

Outdoor Hog Production

Best Practices for Resource Conservation in the San Francisco Bay Area



Rangeland and Pasture Management

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Pasture and Rangeland in California

Forage from rangelands and pastures is the primary, and sometimes only, feed source for beef cattle, sheep and goats, and can be a significant feed source for outdoor-raised hogs. Rangelands are comprised of non-irrigated and non-cultivated grasslands, woodlands and shrublands and provide many important ecosystem services for society, such as: forage for livestock, wildlife habitat, water storage and release, water filtration, recreation and beautiful views to name a few. Pastures are irrigated forage crop systems typically harvested by grazing animals and are located on higher quality soils where irrigation water is available. Pastures are normally seeded with warm or cool-season perennial grasses and clovers and are much less diverse, but more productive than rangelands. While both rangelands and pastures are forage production systems, management of one system is quite different from the other.

Rangelands in the Bay Area and surrounding counties are generally low in productivity, yielding 2,000 to 4,000 pounds forage/acre/year, but have a

very diverse mix of annual and perennial plant species. The vegetative growth cycle begins with fall rains and continues through the winter and spring months as long as there is adequate precipitation. By late-spring, herbaceous plants generally release their seed and die or enter dormancy during the summer months. Grazing is typically seasonal to coincide with the forage growth cycle and



Pigs on perennial pasture. Photo courtesy of Magruder Ranch.

rangelands are generally extensively grazed (low stock density and long grazing duration). High-density, short-duration grazing can occur on rangelands, but is only effective when forage is growing rapidly, typically from February through April.



Funding provided by the Natural Resources Conservation Service Conservation Innovation Grant
86-9104-3-179

Pastures are more similar to cropland than rangeland and can produce between 6,000 and 9,000 pounds forage/acre/year. Grazing on irrigated pastures generally occurs from April or May through October or November, but longer grazing periods and an occasional hay harvest are not unusual. The long growing season and high productivity of irrigated pastures makes them well suited for high-density, short-duration grazing, which is much more intensive than grazing on rangelands. Establishing irrigated pasture requires a high initial investment, but once established it will be productive for many years.

Both rangelands and pastures are important forage resources for livestock producers, but their value and productivity can be greatly compromised from poor management. The propensity for hogs to root and create wallows in wet areas obligates the outdoor hog producer to carefully monitor and manage hog grazing to minimize undesirable impacts.

Managing Hogs on Pasture and Range

Maintaining sufficient vegetative ground cover on rangelands or pastures is beneficial for hogs and for the environment in an outdoor hog production system. In the San Francisco Bay Area and surrounding counties, the climate makes it especially challenging to maintain ground cover year around. The area's wet winters and spring months with good forage conditions are typically followed by hot and dry summer months with no forage growth. Extra planning is required to minimize unfavorable livestock impacts, such as the deterioration of

Environmental risks of high-use areas include:

- Increased soil compaction which reduces water infiltration and soil productivity
- Increased overland water flow during rain events that transport soil and fecal material offsite
- Soil losses due to erosion
- Downstream water quality impairments from soil and fecal material, and
- Weed infestations.

ground cover, excessive soil disturbance, and nutrient loading that may lead to soil and water pollution and weed infestations.

Even with good planning, maintaining cover in high use areas is difficult. In outdoor hog production systems, bare soil is common where hogs congregate, for instance around feed and water sources, farrowing pens or pastures, traffic corridors and lounging areas.



Pigs consuming corn. Photo courtesy of Pasture 42.

Understanding the Role of Forage in Outdoor Hog Operations

A range or pasture-based hog operation must take into account the nutritional needs of the hog while maintaining the health of the pasture or range ecosystem.

Nutritional Needs

Hogs have a monogastric digestive system, much like a human's, which is very good at digesting sugars, starch and proteins, but cannot digest fiber, except for very minimal hindgut fermentation. In contrast, cattle and sheep have a stomach compartment called the rumen, where billions of microbes ferment (digest) fiber into chemical compounds that can be utilized as nutrients. In any species of animal, the type of digestive system determines the type of diet. For cattle and sheep, the diet is primarily high-fiber forages, but for hogs the appropriate diet consist of feeds with high levels of easily digestible nutrients containing low fiber content. A pasture pork operation must grow forages that can be

utilized by hogs. Appropriate forages for hogs include legumes, such as alfalfa and clovers, root vegetables (tops and roots), young and tender grasses and grain-bearing crops. In an integrated livestock and cropping system, corn can be grown for this purpose and harvested by swine after the grain is fully developed.

Sows will have their highest nutrient demand at the onset of farrowing and during lactation. This demand is best satisfied with a grain-based ration supplemented with high quality forages. The amount of grain-based feed consumed will vary with nutrient demand, quality of forage and amount of feed offered. Keep in mind that gestating sows should not be overfed and allowed to become too fat.

Nutritional requirements of outdoor hogs are generally 15% higher than those of confined hogs to compensate for the additional energy needed to search for food and to maintain body temperature. Hogs might also graze on other forages, such as acorns, which can provide additional energy in their diet.

Food by-products and grocery wastes, such as outdated bread or tortillas, milk whey and bakery waste are commonly used by Bay Area hog producers and can help reduce the need of grain-based feeds. While by-products and food wastes are good grain alternatives, they should not supply a large fraction of the total diet since their nutrient value, and quality may vary considerably. Beware of food scraps from restaurants that can consist of all types of meats, vegetables, fats and carbohydrates.

Grazing System Design

A successful grazing system in California’s Mediterranean climate requires adaptation to the unique resources of the farm including soil, terrain, forage mix and animal type. Management will need to be flexible, practical and simple to carry out, while allowing the producer to reach his or her production and conservation goals. To begin, establish your goals

and conduct a resource inventory including forage resources (rangeland and pasture), trees, barns, groups of animals, soil, topography and water sources. A ranch map can be very useful in planning resource utilization and management. Your grazing system will need to match resource availability with animal needs, while adjusting stocking rates for forage, soil and climate conditions.



Brewers grain mixed with whey. Photo courtesy of Devil’s Gulch Ranch.

Grazing hogs

Grazing guidelines for hogs in the greater Bay Area region are not well established and will vary greatly between rangeland and pasture forage production systems. In either case forage height and ground cover should be monitored regularly so that hogs can be rotated through paddocks before damage to vegetation and soil occurs. Determining an appropriate stocking density (hogs/acre) and stocking rate (hogs/acre/year) is difficult due to variable precipitation and forage growth within the year and year-to-year. Stocking densities provided in Table 1 can serve as approximate starting points in stocking rangeland and pasture systems with hogs, but

Forage System	Type of Hog	Hogs/Acre
Irrigated Pasture	Growers/Finishers	15-30 head/acre
	Sows + Litters	4-6 head/acre
Rangeland	Growers/Finishers	4-10 head/acre
	Sows + Litters	0.5-1 head/acre

Table 1: Stocking densities for outdoor hog systems

adjustments will be needed as forage supply changes and local experience is gained.

In irrigated pastures, water should only be applied after hogs are removed, and future grazing should be postponed until forages have recovered to 4-8" and the ground is no longer wet. On both rangeland and pastures, grazing when the soil is saturated should be avoided to prevent adverse impacts on forage and soil and the formation of wallows. In rangelands, grazing should be planned to minimize bare ground and maintain adequate Residual Dry Matter (RDM) to protect soil from erosion and positively influence forage growth and composition during the following growing season. RDM is a very useful management tool and there are helpful guides to understand RDM and implement an RDM monitoring program such as ([Bartolome et al., 2006](#); [Guenther, K., 2008](#)), as well as a companion video that can be viewed [online](#).

Understanding animal behavior will also help minimize grazing impacts. Hogs are social animals and tend to concentrate their activities in small areas with high impact. In general, groups of 15-20 are easier to manage than bigger groups and mixing pigs

from different groups may lead to fights as the animals establish new hierarchies. For these reasons and in light of their foraging behavior, a rotational and/or strip grazing system may allow for better utilization of forage while providing rest between grazing periods. This may include the use of narrow lanes or alleys to move animals among paddocks or sections of the farm.

Fencing

The use of temporary, electrical fences in different configurations can help determine appropriate fencing and rotational patterns before permanent or semi-permanent fences are constructed. In some cases, establishing permanent perimeter fences may prove most convenient, with temporary or semi-permanent cross-fencing to facilitate rotation between paddocks. Fences must follow the lay of the land and landscape features, taking into consideration the need for buffer strips when in the vicinity of water courses or other sensitive areas. See factsheet on [Riparian and Wetland Management](#).

Figure 1 demonstrates several different grazing systems for outdoor hog production.

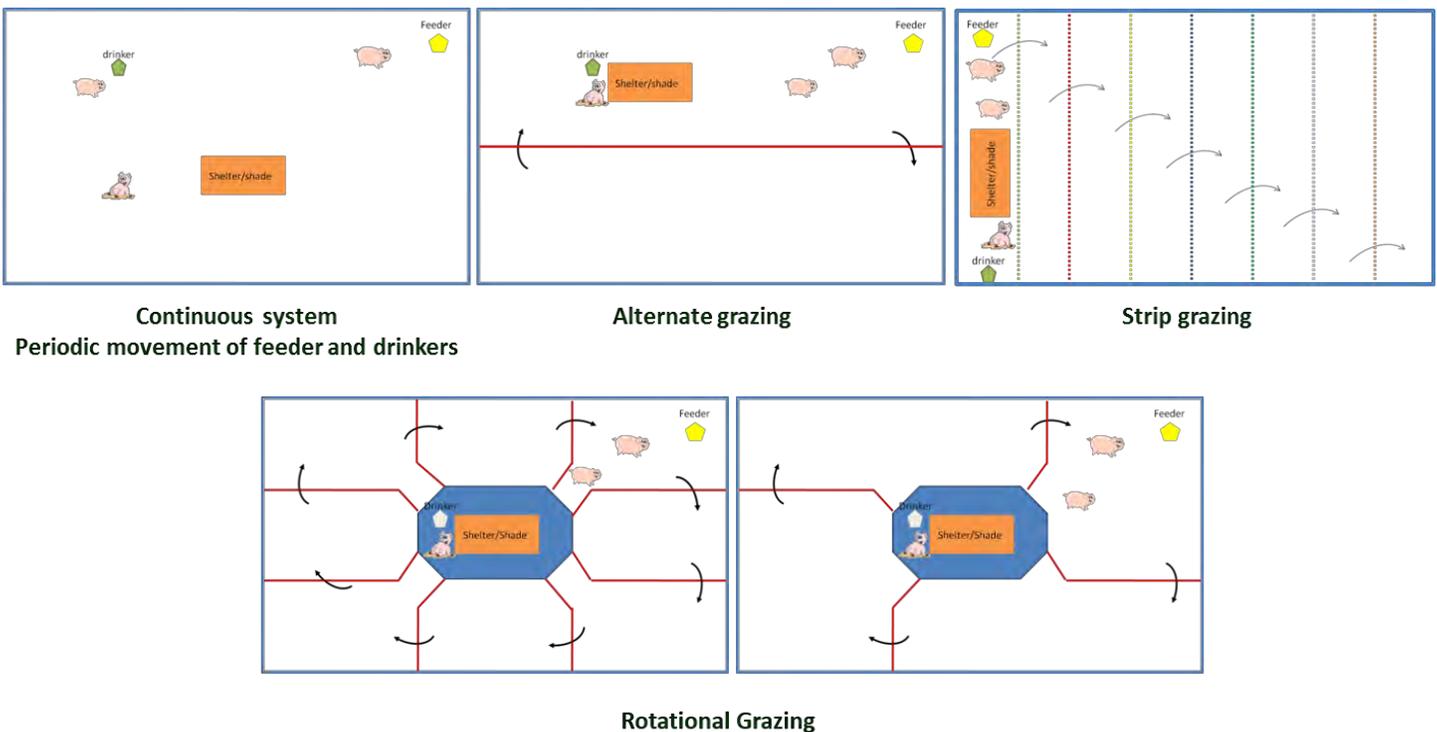


Figure 1: Grazing systems for outdoor hog production (blue line depicts permanent fence). The rotational grazing design encompasses two phases for a 12 week forage growing and grazing period: Phase 1 includes 8 paddocks for weeks 1-8 and Phase 2 combines paddocks to create 4 larger enclosures for weeks 9-12. Design will vary according to the length of the forage growing season. Images courtesy of Silvana Pietrosevoli, North Carolina State University Center for Environmental Farming Systems.

Managing High Impact Areas

Any type of livestock system will have congregation points where impacts will be very high relative to more extensively grazed areas. These heavy use areas are sometimes determined by humans when choosing where to locate water or feed troughs, as well as corrals, barns or other structures that cause animals to persist at high densities. Animals often favor locations with naturally occurring shade (trees), water (creeks or ponds) or feed (acorns or fruit). Congregation points are a necessary part of animal husbandry, but care should be taken to locate and manage them to minimize their corollary environmental impacts such as bare soil, compaction, and above-normal nutrient loads from manure and urine. One practice used by some producers to reduce impacts around feeding and watering sites is to locate the trough on a movable platform that is slotted or perforated. This allows water to drain to the ground, but prevents hogs from disturbing the soil.



Slatted mat for drinkers. Photo courtesy of Silvana Pietrosevoli.

a seed mix over areas with disturbed soil in the late-summer or early-fall months. Establishing desirable plants in high impact areas will reduce the occurrence of undesirable plants and mitigate negative environmental impacts.

Contaminated groundwater is another potential risk from high impact areas as nutrients, especially nitrogen, leach through the soil carried by water from precipitation and irrigation. Vegetation buffers this nutrient leaching by utilizing the nutrients for plant growth before they are transported below the root zone. Vegetation also slows overland water flow which increases the time nutrients are available for plant uptake as well as improving animal welfare by altering the temperature and humidity near the soil surface and reducing joint problems by acting as a cushion. Most importantly, improved animal welfare derived from a healthy rangeland or pasture environment can result in better sow reproductive performance (see factsheet on [Farrowing and Weaning](#)) and higher financial returns.

Weed Management

Common Bay Area Weeds

Weeds are a common problem in almost any agricultural system and can vary from being a mild nuisance to extremely noxious or poisonous. Compared to rangelands, irrigated pastures and drylots are more intensively managed or disturbed, have higher levels of nutrients, and may have more bare soil due to excessive water or animal use. Once established, weeds are difficult to control, let alone eradicate, because seeds can often persist in the soil for several years.



Portable shelters help minimize impact to pasture or range. Photo courtesy of Magruder Ranch.

Minimizing Impacts of Bare Soil

Adequate vegetative ground cover is critical during the winter months to protect soil from intense rainfall events. Grasses increase water infiltration, which reduces overland water flow and erosion. Deep-rooted forbs, such as chicory, will also increase infiltration and add more variety to the suite of forages and nutrients for hogs. A useful guide by [Lennox et al. \(2007\)](#) provides advantages of seeding high impact areas on coastal dairies which can be applied to Bay Area hog operations. Even moderately impacted sites can be treated by simply broadcasting

Common Bay Area weeds in rangelands include grass species such as: medusahead, goatgrass, Mediterranean barley; and red brome and broad-leaf species such as: thistles, perennial pepperweed, fiddleneck (toxic) and black mustard. Rangelands can often become heavily infested with noxious weeds due to a competitive advantage under specific conditions that result from management and the environment. Common weeds in irrigated pasture and drylot areas (bare dirt) include common cocklebur, turkey mullein, smutgrass, foxtail barley and English plantain, of which the latter three are indicative of too much or pooling water in pastures.

Managing Weeds

Options for controlling and managing weeds include: herbicides, hand pulling, mowing, disking, prescribed fire and prescribed grazing. The size of the weed population, dispersal and type of weeds, as well as constraints (i.e. terrain, organic certification) will help determine the correct method or combination of methods used to control weeds. Very small infestations can often be controlled by hand pulling or spot spraying individual plants before the population is too large. Mowing may work on annual weeds if the plants are cut below the growing points. Yellow starthistle and Mediterranean barley are notoriously difficult to control with mowing since the growing points are often at ground level. Perennial weeds cannot be controlled with mowing since the plant will continue growing from the root. Prescribed fire can be very effective on some grass and thistle species, but burning requires extensive planning, often with local fire districts, and is extremely limited by air quality regulatory controls. Herbicides can be very effective if properly selected and applied and are helpful in gaining initial control of very large weed populations. There are many types of herbicides available for use on rangelands and pastures and consultation should be sought from a pest control advisor (PCA) or from [UC Cooperative Extension](#) before choosing and applying an herbicide. It is important to follow all labeled directions and uses of each herbicide, including any grazing restrictions that

are required after application.

No single method will effectively control all weed infestations, which is a good reason to use an integrated approach that employs multiple methods. A good weed control program begins with preventing weed infestations by maintaining healthy growth of desired plants that will competitively exclude weeds. Persistent monitoring for unusual plants that could be weeds will help with early detection of small weed populations which are much easier to control. Once weeds become established, a combination of weed control methods applied over several years is the most effective approach.

Nutrient Management Planning

Hog operations typically depend on a significant importation of feeds from off the farm. Any importation of feed also imports nutrients, some of which are retained in growing animals while the remainder is lost as un-utilized feed or excreted as manure and urine. Growing hogs will utilize about one-third of consumed feed for tissue development and energy while two-thirds will be excreted. [Stender \(2012\)](#) provides a good summary of feed efficiency for growing hogs.



Soil sampling can assist with nutrient management. Photo courtesy of Chris Bordeaux.

Imported nutrients, in the form of feed and hog wastes, can be managed by distributing them across a rangeland or cropping system, either on- or off-farm that will utilize the nutrients for forage or crop production. A nutrient budget should be developed to ensure nutrient applications are balanced with nutrient off-take by harvested forage or crops.

A grazing system that favorably influences and utilizes nutrient distribution will ensure that grassland and cover crops have sufficient nutrient bases to promote crop health. Uniform distribution of nutrients will also help prevent accumulated “point” source pollution sources in either the soil or in surface runoff which could negatively impact ground and surface water quality.

Because of the significant potential for off-site transport of nutrients from outdoor hog operations, a modified nutrient management plan should be prepared. Contact your local [Natural Resources Conservation Services \(NRCS\)](#), [Resource Conservation District \(RCD\)](#) or private consultants to assist in preparing a nutrient management plan for your outdoor hog operation (see [Conservation Practices for Outdoor Hog Systems](#) factsheet).

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Banner photo credit: Pigs in pasture. Photo courtesy of Magruder Ranch.