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First Quarter 2016

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# WINDMILL RANCH

Most of the land that comprises the Windmill Ranch has remained in the family for four generations. Acreage has been sold and bought over the years, but much is made up of numerous old farms that had dwellings on several hilltops where hand-dug wells and natural springs can still be seen. The ranch's owner's names actually go down the maiden side of the four generations. These names include Schoenberg, Schmidt, Waak, and Williams. The females have been fortunate to marry men who were interested in operating and preserving the cattle ranch.

The Windmill Ranch is a new name for the legendary land. It was chosen because the front pasture of the ranch, where the main entrance is located, has been called the Windmill Pasture for the past 100 years. This is where the original, old windmill was and still is located. Previously the ranch was called Carmine Charolais Ranch. The ranch still has these Carmine Charolais Cattle.

There are a few historical stories based on this land. One includes a wagon quarantined under a grove of very old live oaks because of yellow fever. At least 50 years ago an elderly gentlemen in Carmine remembers delivering medicine as a young boy from the Carmine doctor to the wife of the family. On his pony, this boy met her about two miles away from the quarantined grove of trees. Unfortunately only the wife survived the yellow fever attack. She buried her family and left in the wagon never to be heard from again. This certainly proves the strong pioneer spirit that many of our ancestors had.

Several Native American camps were also located on the property and there was a time that eagles regularly returned to nest in certain trees.

In 1961 hurricane Carla, which ranks as the most intense U.S. tropical cyclone landfall on the Hurricane Severity index, blew a prickly pear cactus in a tree where it rooted on a limb and continued to grow. This category 5 hurricane reached winds of up to 175 mph. The drought of 2011 caused much of the cactus to fall to the ground, but it survived. The cactus still grows on the limb of the old live oak today.

This cattle ranch owned by Conway and Marlene Waak runs Charolais herds and Bradford herds with Charolais bulls. There are also a few Brahma cows and a Hereford bull used mostly for replacements for the Bradford herds. Various breeds of heifers are also offered for seedstock at different times. The owners pride themselves in producing quality stock that has the commercial rancher's needs in mind.

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## About Us

Conway is a petroleum engineer consultant and Marlene is a retired school teacher. Both have graduated from Texas A&M. Conway and Marlene do their very best to be available for their customers and welcome visitors. They strive to have quality cattle for their practical customers who want to profit from their calf crops whether it is selling at the local auctions or providing seedstock to sell. Therefore these owners search for genetics with stamina, fast growth, and calving ease.

Ranching is a way of life that they enjoy and strive to preserve it for future generations. Purebred Charolais bulls are for sale from weaning age up to 2 years old, and they are priced according to age. They are sold fertility tested. Charolais heifers are also available from weaning age up to 2 years old.

## Currently for sale are:

- 35 Braford heifers that are 6 months bred to proven Angus Plus bulls
- 10 Charolais bulls that will very soon be one year old

The WINDMILL RANCH is comprised of several locations with the largest acreage at: 2226 W. Hwy. 290, Carmine, Texas

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# Texas A&M Beef Cattle Short Course

The Texas A&M Beef Cattle Short Course has a rich tradition and historical place in the programs emanating from the Department of Animal Science at Texas A&M University. Dating as far back as 1942, Professor John K Riggs started the first in a series of Beef cattle research from the Texas Agricultural Experiment Station with Texas beef producers. This historical beginning and purpose is still the standard today for the Beef Cattle Short Course held at Texas A&M University.

Today the highly respected T&M Beef Cattle Short Course is nationally and internationally recognized as the largest attended beef cattle educational program of its type in the world. It has gained the respect from organizations, associations, Land Grant universities and agencies alike as the focal point for beef educational information. The Cattleman's Collage features more than 200 concurrent sessions. Topics include animal health, nutrition, reproduction, breeding, genetics, selection, research, marketing and handling.

Management sessions will cover business, forage, range, and purebred cattle. Topics such as landmower issues and fence building will be featured at this BCSC. Sessions are designed for everyone, from the newest member of the industry to the most seasoned producer.

A number of pesticide CEUs, veterinarian CECs and BQA credits are available to attendees. Additionally, over 125 agriculture related businesses and trade show exhibitors annually attend the course and attest to the fact that it is the most highly attended activity of its kind anywhere in the United States. Annually over 1400 participants attend the Beef Cattle Short Course to gain valuable knowledge about beef cattle production.

Registration Fee: \$180 (Late fee of \$40 will be applied after July 25th) Printable registration can be found on our website [beefcattleshortcourse.com](http://beefcattleshortcourse.com)



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# Make the Most Out Of Your Forage

Want to ensure top-quality results in your forage crops? Take the initiative to properly manage your crops to make the most out of your forage. This includes choosing the right kind of forage, analyzing your land and keeping your soil nutrient levels where they need to be, keep weeds under control, being informative about your hay's moisture content and how to deal with it, performing forage tests, and choosing the right kind of protection for your finished bales. When done right, your hay should be the best it can get and be used during winter months or anytime to supplement low pasture availability.

## THE RIGHT TIME AND THE RIGHT TYPES

One of the most important things you can do to ensure the quality of your forage is to harvest them at the right time. Typically, the more mature the plant, the less nutritional quality. This is because a plant starts to "shut down" after it creates seeds. The prime time to harvest is right before this happens or right as the plant develops its seed heads. During these stages, its protein and quality are at its peak.

Today, the modern farmer has an abundance of seed options available to them. Growers need to choose the right type of forage to best suit their situation. Different livestock operations require different seasonal pasture strategies. It is crucial to match the nutritive value of hay to the nutrient requirements of a specific animal. This is because the forage nutritive value has dramatic effects on livestock productivity, weight gain and reproduction. Many will utilize both cool-season grasses and warm-season annuals in their fields. For an example, when cool-season forages start to struggle in the heat, plant a summer annual. This way you can make the most out of your field all year round.

## Common Forage Species

### WARM SEASON PERENNIALS

#### Bermudagrass

Bermudagrass spreads mainly by underground stems known as rhizomes and horizontal above ground stems known as stolons. This grass is very adapt to the southern U.S since it tolerates a wide range of pH values and soil types and provides great nutrition to cows. It is abundantly used for winter feeding. There are multiple varieties of Bermudagrass, both seeded (such as common, Cheyenne, and Wrangler) and hybrid (such as Tifton 85, Coastal, and Jiggs).



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## Bahiagrass

This grass is highly tolerant to low-fertility and acid soils, but does not respond to potassium and nitrogen. Because of this, Bahiagrass is better suited for grazing grass rather than hay production. The grass also needs to be harvested approximately every 30 days to maintain its nutritive value. Once Bahiagrass grows 10-12 inches tall, it loses its nutritive value from lack of new growth from its size.

## Dallisgrass

Dallisgrass can preserve its nutritive value later in the summer and has a high level of nutrition than Bahiagrass and some Bermudagrass varieties. However, this grass can be difficult to establish because of its slow germinating seeds and produces a lower dry matter yield than some Bermudagrasses. Another note to be careful of is that Dallisgrass is subject to ergot infection that can be toxic to cattle if consumed. Dallisgrass can be used as a hay crop as long as it is harvested before the seed heads develop.

## Johnsongrass

Johnsongrass can accumulate prussic acid in its leaves and in turn, poison livestock. Because of this, the grass is best suited for hay rather than for grazing. This grass should be harvested at heading, and once the hay has dried enough to be baled safely, the prussic acid will have volatilized to nontoxic levels. Johnsongrass also has a strong potential for nitrate and/or high nitrogen fertilization. Nitrate levels do not decline after cutting and bailing. Proper sampling and testing are required prior to feeding to ensure that it is safe for ingestion.

## Old World Bluestems

Old World Bluestems encompass several species that are well adapt to North, Northcentral, and Central Texas due to their high cold and draught tolerance. These grasses establish very quickly and respond to good fertility and are even persistent with little or no fertilization.

## WARM SEASON ANNUALS

### Crabgrass

Even though Crabgrass is considered a weed species, it is well adapt to sandy soils and can be used for hay production. It usually yields a higher nutritive value than Bermudagrass or Bahiagrass, as well as some more commonly used summer annual grasses such as Pearl Millet or Sorghum-Sudan hybrids. However, dry matter yield is usually less than well-managed Bermudagrass. Crabgrass should be harvested at about 18-24 inches high, in the boot to heading stages. Because of this, Crabgrass allows at least two harvests per year.

## Pearl Millet

Pearl Millet can be used for hay, pasture, or silage, though its large stems can make hay production more difficult. Because of this, Pearl Millet may require a hay conditioner and a greater drying time than species such as Bermudagrass. Proper sampling and testing are required to ensure the safety of the hay due to the grass being prone to nitrate accumulation when subjected to stress and/or high nitrogen fertilization, which can produce prussic acid. Stressful conditions include frost or drought.

## Sorghum-sudan Hybrid

This grass grows rapidly and produces highly nutrition values in high yields. Just like Pearl Millet however, Sorghum-sudan Hybrids also have large stems and may require a hay conditioner and more drying time. This grass is also susceptible to nitrate accumulation when subjected to stress and/or high nitrogen fertilization and require sampling and testing for safety.

## COOL SEASON ANNUALS

### Oat

Oat can be used for grain, pasture, and as a hay crop. However, oat can suffer winterkill due to it being generally more cold sensitive than other small grain species. Harvesting oat until the soft dough stage will produce a greater yield, though harvesting it in the boot stage produces the highest overall forage nutritive value.

### Rye

Rye is the most productive cool season annual grass on well-drained, low fertility sandy soils and is commonly the most winter hardy. Rye produces more forage in the fall than wheat, and it matures earlier in the spring than most wheat varieties.

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## Ryegrass

This grass is primarily used for pasture, although it can be used for hay or silage. Ryegrass grows better in wet soils than any other cool season annuals and it can also tolerate a variety of soils. It's a popular choice for later winter/early spring grazing and hay production, though it is sensitive to acid soil pH values below 5.5.

## Triticale

Triticale is a cross between rye and wheat. The grain is used in the livestock industry as a feed as tolerates pests and drought better than wheat. It can be planted earlier, which often produces more forage, and has a longer grazing period in comparison to rye or wheat.

## Wheat

Wheat is used for grain, hay, and pasture and should be harvested at the boot to early heading stage.

## COOL SEASON PERENNIALS

### Tall Fescue

Tall Fescue can be used for hay, pasture and/or erosion control. This grass grows in a variety of soils, but performs best in soils that have some water-holding capacity, such as clay or loam. Due to this, Tall Fescue grows well in soils that are consistently too wet for other species and can tolerate flooded conditions. The first harvest should be cut in the late boot stage for the highest nutritive value. Consecutive harvests can be done as growth permits. Because of Tall Fescue's water and temperature requirements, its production is limited to northeast Texas.

## COOL SEASON LEGUMES

### Alfalfa

Alfalfa is a perennial with high nutritive value and yield potential. It is very digestible and can be high in vitamins, minerals, energy, and crude protein. Typically, Alfalfa harvested pre-bloom has a higher nutritive value and is more palatable than more mature hay. Watch for Alfalfa contaminated with blister beetle as this may cause blister beetle poisoning and cause colic, urinary infections, shock, dehydration, and even death. Horses are especially prone.

### Red Clover

This short-lived perennial can last 2 to 3 years and is best suited for hay production than other clovers due to its upright and late season growth. Red Clover does poorly in wet soils and should be reserved for well drained soils.

## Arrowleaf Clover

Arrowleaf Clover's regrowth is traditionally poor and therefore one should only expect a single harvest from it. Arrowleaf Clover can be used for grazing until mid-April and then harvested at the early bloom stage in mid-May. Arrowleaf Clover can be used in hay since a mixture of it and annual Ryegrass can make a hay crop of excellent quality. It is suggested that a mower/conditioner will help the hay dry more quickly.

## WARM SEASON LEGUMES

### Soybean

Soybeans can be used for grazing or for hay production. Although you can harvest soybeans at any stage of growth, dry matter yield and its nutritive value are balanced when there is a full pod at one of the upper nodes. Soybean foliage and pods provide digestible protein.

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# Evaluating & Sampling Your Soil

It comes to no surprise that soil fertility is crucial to forage production and nutritive value. Without proper analysis, it is nearly impossible to determine what your soil needs in order to be productive. Every farmer should have some sort of program to make sure their soil is providing adequate nutrients for the growth of their forage. A program requires collecting soil samples and having them analyzed, properly adding and keeping proper levels of nitrogen, phosphorus, and potassium as well as monitoring soil compaction, pH levels, nutrient removal and application rates, and in some cases, the status of the subsoil's nutrient.

## EVALUATE YOUR LAND

Soil's productivity can greatly vary with changes in its depth, slope, moisture retention, as well as its surface and subsoil texture. Soils that have poor texture, low moisture retention, or on a slope is usually difficult to improve. A grower will need to acknowledge each field shape and size in relation to their harvest equipment as well as its proximity to other crops that might prevent or impede the use of additive nutrients, pesticides, or limestone.

A soil survey accompanied with proper observations can provide valuable information about the field's soil differences throughout the landscape. County Soil Survey documents contain soil properties based on aerial topography maps, soil profile samples, on-site assessments, and other various data. These can be obtained from the USDA's Natural Resources Conservation Service (NRCS) at [websoilsurvey.nrcs.usda.gov](http://websoilsurvey.nrcs.usda.gov).

## SAMPLING YOUR SOIL

Where to sample may depend on the soil type, the type of crops grown, land history, or possibly all the above. The most important time to have soil analyzed for perennial crops and permanent pastures is before planting. This way the necessary nutrients can be mixed into the soil first. For pastures and legumes, you should test the soil every 3 years after planting. Annual crops require soil testing periodically, when you first cultivate a field, or change crop rotations. Soil samples are recommended every 2 to 3 years in the fall or winter, or just before planting. Plan to take your samples at the same time of the year, at the same depth, and same approximated location in the field.

## What Tools Should I Use?

There are several tools you can utilize to collect your samples, but the choice should depend on soil conditions and the depth at which you are sampling. The objective is to collect a cross section of the plowlayer or layer being subsampled. Tools that can be

used include a trowel, spade, auger, or a tube. Remember that the samples should not be stored for a long period of time before sent to a lab. Plan to use the same lab for your tests to keep the analysis consistent and to keep tabs on any changes in nutrients.

## Procedure Steps & Tips

- Make a map of the field where samples and composite samples will be taken. This map should be used each time samples are taken so you can compare results over time.
- Collect 10-15 subsamples of soil per sample area. Different samples are required for areas with different soil types, different terrain, and different land uses or fertilizer uses.
- Soil samples are typically collected to a depth of 6 inches. Make sure to clear plant litter from the surface, but not decomposed black material.
- Analysis requires 1 pint of thoroughly mixed composite soil in a soil sample bag. Mix the soil with a clean hand tool. You can acquire soil sample bags, forms, and instructions from your local county extension agent.
- Avoid sampling in atypical areas, slight field depressions, small gullies, former manure piles, fertilizer band, fence lines, or terrace waterways.
- Number each sample, record the sample depth, and keep a record of the areas you sampled.
- Air drying samples before sending them is highly recommended. This is because the nitrate-nitrogen levels in the soil may change if the samples are stored wet. Either allow samples to dry in the shade or on clean brown paper. Do not use heat to dry samples as it can alter test results.

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- Wait 90 days after applying litter or manure to a field before taking soil samples to make sure that they are fully incorporated.

### Other Sampling Circumstances

There are some circumstances where you may be required to take deeper soil samples to more accurately comprehend the status of your deeper soil profile's nutrients. The accumulation of lime and phosphorus from previous surface applications can greatly alter the soil test data. It's a notable concern in nonirrigated and reduced tillage fields that gets limited rainfall. In these cases, sampling depths can vary 2" to 8" or 3" to 9". Different sampling depths may also be required if fertilizer has been placed deeper in the soil more than average. When sampling perennial sod crops, you will need to sample 4" deep and then discard the 1/2" of surface soil before mixing.

### THE ANALYSIS RESULTS

Standard soil analysis in a laboratory unusually measures the soil's pH (acidity), sodium (NA), nitrogen (N), potassium (K), phosphorus (P), calcium (C), and magnesium (Mg).

Your soil pH levels should beat least at 5.8 for most forage species. In the case of most Texan landscapes, calcium carbonate makes the soil pH moderately high. Therefore the availability of phosphorus and most micronutrients is limited. There is no effective mechanism for lowering soil pH, unless it is caused by high sodium levels. If this is the circumstance, then forages that can tolerate a high pH level is a must.

High levels of sodium can also limit water uptake. The cause of high sodium levels is often the result of soils becoming saline because of poor irrigation, infringement of tidal water, or lack of leaching. Leaching salts down through the soil profile with proper irrigation or an abundant of rainfall is the only effective solution.

Nitrogen recommendations are based on yield goals and species. Though most Texan perennial forages find nitrogen very well and will leave little carryover at the growing season's end.

Phosphorus plays a major role in transferring energy from one part of the plant to another, enabling cell division and plant growth. Inherently, many areas of Texas have low amounts of soil phosphorus. It is less available in deeper soil and can even be depleted when its replacement after hay harvests is neglected. To maintain phosphorous availability, rotational stocking systems are effective.

Without adequate potassium, plants will take up less water and nutrients, therefore your forage yield decreases. In Texas, low potassium was only a problem in sandier areas historically, but hay production in more clayey soils have also depleted potassium from the surface and subsurface of these soils as well. Again, rotational stocking will help ensure more even distribution of potassium.

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# Weed Management

Weeds hurt forage by removing moisture and nutrients in the soil that are required for crop growth and by blocking sunlight. Nutrient availability will be highest at the beginning of the season and will decrease as your growing season continues. Your first indication of an infestation problem is weed flowers in the hay meadow. As stated earlier, once they flower, it's often too late. Your best strategy is to investigate pastures early to see if intervention is needed. Overall prevention is the best way to manage weeds before they become a problem. Proper forage selection with the right seeding rates and good fertility added produces forage that are better at competing with weeds. Not to mention this approach is usually more cost-effective than applying herbicide later. Most hay operations, however, will still require some form of weed control even with the best planning and management.

## Methods of Weed Species Control

Chemical weed management is safe and cost-effective when used appropriately. This involves selecting the right herbicide for the right weed species. Their labels will list all the directions and safety measurements for their use. For aid in helping you select which herbicide to use, the Texas Agrilife Extension Service publishes weed control guides.

Prescribed fire is often used after herbicide treatments to extend the life of them and is used to abolish wood species. Prescribed fire isn't common in east Texas, but should not be overlooked as a valuable management tool. Warm-seasoned fires especially can convert wooded areas to savannas that provide a better habitat for livestock.

Mesquite, huisache, blackbrush, are common problem species in Texas where mechanical removal is effective. Mechanical treatments include mowing, shredding, pulling, and pulling beneath its root ball.

## Organic Farming Weed Management

Organic farmers must control weeds without the use of synthetic chemicals and continually adapt their weed management practices as weed populations shift. Knowing the ecology of weeds is key to organic weed management as it promotes weed suppression rather than elimination by enhancing crop competition and phytotoxic effects on weeds.

Some effective methods include: crop rotation, and different production practices. Cultivar or choose a variety section that compete well with weeds and quick canopy-forming will give forages the advantage over weeds with and between rows. Plant at the maximum adapted population and choose a high germinating rate seed grade. Having closer rows will generally lead to great competition in row middles. For an example, some farmers have drilled soybeans with rye to achieve great weed control, but lower yields. Lastly to provide a competitive edge, warm seasoned forages planted when the soil is adequately warm will facilitate rapid germination as warmer soils allow a quicker emergence and a more competitive forage without a big loss in yield. Physical tactics are a key factor and includes mechanical cultivation, mulching, and propane flame burning.

# Harvesting & Storing Hay

## HAY HARVESTING STEPS

Harvesting hay starts with cutting and the means to do so mainly falls into two classes: sickle-bar cutters and disk mowers. Today's cutters are more adjustable than in the past and can perform a higher cut. Higher cut leaves some leaf material to support photosynthesis and encourages a more rapid recovery from the harvest.

After cutting, hay needs to be left on the field to dry or "field cure." Next the dried hay is raked into windrows for the baler. Windrows should be the width of the take-up head of your baler. If heavy dew, high humidity, or rain causes the windrows to become dry on top, but wet underneath, you can implement a tedder to turn the windrows over to help them dry. Once the appropriate moisture level has been achieved, the windrows can be baled into bales; square or round.

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Analyzing your forage can determine the nutritive value and/or any potential toxicity. With the information from the analysis, you will be able to calculate whether or not you will need supplemental protein, energy or minerals. Each lot of hay needs to be correctly sampled independently. A lot of hay refers to "all forage harvested and baled from one field at one harvest date and stored under similar conditions." You should obtain one composite sample for each lot by taking sub-samples from at least 10% of each lot's bales.

#### **FORAGE MOISTURE CONTENT**

When forage is cut, they contain about 70-80% moisture. Field curing as quickly as possible will help preserve its nutritive value, especially the energy portion. It is best to wait for good forage curing conditions than take the chance of the mowed hay to be rained on. This is because hay will continue to respire and leave less energy for livestock as long as the moisture content is above 40%. Rain can also destroy leaves off of harvested forage and consequently reduce crude protein and energy levels. For large round bales, the moisture content should not exceed 18% at bailing. For small square bales, 20%. A moisture meter will provide an accurate reading to find your bale's moisture content.

Normally, hay will reach its peak temperature between 7-14 days after bailing, but temperature may rise for as long as 30 days. Bailing hay at the appropriate moisture content is critical for safety and nutrition. Hay bales will "sweat" during the first few weeks after bailing due to its temperature increasing mainly caused by microbial activity, but also sometimes some final plant respiration. Hay loses about 1% of dry matter for each percent of moisture as it dries. Hay's moisture content and temperature do not stay constant and should be monitored periodically.

Moisture content above 20% up to 35% causes mold production to become a big concern. Mold will consume nutrients in the hay and therefore reducing its nutritive value. When mold respires, it creates heat that produces toxins that will make the hay less palatable. Mold-related heat up to about 120°F does not damage the hay's nutritive value, but temperatures above that

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causes the start of protein breakdown. Browning (caramelization) begins around 140°F and can further increase temperature nearly to the point of combustion. These high temperatures also bind up much of the hay's protein, leaving it unavailable for the animals. Temperatures less than 120°F are considered safe. Temperatures between 120°F-140°F are to be closely monitored. Hay between 140°F-180°F is likely to spontaneously combust.

#### BAILING HIGH-MOISTURE HAY

There are some circumstances where you may need to harvest hay at higher than recommended moisture content. Three common ways to handle high-moisture hay is with Inhibitors, Drying Agents, and Haylage.

#### Haylage

Haylage is where you bail hay with 45-55% moisture content, then putting them into airtight storage. Typically, hay is wrapped in plastic to exclude air. Oxygen remaining inside the hay will be consumed within a few hours by Aerobic (free oxygen requiring) bacteria. Anaerobic (non-free oxygen requiring) bacteria will then reduce the pH and preserve it in a sort of "pickled" state under these circumstances. The low pH inhibits mold and respiration losses that would normally occur in high-moisture bales. Haylage cannot be stored as long as silage due to it not being able to attain as low a pH as silage.

#### Drying Agents

Typically, drying agents are water-based solutions of potassium carbonate ( $K_2CO_3$ ) and/or sodium carbonate ( $Na_2CO_3$ ) with an appropriate surfactant to help them spread over the harvested forage. They are applied immediately after mowing and speeds up the drying process by disrupting the waxy cuticle of the stem, allowing moisture to escape from the forage. The solutions are generally safe to use and do not affect the nutritive value. However, high relative humidity can reduce their effectiveness and rainfall can wash them off. Note that drying agents do NOT allow for bailing hay at a higher moisture level.

#### Inhibitors

Inhibitors can help reduce leaf loss during bailing, can reduce potential rain damage, and make it possible to safely store hay that is bailed up to 30% moisture content. Propionic acid (propionates) and ammonia (applied at about 1% of wet forage weight) are the most commonly used inhibitors. Propionates disrupt the metabolic processes of plant and microbial respiration. Ammonia can prevent mold growth and keep the hay at

safe temperature levels, resulting in improved crude protein and digestibility levels. Both products can pose significant health risks to those applying the materials. It is important to research all the risks prior to use.

#### STORING HAY

Nothing deteriorates a good quality bale more than being exposed to the weather. Growers absolutely need to protect their finished bales. If indoor storage is not an option, bales should be wrapped in plastic. Hay that is stored outside with no protection can lose significant nutritive value and dry matter in a relatively short amount of time. Indoor storage is preferred since typically, hay bales stored outside for several months develop at least 5-6 inches of outer surface, which has no feed value and that animals will reject. Losses under a roof will be significantly less. Hay can be stored under tarps that are specifically designed for this task. Hay bales stored in the field should be stored in rows with the flat ends of the bales together to minimize exposure. Rows should be stored running north and south to maximize east - west sun exposure and on well-drained slope. This will help them dry after rainfall.

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Bale Diameter	Depth of Weathered Band	Amount Of Forage Loss
5 ft.	4 in.	25%
5 ft.	6 in.	36%
5 ft.	12 in.	64%
5 ft.	18 in.	84%
5 ft.	24 in.	96%
6 ft.	4 in.	21%
6 ft.	6 in.	31%
6 ft.	12 in.	56%
6 ft.	18 in.	75%
6 ft.	24 in.	89%

Source: Corriher, Provin and Redmon. 2010.

## Understanding Forage Toxicity

Nitrate levels in forages can increase to toxic levels when the nitrogen supply within the soil exceeds the nitrogen needs of the forage. When plants absorb nitrogen from the soil, it is in the form of nitrate and is then later converted to protein. When protein synthesis is slow, but nitrate is available, the nitrate will accumulate, particularly in the lower part of the forage. The lowest nitrate accumulation will be within the leaves. Anything that slows down the rate of forage growth can cause an increase in nitrate levels in well-fertilized forages. Some of these circumstances include drought and long periods of cool or cloudy weather.

### NITRATE POISONING

Nitrate itself is not toxic to an animal. In normal forages that are consumed by healthy cattle, the nitrate is converted into nitrite and then to ammonia, amino acids, and finally proteins. If an animal consumes forage containing too much nitrate, they cannot convert it all into protein quickly enough and the nitrate level builds up. When this happens, the nitrate reacts with hemoglobin to form methemoglobin. This can cause the animal to die from asphyxiation because methemoglobin does not carry oxygen in the blood; hemoglobin does. Early signs of nitrate toxicity will be seen within 6-8 hours after ingestion and include labored breathing, frothing at the mouth, diarrhea and frequent urination, staggering, and brown coloring of the mucous membranes. Collapse, convulsions and death follow within usually 30 minutes after the onset of symptoms.

Monogastrics, such as horses, swine, and mules, are less sensitive to nitrate toxicity than ruminants, but that doesn't mean that they are completely immune. Since an animal's condition affects its ability to tolerate nitrates, it is wise to consult with your veterinarian before feeding them forage that contains nitrate.

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## Nitrate Poisoning Treatment

The first step to treating an outbreak of nitrate poisoning is to immediately remove the toxic forage in order to prevent additional animal poisoning. Next, you should immediately contact your veterinarian for diagnosis and assistance in handling the toxicity.

Differential diagnoses include poisonings by cyanide, urea, pesticides, toxic gases (eg, carbon monoxide, hydrogen sulfide), chlorates, aniline dyes, aminophenols, or drugs (eg, sulfonamides, phenacetin, and acetaminophen), as well as infectious or noninfectious diseases (eg, grain overload, hypocalcemia, hypomagnesemia, pulmonary adenomatosis, or emphysema) and any other cause of sudden unexplained deaths.

## Nitrate Poisoning Prevention

The amount of nitrogen added to forage should not exceed its potential nitrogen intake and should be applied at agronomic rates. In grazing systems, much of the nitrate that is consumed is returned to the soil by urination and fecal deposits. To understand the potential for nitrate toxicity, producers should understand different forage and weed's potential for nitrate accumulation. Forages that are known to be accumulators include johnsongrass, sorghum-sudangrass hybrids and pearl millet. Some non-accumulators include bermudagrass, fescue, ryegrass, legumes, and small grains.

Research has shown that as much as 50% of the nitrogen applied as fertilizer and taken up by the forage is recycled through animal defecation into new forage growth within 4 weeks of grazing. When livestock is allowed to congregate in shaded areas or near ponds, this efficiency is lost however. To help ensure efficient nitrogen management and capture, rotational stocking with water in each paddock is effective.

## SAMPLING & ANALYZING NITRATES

Having a good testing program is the first step in managing high-nitrate forages. To sample your forage before harvesting, create a composite sample from at least 10-15 areas with the same moisture conditions and fertility. The samples should be obtained with a core sample instead of pulling hay from a bale. Pulling hay may cause misleading results due to uneven distribution of high nitrate forage

within or between bales. Be sure not to mix plants from the bad and good areas of the field as you will want to create different composite samples for those. To send the samples to the laboratory, you will need to send them in clean paper sacks. Always avoid plastic bags since the high moisture content in them will cause the samples to mold and interfere with the analysis.

## Testing Fields for Nitrates

Nitrogen recommendations are based on yield goals and species. Though most Texan perennial forages find nitrogen very well and will leave little carryover at the growing season's end. One ton of high-protein, warm-season perennial grass hay requires about 50 lbs. of Nitrogen. For grazing purposes, the level of nitrogen depends on the species, grazing intensity, and urine and fecal deposits. Quantitative methods that use colorimeters and nitrate electrodes, and/or qualitative spot color methods can be used to test for nitrates in a field. The diphenylamine spot test is a quick test that can be used. The Texas AgriLife Extension Service Laboratory provide these test kits, but they must be either picked up, or hand delivered due to the fact that they contain sulfuric acid.

To test your forage, split a plant stem and drop a single drop of the acid reagent on the freshly split stem. Note that this method only works on moist plants with thick enough stems to split and receive the reagent. If the forage contains nitrate, the reagent will turn dark blue within 5 seconds. If the color doesn't change immediately, then there is no nitrate. The reagent will eventually turn the stem black or a dark brown by caramelizing the plant's carbohydrates and

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sugars. Be sure to follow up any positive field test with laboratory analysis. Remember that dried plants, silage, hay, and similar material should be tested in a lab. Field testing should be used only as a qualitative tool as it is not precise enough to use a basis for mixing feed.

### Understanding Your Nitrate Report

It is crucial to understand your laboratory's method of reporting nitrate to ensure that you don't feed toxic levels of nitrate to livestock. Nitrate content may be expressed as actual nitrate (%NO<sub>3</sub>) or as nitrate-N (%NO<sub>3</sub>-N) values. Actual nitrate differs from plant nitrate analysis for other plants. Plant nitrates are expressed as ppm nitrate-N. To convert it to percent, divide by 10,000. To convert nitrate-N levels to actual nitrate, multiply by 4.42.

$$\text{Nitrate-N ppm} \div 10,000 = \% \text{ nitrate-N}$$

$$\% \text{ nitrate-N} \times 4.42 = \% \text{ nitrate}$$

### FEEDING GUIDELINES

If your hay has a range of nitrate levels, the table's guidelines should be followed.

Level in Forage	Feeding Precautions
0 - 568 ppm	Safe under all conditions
568 - 1136 ppm	Safe to all non-pregnant animals under all conditions. Should not make up more than 50% of total intake for pregnant animals.
1136 - 2272 ppm	Do not feed to pregnant animals and limit to less than 50% total intake for all other animals.
2272 - 3409 ppm	Do not feed to pregnant animals. Exercise caution when feeding to others. Limit to 33% or less of the ration.
3409 - 4544 ppm	Do not feed to any animals if given the choice. If using, limit a mixed ration to 25%
> 4533 ppm	Extreme risk. Do not feed at all

Source: Poore and Green. 2010.

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## PERMANENT MESQUITE & HUISACHE REMOVAL BY PULLING TAP ROOT

### PROBLEM:

Controlling and eradicating invasive trees and shrubs especially those with tap roots continues to be a big problem for ranchers and farmers in Central Texas. Those without tap roots such as cedar and juniper are problems but are much easier to control in that they can be cut off at the ground and will die. Mesquite and Huisache – those with tap roots are a much bigger problem in that cutting by mowing or shearing does not kill the plant but seems to just exacerbate the problem because they sprout out from the stump with many more stems than original. Almost like stirring up a hornets nest.

### METHODS OF CONTROL:

Many methods have been developed over the years to control and eradicate the most invasive species – those with tap roots. Depending on soil type a 20 year old mesquite tree can have a tap root of 10 feet or more.

In the good old days the prevalent treatment for mesquite was to cut the tree at the ground and pour kerosene or diesel on it.

If it was a small plant, one inch in diameter, diesel was poured around the base in the summer time when tree was in stress.

Today methods used to control invasive trees and shrubs can be categorized 1) mechanical such as plowing, pulling, grubbing or cutting/shearing and 2) chemical – applying herbicides at the proper time of the year. In some cases both mechanical and chemical methods are used for example shearing the tree and then applying a herbicide such as Remedy and diesel to the stump within 30 minutes of cutting.

### BEST METHOD:

The best method is the one that permanently eradicates the plant. Pulling a tree beneath its root ball will eliminate it. It will not grow back. When using other methods, mechanical and chemical, a substantial percentage of the trees that are cut grubbed or sprayed will come back – some with a vengeance.

The size of tree that can be effectively pulled by its tap root is determined by soil type, soil moisture and size of machine. Tap roots may be broken or cut if soil is clay and dry. Range Scientist have conducted field test and have concluded that



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if root ball with the nodes are still attached to the tree when pulled even if its tap root is broken, tree will die.

Grubbers and excavators with claws may not extract trees by their tap roots. They leave large holes and disturb the vegetation. Mowing and shearing trees does not kill the tree sprout and multiply by sprouting with multiple stems

Effectiveness of killing trees by spraying with herbicides is expensive and percentage of kill is determined by many variables including, soil temperature, size and condition of plant, chemical including amount used. In most cases a 60% kill with a herbicide is considered good even with small trees. Those that are not killed also multiply.

Extractor – A Tool Bar with Extractor tool pinned to has been developed – patent pending –to pull trees by their tap roots permanently removing them. This invention takes advantage of a bit designed to get good penetration to insert beneath the root ball in most soil conditions. A fulcrum which is part of the Tool Bar design increases the mechanical advantage when pulling trees by their roots. Trees are pulled – dirt shaken out of roots back into the small hole left with very little damage to surface of soil and vegetation. When trees are stacked and burned there is very little dirt left in burn pile.

The Extractor tool is attached to a Tool Bar in just a few minutes with high strength steel pins. Many other tools have been developed to also pin to the Tool Bar – for example an hydraulic activated bucket to dig ditches, a boom to lift loads, hay spear for large hay bales, universal ball hitch to move trailers are a few examples. See the Tool Bar in action in our ad on page 14.

The Tool Bar is compatible with all front end loaders on both tractors and skid steer loader that have the universal skid steer hitch. Tool Bars attached to the front end loader of a tractor come with a wifi camera that is attached to the tractor grill to allow operator to have good visibility when inserting the Extractor bit beneath the root ball of the tree. Camera sends image to a tablet/monitor in the tractor cab. Tractors can pull larger trees because of their increase leverage. A front wheel drive assist tractor is recommended in that it has a heavy front axle and tires.

All trees and shrubs – those without tap roots can be easily and quickly pulled with the Extractor. Juniper for example, those up to 10 inches or more in trunk diameter are easily pulled. Again the dirt is shaken from the root prior to throwing the tree down. Dirt is pulled back into the hole to leave surface smooth with little disturbance to vegetation and no tree stump.

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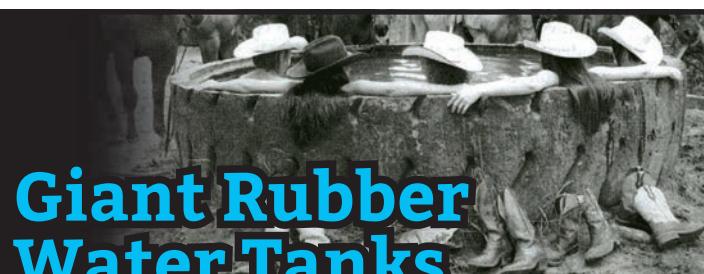
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