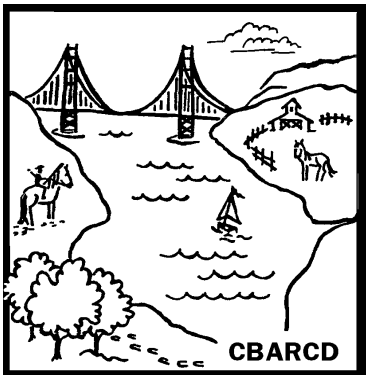

Council of Bay Area Resource Conservation Districts

Equine Facilities Assistance Program

"Working with horse owners to protect San Francisco Bay Area water resources."

Dryland Pasture for Horses

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Participating Resource Conservation Districts

Alameda County RCD
Contra Costa RCD
Marin County RCD
San Mateo County RCD
Southern Sonoma County RCD

Non-point source pollution consists of the diffuse discharge of pollutants that can occur over an extensive area. As water from rainfall, snowmelt, or human activity moves over and through the ground it picks up and transports natural and manmade pollutants, eventually depositing them into surface and ground water.

Water quality: a neutral term that relates to water's chemical, biological and physical characteristics. The quality of water often determines its specific use or its ability to support various beneficial uses.

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Many small ranches and horse facilities in the San Francisco Bay Area utilize some dry, non-irrigated land for horse pasture. These pastures are often used as holding areas or exercise runs. They are not usually expected to provide the primary source of forage for the horse(s). However proper management of the vegetation will improve forage and productivity, and is critical to provide a healthy environment for the horse and protect the soil and water.

Managing Pastures to Protect Water Quality

The vegetation or plants that grow in a pasture hold the soil in place, increase water absorption and reduce water runoff. Pasturing too many horses in an area or allowing them to graze for too long in the same area causes loss of plant cover, compacts the soil, and exposes it to erosion. This condition, known as overgrazing, can cause significant water quality problems. In overgrazed pastures exposed soil is not protected from the erosive energy of raindrops or overland water flows. Erosion removes valuable topsoil, which is carried along in water as sediment. Sediments fill ditches, ponds, creeks and reservoirs, reducing their usefulness and harming aquatic life. Maintaining adequate vegetative cover in a horse pasture is essential to minimizing erosion and protecting water quality.

Proper management that provides for adequate vegetative cover requires an understanding of the life cycle of the plants in the pasture.

How Annual Plants Grow

Annual grasses and forbs (broad-leaf plants) dominate dryland pastures in the San Francisco Bay Area. The grasses include wild oats, soft chess, foxtail barley, and annual ryegrass. The forbs may include filaree, clover, turkey mullin and yellow starthistle. Annual plants grow from seed each year. Because their seeds germinate with the onset of fall and winter rains, weather has a great impact on the early growth of annual plants. The early growth period of the annual plants is easily observed as the pastures and surrounding non-irrigated land "green up" in the fall. The growth period continues through the winter and early spring depending on the timing and intensity of rainfall.

In the late spring and summer, annual plants in the San Francisco Bay Area mature and die. The pastures turn brown covered by dry plant material. The residue or dry plant material that is left on the ground not only provides a seed source for the following year's plants but also protects the soil from erosion. Managing dryland pastures dominated by annual plants is really about managing residue or **residual dry matter (RDM)**.

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Guidelines for Managing Residual Dry Matter (RDM)

Managing RDM in pastures dominated by annuals plants is the most effective way to improve the condition of the soil surface, increase its water holding capacity, increase plant productivity, and minimize the invasion of weedy plants. Residual dry matter can minimize runoff and soil erosion as well as minimize the potential for manure to be transported to waterbodies. Sufficient levels of RDM need to be left in a horse pasture after the growing season and prior to fall rains to protect soil and water resources.

The amount of RDM required to protect the soil will vary according to soil type, slope, and climate. For example, areas with heavy rainfall, erosive soils, or steep hills require more RDM than flat, stable soil in drier climates. The following guidelines represent a range of minimum or lower threshold levels for annual grassland sites in the San Francisco Bay Area. These guidelines were developed based on research conducted at field stations and experimental plots by the University of California and the US Forest Service. Landowners should test these minimums and develop their own levels to meet additional goals for a site.

Estimating Residual Dry Matter

The amount of residual dry matter in a pasture should be estimated at the end of the growing season. This RDM information can be used to gauge utilization of the pasture before minimum RDM level is reached. If horses continue to use the pasture after the growing season ends, RDM should be estimated again to determine when the horses should be removed. As described below, residual dry matter can be estimated by either visual determination or directly by clipping and weighing samples.

Visual Determination. A quick, easy method to visually check residual dry matter levels is to compare the site to a set of photos that illustrate various levels of residual dry matter. When there is less than 400 lbs. of residual dry matter per acre objects the size of golf balls and areas of bare soil are visible at 20 feet. With 400 to 700 lbs. of residual dry matter per acre there will be little bare soil but the vegetation will appear patchy with an average of 2 inches of plant material. When 800 lbs. of residual dry matter is present, small objects are masked and an average of 3 inches of plant material will be present.

Weight Determination. Directly clipping and weighing may also estimate residual dry matter. Place on the ground a square foot or 1/10 meter frame and clip the dried plant material as close to the ground as possible. Include in the sample litter or shattered plant material that can be easily picked up without collecting soil or rocks. Gram scales are recommended for weighing the samples. Air-dry weights are satisfactory under most summer and early fall conditions. Wet or green samples should be oven dried for dry matter determination. Grams per sq foot multiplied by 96 will estimate the pounds per acres. Example: 12 grams of dry matter per sq foot x 96 = 1150 pound per acre.

The variability experienced in most pastures on annual range often requires a large number of weighed samples for accurate estimates. However, adequate information for good management can be obtained by using judgment to select areas to sample that are “representative” or “typical” of the entire pasture. Ten to fifteen separate weights or visual weight estimates are usually enough for an area.

Minimum Recommended Residual Dry Matter (RDM) Levels
to Protect Soil and Water Resources

	Pounds per acre		
	Flat areas	Gentle slopes	Steep slopes
East Bay and South Bay (10 to 40 inches precipitation)	400 lb./ac.	600 lb./ac.	800 lb./ac.
North Coast (more than 40 inches precipitation)	750 lb./ac.	1000 lb./ac.	1250 lb./ac.

Managing horses to achieve and maintain target residual dry matter levels in a pasture requires:

1. **The proper stocking rate**
2. **The proper distribution of grazing**
3. **The proper season of use**

1. The Proper Stocking Rate — Determining a Pasture's Carrying Capacity

Stocking rate refers to the amount of land area allocated to each animal for a specific period of time. The appropriate stocking rate is based on the carrying capacity of the pasture and will vary from year to year due to weather and previous use. Pastures should be stocked at rates so that minimum RDM levels will not be exceeded. Horse owners and/or pasture managers should be prepared to move horses to a paddock or an alternative pasture once target RDM levels are reached or exceeded.

Carrying capacity or the maximum number of horses a pasture will tolerate, is based on the type of horses being grazed, i.e., broodmares, foals, or mature horses, working or idle, the quality and productivity of the pasture's plants, and the level of utilization desired. Many publications and articles state the carrying capacity of horse pastures to be 1 to 2 acres per horse. It must be recognized that this carrying capacity refers to mature horses on irrigated pastures. Dryland pastures are substantially less productive and have much lower carrying capacities. Because productivity of dryland pastures varies greatly depending on soil type, rainfall, and plant species composition, carrying capacities also vary significantly. Carrying capacity on dryland pastures in the San Francisco Bay Area may range from 10 to 60 acres per horse.

Forage Utilized. To estimate carrying capacity, pasture managers should compare the amount of forage consumed and/or trampled by a horse versus the amount of forage available. Mature horses on all hay diets will consume 2 to 2.5% of their body weight in dry hay. Therefore, a 1200-pound horse can be expected to consume as much as 30 pounds of hay per day to maintain body weight and condition. Generally, the average intake of a horse grazing on pastures can be expected to resemble that of a horse fed hay. However, because some pasture plants are more palatable than others and horses may also trample or rub out plants, average intake estimates have only limited value when determining the carrying capacity of a pasture. Instead it should be considered that a mature horse, whether or not its primary source of forage is the pasture, will eat or trample at least 1500 lbs dry-weight of forage per month.

Forage Available. Forage production for favorable and less favorable years has been estimated for range and pasture sites in the Bay Area. These values ranging from 1000 to 3500 pound per acre are reported by site in the USDA Soil Survey. Estimates represent the air-dry weight of forage from unfertilized pastures. To estimate the forage available in your pasture create an exclusion area where forage can mature, be clipped, and weighed to estimate production per acre.

Pasture versus Paddock

Not all areas on a small ranch or horse facility should be expected to support vegetation. Some areas will appear as dry, bare, lots because of heavy useage. These areas should not be referred to as pastures but rather as paddocks (or corrals.) Paddock refers to a small, non-irrigated, non-grazeable holding pen or exercise lot, often adjacent to a horse stall.* Since it is not feasible to manage for vegetative cover in a paddock, the management considerations are different than those for a pasture. Even though most of the ground in a paddock is not protected by vegetation, paddocks, which are not too large, can be managed to protect soil and water resources. See the fact sheet "Horse Paddocks" for management considerations.

*This definition of a paddock should not be confused with the division of a pasture into small grazing cells which may be called paddocks.

2. The Proper Grazing Distribution

Even with the proper stocking rate, grazing distribution can be a problem in larger pastures. Some areas will be overgrazed, and other parts are undergrazed or not grazed at all. Horses have a selective grazing instinct, due to differences in palatability of different species and maturity stage of plants. In particular horses will selectively graze immature forage. This behavior results in spot grazing, where some areas with short new growth are repeatedly grazed while other areas with mature forage continue to grow past the point of being desirable forage. As desirable plants are grazed out, weedy species tend to increase. Pasture utilization can also be impacted by distribution of manure. Some horses may consistently defecate in certain areas and will never consider eating the plants growing there. To minimize parasite infections, horses should not be forced to eat the forage where manure is deposited. Mapping residual dry matter levels for a pasture will help determine the areas in the pasture where distribution can be improved.

Improving Distribution of Pasture Utilization

Among the easiest tools to use in managing distribution are placement of salt/mineral, water, and feed. Moving salt/mineral feeding locations away from water is one way of altering distribution. People have believed that livestock must have water after consuming salt. Recent information indicates that livestock do not utilize salt or mineral and then water or vice versa. Periodically moving the placement of feed is also an effective tool for encouraging distribution. For example, hay piles should be placed far apart with more piles than the number of horses being fed. This will minimize trampling from fighting horses and maximize distribution. Although developing water is one of the more expensive tools to manage livestock distribution, it is also one of the most effective tools.

Additional fencing may also be needed to solve distribution problems where the above methods prove ineffective. Temporary electric fence can be used to create grazing cells. Turning horses out for only a limited period of grazing each day may be necessary to improve the health of pasture.

After horses have been removed from a pasture, removal or dragging of the manure is recommended. Allowing manure to build up can impede plant growth and increase parasite populations. In areas where removal of manure is not feasible, it can be spread by a chain or link harrow.

3. The Proper Season of Use

The germination and growth of annual grass coincides with the rainfall. Their major growing period in the San Francisco Bay Area is usually in March and April. If adequate residual dry matter was left from the previous year's growth, grazing may begin prior to the onset of fall rains and new growth. Horses grazing on range when the feed is dry may need protein supplementation. Grazing annual grass pastures during the winter or early green-feed period is not recommended until the new growth is at least 4 inches high. Mechanical damage results if the plants are grazed when the soil is too moist.

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This fact sheet is part of a series prepared and published by the Council of Bay Area Resource Conservation Districts in cooperation with the USDA Natural Resources Conservation Service and the University of California Cooperative Extension. The Equine Facilities Assistance Program's goal is to protect San Francisco Bay Area water resources by assisting in effective management of possible non-point source pollutants associated with horses. Resource Conservation Districts (RCD) are non-regulatory, special districts governed by a volunteer board of directors. In addition to educational programs, RCDs provide landowners and the general public with technical assistance in natural resource management.