcleanair.org/>

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## What You Need To Know As A Rural Landowner

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### Septic Systems

For installation of septic systems or problems with existing systems call for advice or permits.

Clark County Public Health  
360-397-8428

<http://www.clark.wa.gov/public-health>

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### Streambank and Wetland Protection

Permits are required to fill, drain or dredge water areas and to modify stream channels, streambanks or wetlands. Technical assistance is available for stream and wetland protection.

Washington State Department of Ecology Permit Assistance Center  
800-917-0043 or 360-407-6305 <http://www.ecy.wa.gov/permit.html>

Clark County Department of Community Development  
360-397-2375 <http://www.clark.wa.gov/commdev/>

Clark Conservation District  
360-859-4780 <http://www.clarkcd.org/>

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### Trash Recycling and Disposal

Locate licensed landfills, private trash disposal companies, and recycling centers. Burning or burying household trash on private land is not allowed.

Clark County Department of Public Health

360-397-8000 <http://www.clark.wa.gov/public-health>

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### Water Quality

You are responsible for managing manure, erosion, pesticides, fertilizers, irrigation and near-stream areas to protect surface water and groundwater quality.

Clark Conservation District  
360-859-4780 <http://www.clarkcd.org>

WSU Extension Clark County  
360-397-6060 <http://clark.wsu.edu/>

Washington Department of Ecology, Vancouver Field Office  
360-690-7171 <http://www.ecy.wa.gov/>

Clark County Department of Public Works - Clean Water Division  
360-397-2121 <http://www.clark.wa.gov/public-works/>

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## What You Need To Know As A Rural Landowner

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### Water Rights

A permit is needed for well water uses of more than 5,000 gallons of water per day or more than  $\frac{1}{2}$  acre of garden or lawn irrigation. A water right is required for any surface water withdrawal.

Washington Department of Ecology, Vancouver Field Office  
360-690-7171 <http://www.ecy.wa.gov/>

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### Weed Control

This department is responsible for controlling noxious weeds in Clark County. Noxious weeds crowd our forage and destroy wildlife habitat. Many are toxic to animals and humans. This department can provide you with information on identifying and controlling noxious weeds.

Clark County Vegetation Management  
360-397-6140 <http://www.clark.wa.gov/weed/>

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### Wells

Wells need to be registered with the Washington Department of Ecology. Well logs must then be submitted to the Clark County Health Department. Contact the Clark County Health Department for any well activity!

Washington Dept. of Ecology, Vancouver Field Office  
360-690-7171 <http://www.ecy.wa.gov/>

Clark County Public Health  
360-397-8428 <http://www.clark.wa.gov/public-health>

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### Wildlife Protection Endangered Species

The law protects threatened and endangered species. Your land management may be affected if these species are present.

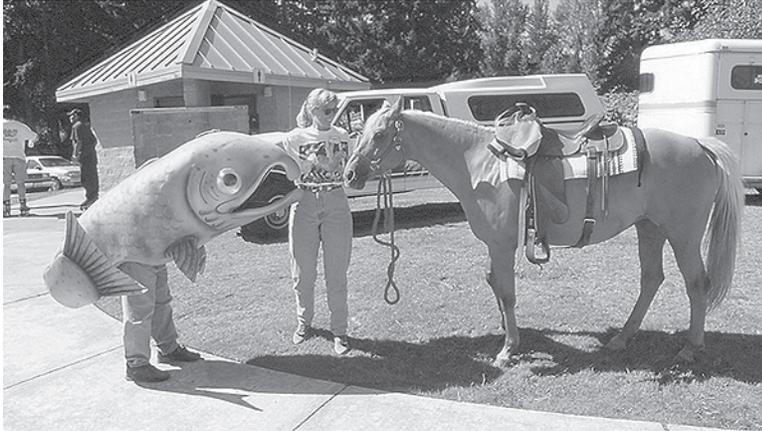
Vancouver Audubon Society  
<http://www.vancouveraudubon.org/>

Washington Dept of Fish and Wildlife  
360-696-6211 <http://wdfw.wa.gov/about/regions/region5>

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# *Resources*





## Clark County Agencies

### Clark Conservation District

Clark Conservation District provides technical assistance, educational handouts, classes, and workshops on livestock and water quality issues. District staff can provide you with information on many aspects of manure management, mud management, pasture management, stream restoration projects, fencing, and wildlife habitat improvement. They can also help you develop a farm plan to help you meet your goals for your property while protecting water quality and natural resources. Farm plans consider farm size, soil types, slope of the land, proximity to streams or waterways, and resources such as machinery or buildings and finances available.

The Conservation District may be able to help fund (or help you find funding) for certain types of livestock management and water quality improvements, including fencing along streams, animal watering stations, and bank stabilization. Conservation districts have no regulatory authority, which means they are not there to enforce the law or report you to anyone that does. This allows people to work with conservation districts to make improvements without fearing that they will get in trouble for how they manage their land now.

Address: 813 W Main Street, Suite 106 Battle Ground, WA 98604  
Phone: 360-859-4780  
Web site: <http://www.clarkcd.org/>

### USDA Natural Resources Conservation Service

The USDA Natural Resources Conservation Service (NRCS) supports the efforts of the Conservation Districts and provides many of the same technical services. NRCS field offices are in each county to provide local technical assistance.

Address: 500 W 12th Street, Suite 135 Vancouver, WA 98660  
Phone: 360-768-3045  
Web site: National: <http://www.nrcs.usda.gov/>  
State: <http://www.wa.nrcs.usda.gov/>

### Washington State University (WSU) Extension Clark County

Each county in Washington has a WSU Cooperative Extension office. The Cooperative Extension provides a wide variety of educational materials and programs on livestock and water quality issues. It administers many educational programs such as the Master Gardener Program, Small Acreage Programs, and 4-H Youth Education.

Address: 1919 NE 78th Street Vancouver, WA 98665  
Phone: 360-397-6060  
Web site: <http://clark.wsu.edu/>





## Regional Agencies & Organizations

### Washington Department of Ecology

The mission of the Department of Ecology is to protect, preserve, and enhance Washington's environment, and promote the wise management of our air, land, and water. The Department of Ecology administers state water quality regulations and permits; provides technical assistance and oversight to local governments in administration of the Shoreline Management Act, in management of wetlands, non-point source pollution and stormwater; and approves local groundwater management.

Address: Vancouver Field Office, 2108 Grand Blvd., Vancouver, WA 98661-4622  
 Phone: 360-690-7171  
 Web site: <http://www.ecy.wa.gov/>

### Horses for Clean Water

A program run and supported by horse owners promoting environmentally sensitive horsekeeping; offering classes, workshops, farm tours and materials development on topics such as pasture, manure and mud management; available for individual farm consultations.

Phone: 206-909-0225  
 Web site: <http://www.horsesforcleanwater.com/>

### Washington State Department of Agriculture (WSDA)

The WSDA supports the agricultural community and promotes consumer and environmental protection.

Address: 1111 Washington Street S.E., Olympia, WA  
 Phone: 98504-2560/360-902-1800 or 360-902-1996 (TDD)  
 Web site: <http://www.agr.wa.gov>

## Manure, Mud, Pasture, and Wildlife Management Resources

*Please note that the following list of businesses and agencies in this section is not comprehensive. The inclusion of an organization or business as a resource does not constitute an endorsement by the authors or funding agencies.*

### Manure Management Resources

#### *Manure Exchange Program- Clark Conservation District*

The Clark Conservation District has a manure exchange program where you can get connected with people in the county who have a use for your horse manure. The Conservation District gathers information including the type of bedding you use, manure to bedding ratio, age of the manure, months of the year when it is accessible, whether a loader is available, and the part of the county where your farm is located. The goal of the program is to provide this list of landowners to others in the community who could put your manure to good use. The Conservation District often advertises the service in the local newspapers and other publications as well as at community events. And best of all, the service is free! For more information, call 360-859-4780





### Manure Spreader- Clark Conservation District

If you'd like to use a manure spreader but do not own one, the Clark Conservation District has one available for use to landowners within the District. It is ground-driven (no need for a PTO) and can be pulled behind a garden tractor with at least 18 horsepower or a vehicle weighing at least 1,000 pounds. The spreader can hold approximately 55 cubic feet of manure. It is available both during the week and for check out over the weekend by appointment. For more information, call 360-859-4780.

### Wood Pellet Bedding

Check with your local feed supply store; most carry alternative bedding options. Woodstove pellets are usually available at feed stores, but also check hardware stores, grocery stores and woodstove shops. Be sure to use only pellets that contain 100% wood products with no chemicals, glue or other additives. Please note that these listings are not comprehensive and are subject to change. Refer to your local phone book and always call first to be sure that the supplier currently has wood pellet bedding available and in stock.

Resource	Address	Phone
<b>Remnant Fams Feed and Supply</b>	1501 Guild Rd., Woodland, WA	360-225-5980
<b>LJC Feed</b>	3501 N.E. 3rd Ave., Camas, WA	360-835-0164
<b>Lacamas Pellets and Feed</b>	18110 N.E. 4th Plain Rd., Vancouver, WA	360-892-0442
<b>Orchards Feed Store</b>	10902 NE Rosewood Ave, Vancouver, WA	360-892-3001
<b>Pioneer Feed Co.</b>	21605 N.E. 10th Ave. #B, Ridgefield, WA	360-887-4237
<b>Rietdyks Milling Co.</b>	512 N.W. Carty Rd., Ridgefield, WA	360-887-8874
<b>Thrifty Feed &amp; Garden</b>	4207 N.E. St. Johns Rd., Vancouver, WA	360-695-7351
<b>Wilco Farm Stores</b>	815 W. Main St., Battle Ground, WA	360-687-3113





## Books and Publications

**On-Farm Composting Handbook**, Robert Rynk, ed., June 1992, (NRAES-54), distributed by the Northeast Regional Agricultural Engineering Service.

Phone: 607-255-7654  
 E-mail: [PALSPublishing@cornell.edu](mailto:PALSPublishing@cornell.edu)  
 Web site: <http://tinyurl.com/onfarmcompost>

**On-Farm Composting Field Handbook**, a shorter publication about related farm topics, such as dairy expansion, lagoon management, and facility design and construction.

Phone: 607-255-7654  
 E-mail: [PALSPublishing@cornell.edu](mailto:PALSPublishing@cornell.edu)  
 Web site: <http://tinyurl.com/onfarmfield>

**Biocycle Publications**, various publications on topics of commercial composting operations. Published by JG Press, 419 State St., Emmaus, PA 18049

Phone: 610-967-4135  
 E-mail: [biocycle@jgpress.com](mailto:biocycle@jgpress.com)  
 Web site: <http://www.biocycle.net/>

**Worms Eat My Garbage**, How to set up and maintain a worm composting system, by Mary Appelhof; ISBN 0-942256-03-4, Flower Press, Kalamazoo, MI

## Websites on Composting

Resource	Address
City Farmer	<a href="http://www.cityfarmer.info">http://www.cityfarmer.info</a>
Clark Conservation District	<a href="http://www.clarkcd.org/">http://www.clarkcd.org/</a>
Composting Council of Canada	<a href="http://www.compost.org/">http://www.compost.org/</a>
Compost Connection for Western Agriculture	<a href="http://www.csanr.wsu.edu">http://www.csanr.wsu.edu</a>





Resource	Address
Compost Resource Page	<a href="http://www.oldgrowth.org/compost/">http://www.oldgrowth.org/compost/</a>
Cornell Waste Management Institute/Cooperative Extension	<a href="http://www.cwmi.css.cornell.edu/composting.htm">http://www.cwmi.css.cornell.edu/composting.htm</a>
Washington Organic Recycling Council	<a href="http://www.compostwashington.org/">http://www.compostwashington.org/</a>
Washington State Department of Ecology	<a href="http://www.ecy.wa.gov/programs/swfa/">http://www.ecy.wa.gov/programs/swfa/</a>
Washington State University	<a href="http://www.puyallup.wsu.edu/soils">http://www.puyallup.wsu.edu/soils</a>
Washington Tilth Association	<a href="http://www.tilthproducers.org/">http://www.tilthproducers.org/</a>
University of Maine Cooperative Extension	<a href="http://extension.umaine.edu">http://extension.umaine.edu</a>
U.S. Composting Council	<a href="http://www.compostingcouncil.org/">http://www.compostingcouncil.org/</a>
Worm Digest	<a href="http://www.worndigest.org/">http://www.worndigest.org/</a>

## Mud Management Resources

### *Used Conveyor Belting Sources*

Conveyer belting can often be used as an inexpensive substitute for rubber stall mats. Check with gravel quarries in your area to see if they have used conveyer belting available for free or at a low cost. You may have to be a little bit patient—not all quarries have belting available on a constant basis so you may need to keep checking back.

Another option is to check the materials exchange websites listed below. These websites provide a convenient way to locate used or surplus building materials and household items that are available in your community at any given time. You may be able to find used conveyer belting along with other materials such as hogfuel, lime, fencing materials, farm equipment, and lots more!

<http://www.2good2toss.com/>

<http://www.repurposedmaterialsinc.com>





### Hogfuel & Tree Trimming Sources

Please note that many of these suppliers only offer hogfuel on a seasonal basis or only sell cedar chips. Since hogfuel and wood chips are often made from cedar, be aware that a small percentage of horses are allergic (skin sensitivity) to cedar. To test this beforehand, try a bag of cedar shavings as bedding for a week to see if your horse has a reaction.

Check your local phone book for other tree trimming services.

Resource/Location	Phone
<b>H &amp; H Wood Recyclers Inc.</b> 8401 N.E. 117th Ave., Vancouver, WA	360-892-2805
<b>McFarlane's Bark</b> 8806 N.E. 117th Ave., Vancouver, WA	360-892-6125
<b>Metro Landscape Supplies</b> (cedar chips) 1910 S.E. 8th Ave., Camas, WA	360-833-9456
<b>Shortys Garden Centers</b> 705 N.E. 199th St., Ridgefield, WA	360-887-3936
<b>Thrifty Feed &amp; Garden</b> 4207 N.E. St. Johns Rd., Vancouver, WA	360-695-7351
<b>Yard N Garden Land Inc.</b> (cedar chips) 1501 N.E. 102nd St., Vancouver, WA	360-573-7172

### Pasture Management Resources

#### Soil Testing

Check with the Clark Conservation District for information on soil testing and soil testing laboratories. WSU Extension also provides a website with excellent information and links to resources on soil sampling, soil testing, and soil test interpretation. This page also includes a list of soil testing laboratories and consultants serving agriculture in the Pacific Northwest.

Visit: <http://www.puyallup.wsu.edu/soils>





### Pasture Seed Sources

Check with the Clark Conservation District or Natural Resources Conservation Service for recommendations on seed mixes based on your location and needs. Many farmer’s co-ops and feed stores carry pasture seed—here are some additional suppliers:

Resource	Phone/Fax
<b>LJC Feed</b> 3501 N.E. 3rd Ave., Camas, WA	360-835-0164
<b>Lackamas Pellets and Feed</b> 18110 N.E. 4th Plain Rd., Vancouver, WA	360-892-0442
<b>Orchards Feed Store</b> 6017 N.E. 109th Ave., Vancouver WA	360-892-3001
<b>Thrifty Feed &amp; Garden</b> 4207 N.E. St. Johns Rd., Vancouver, WA	360-695-7351
<b>Wilco Farm Stores</b> 815 W. Main St., Battle Ground, WA	360-687-3113

### Lime Sources

Resource	Phone/Fax
<b>Columbia River Carbonates</b> 300 N Pekin Road, Woodland, WA	360-225-6505
<b>LJC Feed</b> 3501 N.E. 3rd Ave., Camas, WA	360-835-0164
<b>Lacamas Pellets and Feed</b> 18110 N.E. 4th Plain Rd., Vancouver, WA	360-892-5810
<b>Orchards Feed Store</b> 6017 N.E. 109th Ave., Vancouver WA	360-892-3001





Resource	Phone/Fax
<b>Rietdyks Milling Co.</b> 512 N.W. Carty Rd., Ridgefield WA	360-887-8874
<b>Thrifty Feed &amp; Garden</b> 4207 N.E. St. Johns Rd., Vancouver, WA	360-695-7351
<b>Wilco Farm Stores</b> 815 W. Main St., Battle Ground, WA	360-687-3113

### *Toxic Weed and Weed Control Information*

Resource/Address	Phone/Fax	Web Site/E-mail
Clark County Vegetation Management	360-397-6140	<a href="http://www.clark.wa.gov/weed/">http://www.clark.wa.gov/weed/</a>

### *Websites:*

<http://www.ansci.cornell.edu/plants/>

<http://www.horsesforcleanwater.com/>

### *Books and Publications on Weeds, Weed Control and Toxic Plants*

The following can be purchased from the WSU Cooperative Extension Publications Office in Pullman, WA by calling 509-335-2857.

**Pacific Northwest Weed Control Handbook.** WSU Cooperative Extension; published each year, contains most recent information on the type of herbicide to apply for each specific weed, how to handle it, and when to apply it.

<http://pubs.wsu.edu>

**Weeds of the West.** 1991, Western United States Land Grant Universities Cooperative Extension Service. This is the definitive source for weed identification used for this area. Contains excellent photos and information on each plant, including whether they are toxic or not.

**Turf and Ornamental Weed Management** publication# MISC 0170 from WSU Cooperative Extension.

The following publications can be purchased through University Bookstore using the ISBN #.

**Weeds, Control Without Poison.** 1991, Walters. ISBN: 0-911311-25-4. Information on weed management without chemicals.

**Plants of the Pacific Northwest Coast.** 1994, Pojar and Mackinnon. ISBN: 1-55105-040-4. Contains excellent information and photo identification on most trees, shrubs, flowers and grasses of this area, including weeds. Includes information on toxic properties for each plant.





**Horse Owner’s Field Guide to Toxic Plants.** 996, Sandra Burger. ISBN: 0-914-327-62-3. Color photos of many of the plants toxic to horses common across North America.

## Stream and Wetland Management Resources

Resource/Address	Phone/Fax	Web Site/E-mail
<b>Clark Conservation District</b> 813 W Main Street, Suite 106 Battle Ground, WA 98604	360-859-4780	<a href="http://www.clarkcd.org/">http://www.clarkcd.org/</a>

### Regional Fisheries Enhancement Groups

The Lower Columbia Fish Enhancement Group engages local communities to foster private stewardship and to create sustained habitat restoration and community-supported salmon recovery strategies within our watersheds. Their activities emphasize intensive habitat restoration projects that include education and outreach, project effectiveness monitoring, and assessments of important habitat functions that limit salmon productivity.

Resource/Address	Phone/Fax	Web Site/E-mail
<b>Lower Columbia Fish Enhancement Group</b> 12404 S.E. Evergreen Highway Vancouver, WA	360-882-6671	<a href="http://www.lcfeg.org/">http://www.lcfeg.org/</a>

## Wildlife Enhancement Resources

### Books on Native Plants & Wildlife Enhancement

**America’s Neighborhood Bats**, by Merlin D. Tuttle, ISBN 0-292-70403-8

**Plants of the Pacific Northwest Coast**, by Pojar & MacKinnon

**Gardening with Native Plants of the Pacific Northwest**, by Arthur Kruckeberg

**Northwest Trees**, by Arno & Hammerly

**Noah’s Garden**, *restoring the ecology of our own back yards*, by Sara Stein

**The Original Birdhouse Book**, by Don McNeil

**Landscaping for Wildlife in the Pacific Northwest**, by Russel Link

**Horse Owner’s Field Guide to Toxic Plants**, by Sandra Burger

**Birds of North America**, by National Geographic Society

### Fly Parasite Suppliers

Resource/Address	Phone/Fax	Web Site/E-mail
<b>Kunafin</b>	800-832-1113	<a href="http://www.kunafin.com/">http://www.kunafin.com/</a>
<b>Arbico</b>	800-827-2847	<a href="http://www.arbico-organics.com">http://www.arbico-organics.com</a>
<b>Spalding Labs</b>	888-562-5696	<a href="http://www.spalding-labs.com/">http://www.spalding-labs.com/</a>





### *Nest Box and Bat Box Sources*

Please note that these listings are not comprehensive and are subject to change. Check your local phone book for current listings.

<b>Resource/Address Information</b>	<b>Phone/Fax</b>	<b>Web Site/E-mail</b>
<b>Backyard Bird Shop</b> 8101 N.E. Parkway Dr. Vancouver, WA This chain of stores has several retail stores in the Vancouver area. See your local phone book for one near you.	360-253-5771	<a href="http://www.backyardbirdshop.com/">http://www.backyardbirdshop.com/</a>
<b>Thrifty Feed &amp; Garden</b> 4207 N.E. St. Johns Rd. Vancouver, WA	360-695-7351	<a href="http://www.thriftyfeed.com">http://www.thriftyfeed.com</a>

### *More Information on Bats*

<b>Resource/Address Information</b>	<b>Phone/Fax</b>	<b>Web Site/E-mail</b>
<b>Bat Conservation International</b> Catalog, information and resources on all sorts of bat-related topics.	800-538-BATS	<a href="http://www.batcon.org/">http://www.batcon.org/</a>
<b>Real Goods</b> Catalog carries bat houses	800-919-2400	<a href="http://www.realgoods.com/">http://www.realgoods.com/</a>
<b>Missouri Department of Conservation</b> A blueprint for the "Missouri-style" bat house, a house for large colonies.		<a href="http://www.mdc.mo.gov/">http://www.mdc.mo.gov/</a>
<b>Bats Northwest</b> In Washington contact for questions and information on bats.	206-256-0406	<a href="http://www.batsnorthwest.org/">http://www.batsnorthwest.org/</a>





## Other Wildlife Agency and Organizations

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<b>Resource/Address Information</b>	<b>Phone/Fax</b>	<b>Web Site/E-mail</b>
<b>Vancouver Audubon Society</b>		<a href="http://www.vancouveraudubon.org/">http://www.vancouveraudubon.org/</a>
<b>Natural Resources Conservation Service</b> For information on preserving backyard wildlife habitat visit their website.		<a href="http://www.nrcs.usda.gov">http://www.nrcs.usda.gov</a>
<b>Washington Department of Fish and Wildlife</b> The WDFW Backyard Wildlife Program offers a package of specific information for creating wildlife habitat in our state.	360-696-6211	<a href="http://wdfw.wa.gov/wlm/backyard">http://wdfw.wa.gov/wlm/backyard</a>
<b>National Association of Conservation Districts</b>		<a href="http://www.nacdnet.org/outreach/backyard.htm">http://www.nacdnet.org/outreach/backyard.htm</a>
<b>Wolf Haven</b>	800-448-9653	<a href="http://www.wolfhaven.org/">http://www.wolfhaven.org/</a>

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