MANAGEMENT NOTES

RANGE AND WILDLIFE MANAGEMENT

College of Agricultural Sciences
Texas Tech University

SAND SHINNERY OAK: CONTROL AND MANAGEMENT

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Sand shinnery oak (*Quercus havardii* Rydb.) is a rhizomatous, deciduous shrub on sandy soils from southeastern New Mexico to western Oklahoma. The common name, shinnery, comes from the French word chenneire, which means an oak that is shin high. It is a white oak in contrast to red and live (evergreen) oaks common in other areas.

Shinnery oak is a management problem when it grows in dense stands. On many sites, it may be 80% of the annual plant yield and it is highly competitive with grasses and forbs for water and nutrients. Cattle cannot tolerate a diet high in oak particularly in the spring because of rumen ulceration and subsequent destruction of the liver and kidneys. Symptoms include cattle arching their backs, blood in the manure, and mucus around the nose. Goats can eat more oak than cattle with no toxic effect. However, a pure oak diet will kill goats. Shinnery must be considered an emergency forage during drought or inadequate when the range is depleted of grasses and forbs.

Shinnery grows on more than 50 soil series; the only common property is sand in the surface horizon. As surface sand depth decreases and clay content increases, height and cover of oak decreases. Regardless of soil type, herbicide effectiveness, stocking rates, and management practices are affected by soil and weather variables.

Oaks hybridize easily. Within one pasture you can see the "true" shinnery growing waist high and others in mottes (clumps) to 20 feet tall. The taller oaks seem to be hybrids of post oak and sand shinnery. Annual growth ring counts show the taller hybrid to live over 80 years; however, "true" shinnery stems usually live from 11 to 15 years.

In west Texas, mid-March is about the earliest that buds begin to swell. Ranchers use this as an indicator of potential oak poisoning for cattle. After buds develop, male and female flowers (catkins) begin to form. No acorns will form if a freeze occurs after flowering; consequently, acorns are not dependable. The average crop is about 3 out of 10 years.

Shinnery oak's new growth is from the tip of branches, thus its older leaves are at the base of a branch or stem. After leaves form, they are similar in color and hairiness on the upper and lower surface. Shinnery leaves gradually change from lime-green to a glossy-green upper surface and felty-lime green on the lower surface after about two months. The waxy upper surface is from deposition of waxes and fats, while the lower surface is covered with star-like hairs. The wax coating on the leaf top is thicker in southeastern New Mexico than in Oklahoma. Similarly, there are more hairs on the bottom of the oak leaf in dryer areas while stomata are more abundant in Oklahoma shinnery. These features are believed important when related to leaf uptake of foliar-applied herbicides.

When acorns germinate, the first root elongates quickly and may be over 12-inches long before leaves emerge. This provides shinnery a strategy to get a root into the subsoil and more dependable moisture before leaf development. Seldom will an acorn become a new plant "in the wild" unless it is wet from late July to early August when the acorn falls from the husk. Shinnery spreads slowly by tillers. An Oklahoma study reported a 30-foot spread in 50 years. Aerial photos of Bailey County, Texas, taken in 1941, when compared to recent

Before control shinnery oak may be over 80% of the aboveground growth with little palatable forage for animals.

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photos, show little increase in oak during the past 40 years.

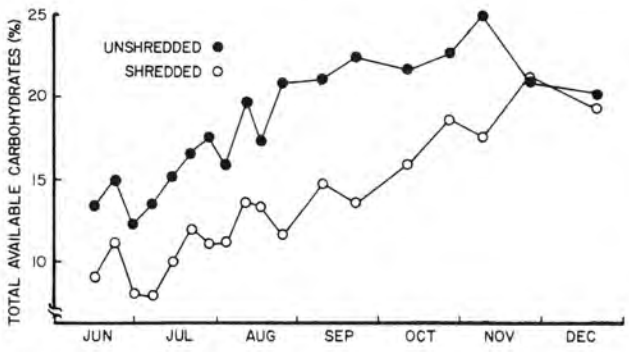
Oak rhizomes absorb much water during wet periods with up to 50% of their weight being water. This is particularly important during dry springs because grasses and forbs cannot "mine" or "store" water. Because of this, shinnery will grow at the expense of better forages. Texas Tech studies showed the underground oak weight to be 10 to 16 times greater than the stems; perhaps the highest for any shrub in the United States. There was also 10 to 20 times more mass in oak roots than in herbaceous roots.

Many aboveground oak stems are connected by a common rhizome system. Over 60 stems may be connected to the same rhizome. Thus, when a stem is killed, buds near the soil surface form new plants. Many fine oak roots are in the surface sand. These roots are believed to be the principal structures for absorbing water and nutrients.

Several insects feed on oak rhizomes, leaves, and stems but no oak mortality has ever been observed. Perhaps the best biological control for shinnery is to use 3 years of goat browsing!

Control of Shinnery with Herbicides-Shredding

Since the 1940s, phenoxy and other herbicides have been applied to shinnery with results varying from total top-kill to only a little browning of the leaves. Where shinnery is top-killed, grasses flourish for up to three years until the oak comes back. Early work was with 2,4,5-T, 2,4,5-TP, fenuron, monuron, and a few others. It has been difficult to root-kill the oak. The "grass dose" herbicide management of shinnery originated in Woodward, Oklahoma. This practice usually consisted of using low rates...1/16 lb/acre...of 2,4,5-T or silvex applied with a mist blower. Those using the "grass-dose" hoped to obtain top-kill and



Shredding effectively reduces the nonstructural carbohydrate content of shinnery rhizomes, but by winter there is no difference.

Hybrid oaks are common in the Panhandle with some of the trees being 20 feet tall. These trees are connected by a common root system and the oldest is about 80 years.

subsequent grass growth for a time at a relatively low cost.

Shredding and burning have been tried for shinnery control. Each increases sprouting from the plant base and increases oak-stem density the following year. Shredding weakens the plant by reducing carbohydrate reserves in the rhizome system. However, by the end of the first growing season, reserves are replenished to the original level. Repeated shredding or mowing may kill shinnery but the terrain is usually such that it is difficult to get equipment over most shinnery sites.

As many of you know, Graslan has been removed from the market for private rangelands. It will be back as Spike 20P in early 1986 and will be available directly to a rancher through distributing firms. It will be packaged in 25-lb. lots; yet if ranchers form a large order, costs will be reduced. The "new label" will state the use of 3/4 lb/acre on shinnery oak; and to get cost-share, the label must be followed.

Shinnery oak densities vary from occasional clumps on sandy loam soils to solid stands on deep sands. As the soil clay content increases the oak cover decreases. No two ranches or even the same ranch will get the same rainfall in the often intense convectional thunderstorms. Consequently, effectiveness of herbicides cannot be expected to give identical results. The soil texture-precipitation variables as related to herbicide effectiveness are not well understood.

The first changes in shinnery communities after herbicide application are in the oak and forbs. Sensitive annual and a few perennial forbs may brown and a few die after the chemical enters their system. After three years, there is a greater variety and yield of forbs in treated than untreated pastures. Some perennials such as greenthread are very cyclic as they may increase or decrease throughout the entire region regardless of treatment. The annual forbs fleabane, sunflower, buckwheat, marestail, and others are locally abundant during wet years. Timing of precipitation may be more important than amount in causing a particular "weed" problem.

Forage yields will increase 3- to 7-fold after oak is killed. The increase depends on: (1) severity of oak infestation; (2) type of soil; and (3) amount of rain following treatment. Much of this increase may be the "so-called weeds," which are good forages in some oak communities.

For shinnery oak control to be economically feasible, several variables must be considered. Among these are: (1) cost of treatment; (2) life of control; (3) forage increase; (4) price of livestock; and (5) interest rates.

Our analysis showed that shinnery control with Graslan at 0.5 lb/acre is profitable with $0.75 calves weighing 400 pounds and with interest rates not over 12%. This assumes *no cost-share* on the treatment. At lower calf prices or higher interest rates, treatment of oak is less attractive. This analysis was based on a 15-year treatment life, a *modest* forage increase, and *liberal* herbage per animal unit. Several area ranchers estimate a 3- to 6-year pay-off period.

Despite the shortcomings in most data collection techniques and economic predictions, each ranching unit is also a unique situation. If all grass is gone before killing the oak, other improvement practices, such as seeding, would be needed. No blanket statement can be made which will apply to all ranches. Good shinnery control is a buffer against drought as forages in treated pastures will grow while those in untreated oak remain dormant.

A 2-year grazing study using 110 commercial hereford cow-calf pairs has been completed on treated and untreated shinnery range. A 6-pasture short duration system, a Merrill 4-pasture, and continuous grazing techniques were compared. Ranch records suggested a baseline of 45 acres per animal unit on untreated oak range. We adjusted stocking rates based on forage produced in each pasture.

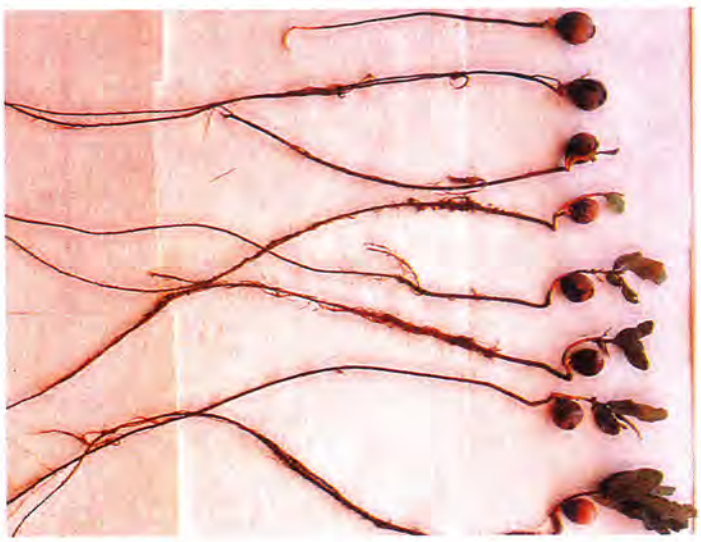
Several interesting observations were made. Some are: (1) cattle on treated range consume more salt and mineral than those on untreated range; (2) cattle on the short duration untreated pasture (30 acres per animal unit) were starving by August and had to be removed; (3) continuously grazed cattle on treated and untreated range did not spend as much time grazing at the back of the pasture as in the rotation systems; and (4) forage quality after frost went down rapidly in both treated and untreated range and livestock performance was penalized even with protein supplementation.

In manure samples for diet analyses, 7 of 46 forages eaten made up more than 3% of the diet. Cattle eat from 60 to 75% grass on oak treated range and 50 to 60% grass on native oak range. Favorite forages in this area include paspalum and primrose in the spring and purple sandgrass in the summer. Dropseeds become important in the fall. Forbs are of higher quality than grasses, but many are unpalatable or too sparse to meet the animals' needs.

Although only a 2-year study, some generalizations can be made. Average daily cow gain is higher in the summer and fall on treated range. Calves on oak treated range gained nearly 2 lb/day while gain was 1.6 lb/day on untreated range. When oak is replaced by better forages, over three times more young beef can be produced per acre than on untreated shinnery country.

Before treating shinnery oak range, short- and long-term goals for the ranch should be developed. There is little need to grow grass that is not

When acorns germinate most of the energy is used to produce a woody taproot which often grows more than a foot long before the first leaves emerge.



managed or harvested properly. After shinnery control, grasses need to be grazed to prevent dense and large, "wolf-like" plants which only receive grazing on the perimeter of the clump. Our animals did not prefer large stemmy grasses except giant dropseed. In many treated and lightly grazed pastures less than 25% of the herbage is desirable and of sufficient quality to get good livestock weight gains. There is no "cookbook" recipe that will solve problems such as proper stocking rate, shinnery kill, timing of animal movement, and others. Treated shinnery range needs to have a strategically planned grazing program to prevent the excessive wastage of forage before the grasses reach maturity.

General Guidelines to Consider

1. Do not use herbicides at the label rate on "marginal" shinnery country where mesquite and snakeweed are common; the oak kill and grass responses are low. Spend available dollars on pastures with the heaviest infestations of oak. Foliar applied herbicides have usually not given long-term shinnery control. Reason for this is that oak cannot get enough chemical into the root to kill it. Soil applied chemicals should move directly into the root area after a good 1 to 2 inch rain.
2. A study of rainfall and distribution suggests that if phenoxys are available or other foliar applied herbicides, a low-rate treatment may give short term top-kill and acceptable forage yield for 2 to 3 years.
3. Proper stocking rates will vary with each pasture because of differences in range condition and the uneven distribution of rainfall over the ranch. In the Yoakum-Cochran county areas, 45 acres of native oak is suggested per animal unit. If the oak is root killed, we can come down to 20 acres with continuous grazing. With this grazing technique, cattle seldom walked a mile away from water to graze. In a short duration system, I suggest 12 to 15 acres per animal unit. Each paddock can be grazed a week by the entire herd then rested 35 days before regrazing. I believe the secret to livestock performance in this area is to graze sufficiently heavy to keep purple threeawn and little bluestem from producing seedheads. Once this occurs their palatability and quality drop rapidly. In the Panhandle, if a good cover of grass results from shinnery control, I estimate that stocking rates could be 25% higher than listed above. In southeast New Mexico, stocking rates probably would be 25 to 30% less than West Texas after oak control.
4. If only part of a pasture is treated or if the shinnery is treated in strips, stocking rates should be adjusted to only the area treated. Cattle will "camp" on treated areas and walk through untreated oak without grazing. After treatment to kill oak, the pastures should be rested for a growing season to allow the grasses to regain vigor. If treatment is in the spring, and good rains were received, I would begin grazing in September. If a July or August treatment were used, grazing should not begin until the following May or June.
5. The grasses on oak treated pastures will average about 60% greater water content than the same species in untreated pastures. Cattle also consume more salt when grazing treated range. Because the forage phosphorus content is low, a 10% phosphorus and micronutrient mineral mix should be used. Minerals should be free choice year round. When grazing in the winter, protein supplementation must be used to minimize cow weight loss.
6. Because forage quality is low from November to April, a viable alternative to cow-calves in this country is to use stockers in late April and let them harvest the feed in a rotation system. If dry weather sets in, they can be sold in a hurry. If you have a good year, I would hold them on until October. I believe we could average 2 pounds of gain per day. This also would save the cost of buying cake or cottonseed.

This range catepillar has a hearty appetite for oak leaves and large acreages may be defoliated. Sand shinnery oak seems to be unaffected by this grazing pressure.

When sand shinnery oak is controlled, a midgrass prairie becomes dominant.

7. Shinnery ranchers usually prefer having some pastures with finer textured soils. These soils usually grow grasses such as blue grama, sideoats grama, sand dropseed, windmillgrass, and other "stronger" forages. This situation allows the manager more flexibility in his operation and also can help reduce production costs.
8. It is difficult in a note to precisely provide guidelines suitable for each ranching situation. For example, in the Panhandle weeping lovegrass pastures could be incorporated in a grazing rotation with native forages. In our area and southeast New Mexico this is less feasible because of a more arid climate.

Some shinnery ranches have several section pastures and it may not be feasible to add fencing to reduce size of grazing unit. Not all ranches are watered the same, consequently, new wells may have to be drilled.

Factors affecting the economics of shinnery control include cow-calf prices, interest rates, herbicide costs, and percent calf crop. A cost share program is helpful in many cases but perhaps the most important factor is the managerial ability of the rancher. Problem solving and decision making abilities are different with each manager.

COVER PHOTO: Sand shinnery oak on the Texas High Plains.