E-629
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Controlling Brush with Herbicides to Increase Ranch Profits

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Managing noxious brush and weed species using herbicides can improve forage availability and enhance ranch profitability by increasing the livestock carrying capacity of native pastures. However, deciding how and when to control noxious plants is crucial, and is generally more profitable on more productive soils with less brush.

Factors that contribute to brush encroachment on rangelands include:

- Fewer fires because of human development
- Livestock overgrazing
- Advancements in transportation that increase the spread of noxious plant species
- Increased atmospheric carbon dioxide which enhances woody species growth

Controlling brush can be expensive. The cost must be weighed against the potential increase in livestock forage and carrying capacity. The method chosen for brush management could be biological, chemical, mechanical, prescribed fire, or a combination of these. Typically, chemical control provides the most flexibility in terms of plant species, size, location, and ease of incorporation into a livestock operation.

This publication focuses on herbicides to control or suppress noxious brush alone or with weeds. Control is defined as a percentage of plants treated and killed, whereas suppression refers to killing a plant partially. Suppression could be a reduction in the plant size or canopy cover, although it will continue to live.

This study used the Financial and Risk Management (FARM) Assistance model to evaluate the economic impact of using herbicides in three typical pasture scenarios to reduce the encroachment of:

- heavy brush
- light brush and weeds
- light brush without weeds

When you manage a pasture having one of these three conditions, the forage response can vary depending on the soil's ability to

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produce forage, even under ideal conditions. This is known as forage productivity potential. To account for this variability, each pasture scenario was modeled using three soils with different productivity potentials:

1) High: 5,100 lbs/acre

2) Moderate: 3,600 lbs/acre

3) Low: 2,550 lbs/acre

These forage productivity potentials were taken from the Web Soil Survey tool produced by the Natural Resource Conservation Service (NRCS). This range production value is the amount of vegetation expected to grow per acre in a well-managed native plant community. It refers to forage quantity, not forage quality.

Though ranches typically have several different types of soil, each with different forage productivity potentials, this study assumes one soil type throughout the ranch to simply look at pasture recovery costs. The 500-acre ranch in this model consists of all native pasture. The ranch has income from a wildlife hunting lease, so only 400 of the 500 acres are treated in order to leave adequate brush for wildlife habitat.

The study assumes the 400 acres is grazable and that all the forage is palatable to livestock. The ranch operation assumptions used in this study are based on average rates during 2012 (Table 1). The initial cowherd includes 25 cows—1 animal unit to 20 acres—and 1 bull.

Herbicide applications are based on the *Chemical Weed and Brush Control Suggestions for Rangeland* (B-1466) and costs are determined using the PESTMAN online management support system for brush and weed control at http://pestman.tamu.edu. In all scenarios, brush is assumed to be honey mesquite (*Prosopis glandulosa*), although size and number per acre vary.

Table 1. General ranch assumptions

Selected parameter	Assumptions
Operator off-farm income	$45,000/year
Spouse off-farm income	$35,000/year
Family living expense	$30,000/year
Native pasture	500 acres
Ownership tenure	100%
Hunting income	$10/acre
Herd size (initial)	25 Cows, 1 Bull
Cow herd replacement	Bred cows
Vet, medicine & supplies	$25/cow
Salt/mineral blocks/year	$26/cow
Calving rate	85%
Cow culling rate/year	7.50%
Steer weaning weights	550 lbs.
Heifer weaning weights	500 lbs.
Steer prices (550 wt.)	$1.80/lb.[1]
Heifer prices (500 wt.)	$1.70/lb.[1]
Cull cow prices	$.70/lb.[1]
Cull bull prices	$.90/lb.[1]
Bred cow prices	$1,400/head[1]
Replacement bull prices	$2,500/head[1]
Hay prices (2012)	$120/ton[2]
Range cube prices	$.20/lb.[2]
Pregnancy testing	$8.50/cow
Bull testing	$75/bull

[1] Cattle prices: Live Oak Livestock Commission Company (March 12, 2012)

[2] Supplemental feeding assumptions: 0.3 tons of hay and 0.06 tons of protein/cow/year

Heavy brush

The heavy brush scenario began with 400 honey mesquite trees per acre with an average stem diameter of 6 inches. Because there were 400 or more plants per acre, a broadcast treatment was used. However, heavy brush is difficult to spray with a ground broadcast rig, so an aerial treatment was chosen in Year 1. Because they typically cost less to hire, an airplane was used instead of a helicopter.

The broadcast herbicide recommendation for south Texas, where our ranch is assumed to be located, is a mixture of triclopyr (0.5 pounds active ingredient) and clopyralid (0.25 pounds active ingredient), with 0.25–0.5 percent surfactant in 4–5 gallons of water per acre. Consult the product label for information on using methylated seed oil (MSO) instead of surfactant. Note that in the rest of the state, reducing the triclopyr component to 0.25 pounds of active ingredient has been found just as effective.

According to PESTMAN, this heavy brush treatment would costs $33.97 per acre or $13,588 for the 400 acres (Table 2). This application was assumed to kill 50 percent of the honey mesquite.

Brush control always requires follow-up treatments. During Year 4, the remaining brush and new seedlings—200 plants per acre averaging 2 inch stem diameter—were treated using the Brush Busters leaf-spray individual plant treatment method (IPT).

The mix used for foliar IPT includes 0.5 percent triclopyr, 0.5 percent clopyralid, 0.25 percent surfactant, and 0.25 percent blue dye in water. After adding $10 per hour for labor, this treatment costs $17.36 per acre or $6,944 total (Table 2). This treatment method typically kills 70 percent or more of the brush.

In Year 7, foliar IPT follow-up treatments were applied—60 plants per acre averaging 2 inch stem diameter—with the same mix as above. The cost was $5.21 per acre or $2,084 total (Table 2). The 10-year treatment cost on 400 acres of heavy brush was $22,616 (Table 2).

Table 2. Brush and/or weed treatment cost by year for 400 acres

Native pasture conditions and soil productivity scenarios	Yearly cost ($)										
	1	2	3	4	5	6	7	8	9	10	Total
1-Heavy brush; high soils	13,588			6,944			2,084				$22,616
2-Heavy brush; moderate soils	13,588			6,944			2,084				$22,616
3-Heavy brush; low soils	13,588			6,944			2,084				$22,616
4-Light brush & weeds; high soils	4,200		4,200		4,200		4,200		4,200		$21,000
5-Light brush & weeds; moderate soils	4,200		4,200		4,200		4,200		4,200		$21,000
6-Light brush & weeds; low soils	4,200		4,200		4,200		4,200		4,200		$21,000
7-Light brush; high soils	2,084			1,124			560			348	$4,116
8-Light brush; moderate soils	2,084			1,124			560			348	$4,116
9-Light brush; low soils	2,084			1,124			560			348	$4,116

Light brush and weeds

Landowners sometimes need to treat weeds in pastures that have scattered brush. In the light brush and weeds scenario, brush suppression and weed control consisted of ground broadcast spraying with a 1:4 mix of Picloram and 2,4-D, applied at a rate of 2 quarts per acre. This application costs $10.50 per acre, or $4,200 (Table 2).

This technique kills about 25 percent of the honey mesquite. The treatment must be repeated in years 3, 5, 7, and 9. Over 10 years, the cost to treat 400 acres of light brush and weeds totals $21,000 (Table 2).

Light brush without weeds

Another common scenario is a pasture having seedlings or smaller brush regrowth. Light brush without significant weeds is defined in this study as 60 honey mesquite trees per acre with an average stem diameter of 2 inches. The Brush Busters foliar IPT method described above was used here. The cost to manage honey mesquite in this case included $10 per hour labor and was $5.21 per acre, or $2,084 total.

Follow-up treatments used the foliar IPT method as well. In Year 4, 60 plants per acre averaging 1-inch stem diameter were treated at a cost of $2.81 per acre or $1,124 total. In Year 7, 30 plants per acre averaging 1-inch stem diameter, were treated for $1.40 per acre or $560 total. In year 10, treating 10 plants per acre averaging 1-inch stem diameter cost $0.87 per acre or $348 total. The cost of treating 400 acres of light brush over 10 years totals $4,116 (Table 2).

Stocking rates

Table 3 shows the expected number of cattle that can be stocked per acre each year for each scenario based on high, moderate, and low forage productivity potentials. Each scenario starts with 25 animal units, but is partially destocked in the first year to accommodate planned treatments and the expected delay in forage response (Table 3). Restocking was initiated in Years 3-5 based

Table 3. Year and corresponding cattle stocking rate (acres/animal unit/year)

Native pasture condition and soil type scenarios	Initial	Year 1	2	3	4	5	6	7	8	9	10
1-Heavy brush; high soils	25	12	12	23	23	46	46	46	46	46	46
2-Heavy brush; moderate soils	25	12	12	16	16	33	33	33	33	33	33
3-Heavy brush; low soils	25	12	12	12	12	23	23	23	23	23	23
4-Light brush & weeds; high soils	25	23	23	23	46	46	46	46	46	46	46
5-Light brush & weeds; moderate soils	25	16	16	33	33	33	33	33	33	33	33
6-Light brush & weeds; low soils	25	12	12	23	23	23	23	23	23	23	23
7-Light brush; high soils	25	23	23	46	46	46	46	46	46	46	46
8-Light brush; moderate soils	25	16	16	33	33	33	33	33	33	33	33
9-Light brush; low soils	25	12	12	23	23	23	23	23	23	23	23

on expected forage improvement and availability for each scenario.

The final stocking rate in all scenarios is reached by Year 5. This rate was calculated based on the potential forage production value of that soil type multiplied by the 400 grazable acres.

For example, the forage potential for moderately productive soil is:

3,600 lbs/acre x 400 ac = 1.44 million lbs forage

Ideally, half of the forage should be left to promote plant vigor, rain infiltration, organic matter, and soil stability. Another 25 percent will be lost to other animals and trampling effects. The remaining 25 percent—360,000 pounds—is available for livestock. An average 1,200-pound cow eats about 30 pounds of feed per day plus supplements. Therefore, 33 cows (360,000 ÷ 30 ÷ 365) of this size could graze on 400 acres during a year.

The three scenarios with moderate soils in Table 3 use this calculation to reach a maximum stocking rate of 33 head.

Ranch implications

Average net cash farm income (NCFI) projections for each management scenario are shown in Table 4. The NCFI is a measure of profitability that includes the purchase and sale of breeding livestock but not noncash expenses such as depreciation.

Table 4 shows the NCFI for every dollar spent on treatment during the 10 years. Figure 1 also shows yearly NCFI variation by soil productivity potential for each pasture condition.

Modeling these ranch scenarios show that each of the three pasture conditions could generate profits after brush and/or weed treatments regardless of the soil productivity level (Table 4 and Fig. 1). Although the treatment cost varied greatly depending on the size and number of brush plants present, profit potential probably holds true on most types of well-managed land (Table 2).

Table 4. The 10-year total net cash farm income and treatment cost by pasture scenario

Native pasture conditions and soil type scenarios	10-year total net cash farm income[1]	10-year total treatment cost
1-Heavy brush; high soils	$110,900	$22,616
2-Heavy brush; moderate soils	$67,200	$22,616
3-Heavy brush; low soils	$38,800	$22,616
4-Light brush & weeds; high soils	$156,200	$21,000
5-Light brush & weeds; moderate soils	$95,300	$21,000
6-Light brush & weeds; low soils	$51,000	$21,000
7-Light brush; high soils	$173,100	$4,116
8-Light brush; moderate soils	$112,200	$4,116
9-Light brush; low soils	$72,000	$4,116

[1] Projections for commodity and livestock price trends with cost adjusted for inflation (Food and Agricultural Policy Research Institute, University of Missouri)

The bottom line

It costs less to treat brush when it is smaller than waiting until it is larger and denser. Treating light brush in highly productive soils offers the greatest profit potential (Table 4). The Brush Busters publications cover specific species and are an excellent guide for treating smaller brush with individual plant treatment methods.

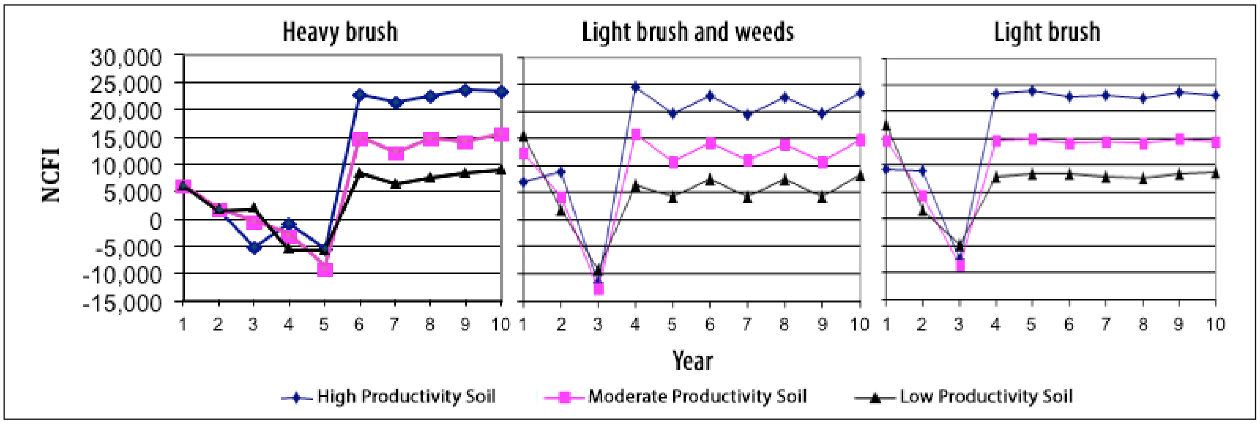

Figure 1. Yearly net cash farm income (NCFI) by initial pasture condition

Treating heavy brush costs more relative to profit potential, especially in poor soils (Table 4). However, much of the benefit continues beyond the 10-year horizon.

Landowners who regularly treat pastures for weeds should consider using an herbicide that is also suggested for brush suppression. Typically, an herbicide labeled for suppression kills only 25 percent of brush, but it will also help keep the brush smaller. You will need to make regular applications which can be costly long-term (Table 2).

On the other hand, it may cost more initially to treat brush for control than for suppression, but the control cost should decrease once the brush become smaller and less dense. Over a 10-year period, continuously suppressing light brush and weeds cost almost as much as controlling heavy brush (Table 2).

Other than initial pasture condition, soil productivity potential is the other big factor to consider when determining what land to treat. The model shows that the highly productive soils produce more forage, and therefore carry a higher sustainable stocking rate than the moderate- or low- productivity soils (Table 3). If a soil type in one section of a property has more potential to produce forage for livestock, a landowner should treat the brush in that area first.

Table 4 and Figure 1 show that higher stocking rates on more productive soils can yield higher net cash farm income for the producer. For more information on identifying soil types and forage potential on your property, see the NRCS Web Soil Survey at websoilsurvey.nrcs.usda.gov.

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Special thanks to John Crawford
for contributing to this publication.

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