

Clipping chaparral

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Chaparral is one of the most extensive vegetation types in California, covering 3.5 million hectares (8.6 million acres), or about 8.5 percent of the state. The frequency and intensity of wildfires are normally related to fuel buildup in chaparral, which is usually controlled by prescribed burning of standing or mechanically crushed brush. Because mowing or clipping has been suggested as another technique, we undertook this study to assess clipping as a means of controlling chamise chaparral growth.

Although chaparral is composed of a great variety of plants, its appearance is much the same throughout California. Common characteristics of the evergreen shrubs that dominate the type are extensive root systems in relation to

Sprinkler systems, continued

use caution in modifying a system. If the original nozzles were replaced with equivalent-size low-pressure nozzles (1/8 LP) and no changes were made to the pumping plant, little change in pressure or in costs would occur. However, with the larger nozzle (9/64 LP), pressure would drop from 50 to 35 psi, which is the desired response of the system. The drop in pressure results from forcing the pump to operate at a higher capacity, which in turn develops less head and consequently less pressure.

At the same time, the application rate of the system would increase slightly,

thus reducing the set time required to apply the needed water. For this particular pump, however, the horse-power demand would also increase, because BHP demand increases as capacity increases. This modification would save energy only if the set time were reduced to compensate for the increased application rate. If the set time were not reduced, then energy costs would be higher than those of the original system because of the increased horsepower demand. Thus, it is possible to reduce the pressure of an irrigation system yet increase energy costs.

Table 3 shows that significant energy

savings result only from reducing the impeller diameter or rpm. Using a 5 percent impeller trim (or 5 percent reduction in rpm) and the 1/8 low-pressure nozzle would reduce pressure by 14 percent from the initial pressure and energy consumption by about 9 percent. With a 10 percent trim, the pressure would be reduced by 26 percent and energy use by 18 percent.

Our example assumes that no change in uniformity of application occurs as a result of the modification. If a change does occur, spacings should be reduced to maintain a satisfactory uniformity. Otherwise, longer operating times may be required for adequate irrigation.

TABLE 3. Effect of sprinkler system and pump modifications on energy consumption

Modification	Nozzle pressure	Wetted diameter	Nozzle discharge	Application rate	Set time	BHP	Energy consumed
	psi	ft	gpm	in/hr	hr		per set
Standard nozzle (1/8)	50	80	3.19	0.256	19.9	82	1,353
Low-pressure nozzle (1/8)	49	78	3.22	0.258	19.8	82	1,346
Low-pressure nozzle (9/64)	35	75	3.41	0.273	18.7	84	1,302
5% impeller trim (1/8 low pressure)	42	76	2.99	0.240	21.2	70	1,230
5% impeller trim (9/64 low pressure)	30	74	3.18	0.255	20	71	1,177
10% impeller trim (1/8 low pressure)	37	76	2.80	0.225	22.7	59	1,110
10% impeller trim (9/64 low pressure)	27	74	2.99	0.240	21.2	60	1,054

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as a brush-management technique

If done long enough, the technique might reduce total aboveground fuel load

plant size; dense, rigid branching growth form; and thick, leathery leaves.

Climate affects growth and development of chaparral more than any other factor. In California, chaparral occurs where winters are mild and moist and summers are hot and dry — the Mediterranean-type climate zone. This climate promotes abundant growth but slows decomposition of accumulated plant debris. As a result, periodic fires occur, usually in summer and fall. New growth arises from seeds in the soil or sprouts produced by underground vegetative organs.

Chamise chaparral

Chamise (*Adenostoma fasciculatum* H&A) is the most abundant shrub of the

chaparral and, where it dominates, the type is called chamise chaparral. After fire or other forms of top removal, chamise crowns sprout vigorously. Fire also stimulates abundant regeneration of this shrub from seed.

When the moisture content of new chamise growth increases in spring, and growth accelerates, a period of rapid root starch depletion usually begins. Although many factors can affect carbohydrate depletion, new spring growth of about 7.6 centimeters (cm) — 3 inches — has been used to identify the beginning of loss. Previous research has shown that cutting chamise to 2.5 cm (1 inch) above the ground at this time has resulted in the greatest reduction in sprout height the following year.

To further determine the effect of top removal on chamise as a possible fuel management technique, we applied two spring clipping treatments to three-year-old regrowth in a chamise chaparral stand recovering from wildfire.

Procedure

We compared the growth of clipped and unclipped chamise chaparral in the Japatul Valley in south-central San Diego County, within the Cleveland National Forest. Elevation is approximately 820 meters (m), or 2,700 feet. Precipitation averages 58 cm annually, but during the study it ranged from 50 cm in 1977 to 115 cm in 1978. Soil at the site is Fallbrook sandy loam (typic haploxeralf) on eroded slopes of 15 to 30 percent.

At the beginning of the study in 1974, there were 16,600 sprouting chamise plants per hectare (ha), and 71,700 chamise seedlings per ha. This population averaged 50 cm in height in 1974 and 61 cm in the spring of 1981. The standing dead chamise biomass remaining at the



Left: Chamise sprouts, less than a year after a southern California wildfire. The shrub has small, almost needle-like leaves (above) and small white flowers in spring.

site following the Laguna fire of 1970 was 2,380 kilograms (kg) per ha.

We applied the two clipping treatments to a series of plots, each 3 m by 6 m, organized in a randomized complete block design. During the four-year study, the chamise was clipped once by hand each spring when new growth was 7.6 cm long. All clipped plants were cut at a height of 30.5 cm (12 inches), and the clipped material was allowed to fall to the ground. We selected the clipping height as a practical minimum based on ground surface irregularities and obstructions at the site and the potential use of powered mowing equipment in management situations represented by the site.

Treatment 1 consisted of annual spring clipping for four successive years, 1974 to 1977. Destructive sampling of four plots each winter and measurement of aboveground biomass began after the first year, in 1975. Plots clipped twice, three times, and four times were harvested in 1976 to 1978, respectively. Plots sampled were not clipped in the spring of the harvest year.

Treatment 2 plots were clipped once at 30.5 cm in the spring of 1974. Four replications of this treatment were sampled in each of the harvest years.

To determine the effect of clipping, we compared the winter-season dry weight of standing biomass collected from the two treatments with weight of biomass collected from replicated control plots in each of the harvest years. We divided all aboveground biomass into three components: (1) chamise

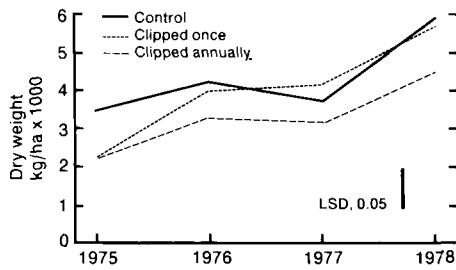


Fig. 1. In last two years, total chamise aboveground standing biomass in winter was significantly less in annually clipped plots.

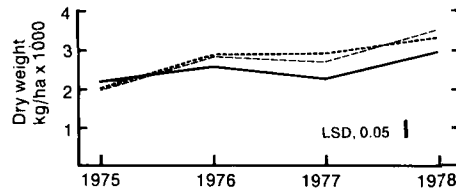


Fig. 2. Chamise standing biomass below the 30.5 cm clipping height, however, was significantly greater in clipped plots.

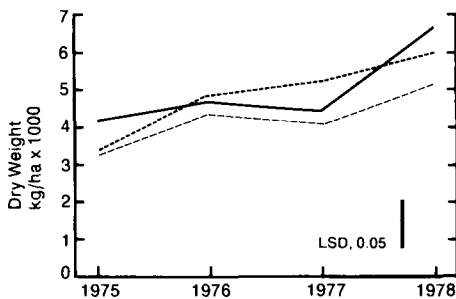


Fig. 3. Total chemise, other herbaceous, and sub-shrub biomass was significantly less in clipped plots only in 1978.

above 30.5 cm; (2) chamise below that level; and (3) other herbaceous and sub-shrub biomass, primarily foothill stipa (*Stipa lepida* Hitchc.), snakeweed (*Gutierrezia* sp.), and evening primrose (*Camissonia* sp.), and residue from spring clipping in treated plots. Resources available to the study did not permit separating live and dead material collected from growing chamise plants, a desirable breakdown because the live-to-dead ratio influences flammability.

Effect of clipping

The effect on chamise became apparent in 1977. Total chamise biomass in 1977 and 1978 was significantly less in plots clipped annually (fig. 1). However, as an apparent effect of clipping, biomass of chamise below the clipping height was significantly greater than in unclipped plots (fig. 2). Clipping once had no lasting effect (fig. 1,3).

The herbaceous and sub-shrub component from spring clipping in treated plots showed no significant difference among treatments within years. When this component was included with chamise, total biomass in plots clipped annually was significantly less than in unclipped plots in only one year — 1978 (fig. 3).

The results suggest that annual spring clipping of three-year-old chamise chaparral recovering from wildfire in San Diego County had only a small effect on total aboveground biomass production over the four-year duration of the study. However, clipping had a real, although not always significant, effect on chamise plants. When compared with plants unclipped or clipped once at the beginning of the study, plants clipped annually produced less winter above ground standing biomass.

The difference in biomass production between clipped and unclipped plots observed in 1978, at the end of the study, suggests that differences in total production may become significant if clipping is carried on for longer than four years. However, the treatment may stimulate biomass production below the clipping height. Such production would defeat the objective of clipping as a brush management technique, unless the moisture content of new growth helped clipped plants to maintain a higher level of fire resistance than unclipped plants. Answers to these questions are being pursued in a new chamise clipping trial at the University of California Hopland Field Station in northern California.

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Chamise, hand-clipped each spring to simulate power mowing, stimulated growth below clipping height, possibly defeating objective of clipping as a management technique.