# Controlled Burning in Chamise Chaparral

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CHAMISE is a woody native plant of California found on brushland areas that are periodically burned by fires. Its principal distribution is confined to those areas designated as brushlands and is found as far north as Humboldt and Shasta Counties and in most of the coastal and valley foothill counties south to San Diego County. It thus occupies a wide range of rainfall, temperature and soil conditions in California. If a shrub could be picked as a typical brushland species, chamise would best meet this criteria because of its wide distribution.

The shrub is characterized by a spreading form varying from 2 to 10 feet high, depending on the site, has small fascicled leaves, white flowers, fibrous grey bark, and is somewhat resinous which sometimes accounts for the plant being termed "greasewood". Like many brush species, seed production is abundant and will remain dormant in soil but will germinate abundantly following burning. Chamise is found growing with other brush species, for example, on south exposures it will associate with ceanothus species, manzanita, poison oak, and yerba santa while on northerly exposures it usually mixes with scrub oak, toyon, birchleaf mahogany, chaparral pea, knob-cone pine and interior liveoak. In locations where soils are shallow and rocky, chamise will often form pure stands to the

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exclusion of other brush species. Where it tends to be the dominant brush species the soils are usually stony, clay or sandy loam texture and generally of acid pH or neutral reaction. In Lake and Mendocino Counties usually the Maymen, Henneke, or Los Gatos soil series are associated with chamise while in Southern California, Dulzura soils series are more common. Slopes of chamise on many of these soils will often exceed 50% while in other cases it will occupy good soils on relatively flat terrain.

Most owners of brushlands and other land managers in California are familiar with this adaptable chaparral plant. Problems for managing chamise are many depending on locality and use of the land. The livestock manager may be interested in manipulating chamise so that the land can be converted to grasses and forbs; the wildlife manager is concerned with keeping an abundant supply of succulent chamise sprouts within reach of deer as well as providing cover; the watershed manager may be interested in replacing the water-using chamise brush with a plant like grass with less water requirements and better soil holding qualities; and then the fire protection manager will be concerned with reducing the accumulation of live and dead chamise fuel. Research, in California over the past decade on brushland management, has developed many techniques and systems for working with chamise and its associate brush species.

## MANAGEMENT FROM THE LIVESTOCK OPERATORS VIEWPOINT

Probably the most extensive experience and understanding of chamise brushland has come from ranchers like Mr. Glenn Keithly. His livelihood and success in raising livestock has depended on his knowledge of using chamise brushland to its utmost advantage. His grazing land in Lake County extends from the foothills adjacent to Clear Lake well into the Mayacmas Mountain Range brushlands. This area, generally known as Cow Mountain, embraces in excess of 50,000 acres of varied brush, soil, and rough topography. Much of this acreage is administered by the Bureau of Land Management but many landowners, like Mr. Keithly, operate in this brush terrain. The principal method used and available to these ranchers has been controlled burning. Combinations of burning with seeding of forage

grasses and legumes has developed a livestock operation where formerly useless brushlands are now productive in livestock feed. Successful burning in chamise brushland is best accomplished by those with considerable burning experience such as Mr. Keithly has acquired over the years. Generally speaking, chamise can be burned any time of the year if the weather conditions are satisfactory. From the more practical standpoint burning is usually accomplished in late spring, summer, or fall. Obviously in the summer, during high temperatures and low humidity, it will burn most intensely but the fire risk of escape is also greater at this time. Similar to any other burning situation the ultimate success is usually determined by an organized fire plan. If, for example, spring burning is anticipated then plans should be made to treat some of the brush in the fall or winter by mechanical crushing or chemical treatment. By having some of the brush dead at burning time, more flexibility is possible with weather conditions. The dead or crushed brush will burn easier and better than the green standing brush; thus can be fired at lower temperatures and higher humidity than green chamise. Blanford (1962) reported that crushed brush resulted in 50% less chamise sprouts because the crushed plants were more weakened and the fire burned hotter killing more roots than where it was not treated.

Summer burning, being more hazardous, requires experience, however, in some cases where the brush may be situated on north exposures this may be the only time it will burn. Again, planning in advance will enhance success especially in the aspect of fire control lines. On the University of California's Hopland Field Station in Mendocino County, many chamise slopes were burned in the summer, with safety, by having burnt out fire lines around the area in the previous spring thus providing a firetrail clear of flammable brush. Fall burning is less hazardous than summer burning but more hazardous than spring burning, however, many acres in the Cow Mountain area have been successfully burned in the fall by the California Fish and Game Department. In the fall, under proper weather conditions, fires can be set at the lower edge of a chamise slope and will burn to the top of the ridge where it will generally go out. To understand fall burning one must know which weather condition will give the proper burning result.

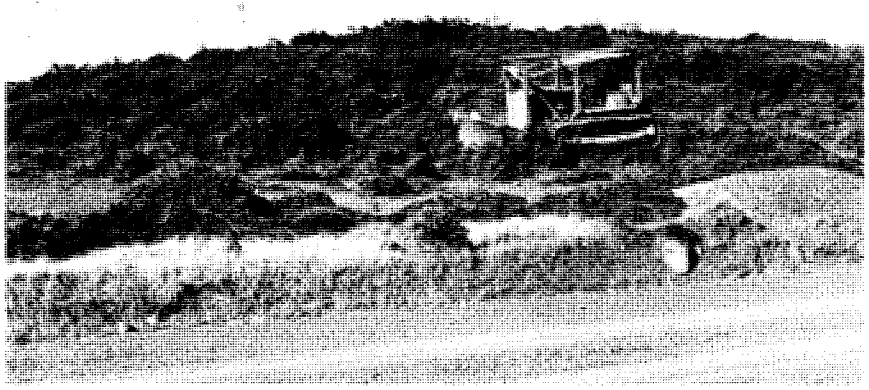

FIG. 1. Bulldozer tractor crushing brush. Blade is held 6 to 12 inches above surface thus brush is crushed in place and not piled.

From the livestock operator's position, management of chamise must continue beyond the burning stage to be profitable. Like most brush plants, chamise has vigorous seed production and sprouting ability thus the advantage of burning can quickly be diminished if some follow-up of the burning is not planned. Sampson and Burcham (1954) showed that the usable forage on a chamise brush area was reduced from 640 lbs./acre the first year to 201 lbs./acre at the fourth year following the burn as a result of brush encroachment. Kay *et al.* (1958) found in plant counts of chamise in San Bernardino County, as many as 8,200 seedlings per acre. Buttery, Bentley and Plumb (1959) indicated the number of chamise plants per acre in Glenn County varied from 1,200 to 4,000, and each of these plants would have many sprouts per plant crown. Control of seedlings and sprouts of chamise can be achieved by several methods or combinations, such as seeding grasses and legumes, chemical spraying, grazing and reburning. Biswell *et al.* (1952) showed a very high negative corre-

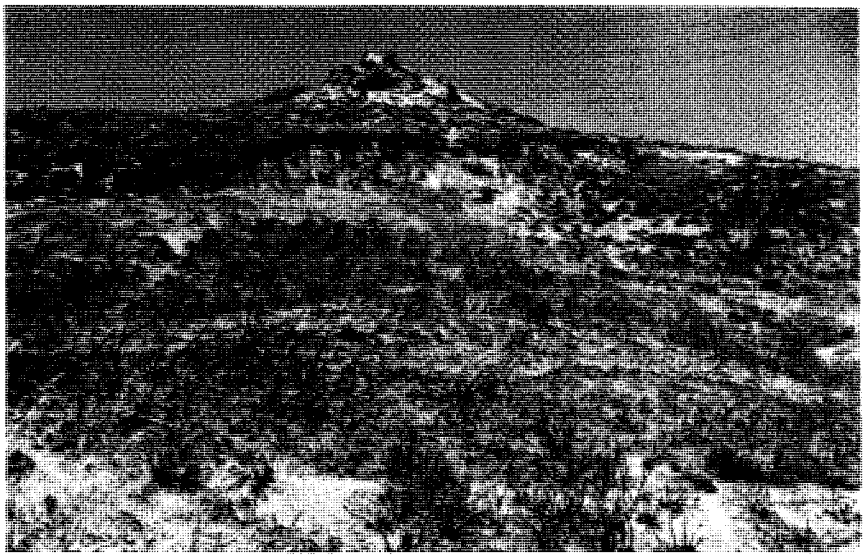

FIG. 2. Area shortly after burning.

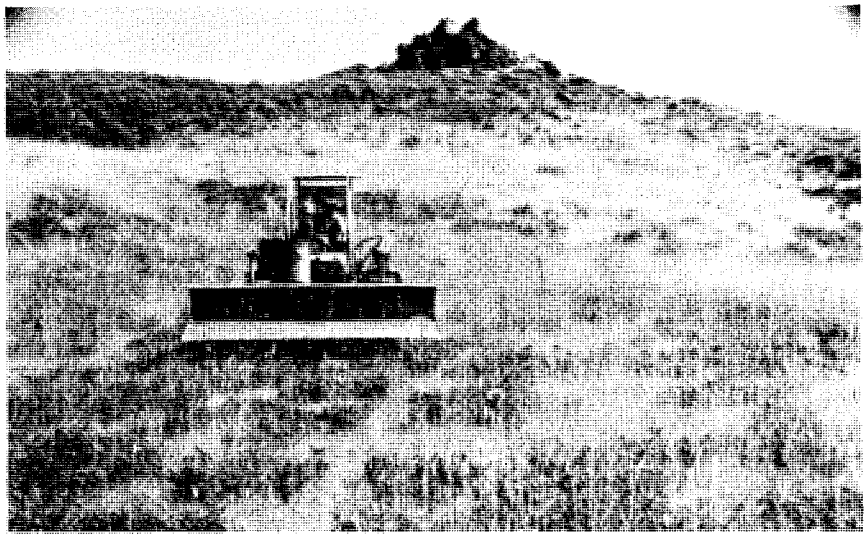

FIG. 3. Two years after burning, the sprouts had developed sufficiently to require the tractor-mounted sprayer to treat the sprouts with 2,4-D to insure survival of seeded grasses and legumes.

FIG. 4. Typical browsing of a brush plant by deer and domestic animals. Note where animal can reach, the shrub is closely hedged but once beyond their reach it elongates rapidly.

lation between density of herbaceous cover and number of brush seedlings on chamise brushlands in Lake County. Love and Jones (1947) have developed methods of seeding brush burns and recommended species of grasses and legumes that will successfully compete with brush seedlings for all California conditions. Leonard and Carlson's (1953) work shows that the use of 2,4-D as a spray will successfully control regrowth and seedlings of chamise. The important point stressed by most authors on chemical control of chamise is the necessity of spray applications within the first year following the burn. If a longer interval lapse is allowed the chamise becomes more difficult to control and requires additional amounts of chemicals.

Chamise seedlings and sprouts may be effectively controlled by the grazing of livestock and deer. Sampson (1963) rates chamise as good to fair feed for sheep, goats and deer, especially on newly burned areas, but poor value to cattle. Bissell and Weir (1957) found

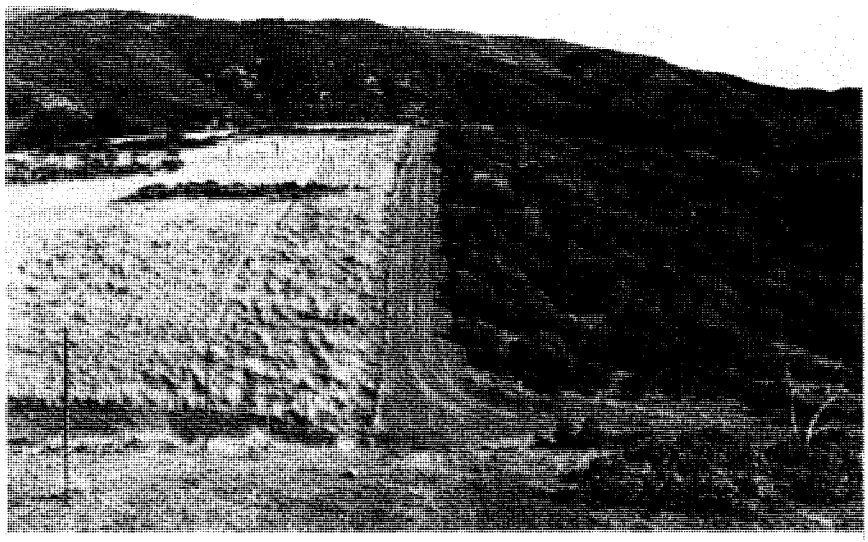

FIG. 5. Chamise brushlands in the background can be converted to a more usable forage as demonstrated by the area on the left which was burned, seeded, and treated with 2,4-D. This area was converted 10 years ago. The areas of brush in the grass are experimental control plots.

that deer and sheep on brushlands would obtain some energy from chamise but that protein should be supplied from other sources. Observations at the Hopland Field Station show that browse plants, including chamise, can be most efficiently cropped by sheep if used when the grasses and forbs are dry. At this time, during the summer, sheep seek green feed which is only available from the brush, thus the stock will heavily use chamise and the other browse plants. If livestock clip chamise seedlings near the soil surface they are very likely to die. While sheep can be concentrated in pastures for browsing of chamise, it is more difficult to concentrate deer in a specific area. On the Cow Mountain area Biswell (1952) found in an area used heavily by sheep and lightly by deer that they killed 64% of the chamise plants whereas in an area used lightly by deer they killed less than 1% of the chamise plants.

Chamise can also be controlled by a reburn following the original fire. The reburn should be done within four years and sufficient

grass must be left to carry the fire and provide enough heat to kill the chamise foliage. Kay *et al.* (1958) reported on a chamise burn that was followed by a reburn one year later, it resulted in 94% kill of seedlings and 90% kill of sprouts of chamise. If a reburn is planned some deferred grazing will be necessary in the spring to leave sufficient grass to carry the fire. One disadvantage of reburns is that they can be detrimental to the non-sprouting forms of brush.

## MANAGEMENT FOR THE WILDLIFE VALUES

The wildlife manager looks at chamise in a somewhat different view as he appraises most of the brush species as a principal source of feed as well as cover. Taber and Dasmann (1958) rated chamise as the "bread and butter" plant for deer for it makes up from ¼ to ⅓ or more of their diet, depending on the location. The aim therefore, is to open up selected scattered areas where the chamise can be kept succulent and palatable. In the Cow Mountain area, Biswell's (1952) research indicated these areas should be 5 to 10 acres in size in order to form as much edge as possible. He recommends that 30% of the area should be left in well distributed dense brush for cover. Elimination of the brush is not the intent of the wildlife manager as chamise and other brush is the main source of feed. He is more concerned with managing the plant so it fits the needs of deer as a feed and cover plant. For this reason burning, browsing, seeding and reburning but probably not chemical control, except for specific needs, are the methods to use.

## MANAGEMENT FOR THE WATERSHED VALUES

The manager of watersheds, where soil and water are the main concern, appraises chamise with the possibility of substituting this plant for some other vegetation with better soil holding qualities and less demands on the sub-surface water supply. Burgy and Pomeroy (1958) showed that an increase in water yield results from conversion from brush to grass; part of this increase is due to lower net interception loss from grass. Another part of the increase is due to the lower summer water requirements of grasses. Water yield

increases as much as 10 inches have been measured under favorable conditions without serious acceleration of soil erosion where grass has replaced brush. Where these benefits are desired the most expeditious way of accomplishment is by burning, seeding to grasses and legumes then maintain this cover by grazing and chemical treatment.

Control of vegetation on watershed units has been accomplished in several locations at the Hopland Field Station without undue soil losses. Conversion of brush slopes to grass covered slopes started with burning of the brush then seeding soon afterwards in the ash. The spring following the fall burning all the chamise sprouts were treated with 2,4-D spray and this combined with sheep grazing, eliminated all the existing brush plants. Without the chamise brush competition the grass was able to form a good ground cover that was superior in soil holding properties to the brush. For ten years, since this conversion, and by proper management techniques, the grass has been maintained.

## MANAGEMENT FROM THE FIRE PROTECTION VIEWPOINT

Chamise brushlands are probably viewed by those concerned with fire protection in a different sense than those previously mentioned. Brush and chamise in particular, represent a combustible material, extremely hazardous in late summer and practically harmless in mid-winter. What quantities of fuel is the fire protection manager thinking about when he looks at a chamise covered hillside? Kay *et al.* (1958) in yield determinations, on a chamise brushfield in Mariposa County that had been unburned for at least 25 years, found that the dry weight yield of chamise plants varied from 8½ to 17½ tons of standing material per acre. In addition, dead material added another 1¾ tons per acre. They found the chamise crown closure amounted to about 95%, average height 5′ 9″, and about 5500 plants per acre. This could be considered for most purposes, a pure stand of chamise. In this chamise stand only about 4% of the ground surface had herbaceous cover. Obviously, such a bulk of fuel is not a desirable situation to contemplate when developing a fire protection plan. In areas where dwellings are scattered in these

brush accumulations, such as recent Southern California brush fires have illustrated, reduction of this hazard is essential if an effective fire protection plan is to be achieved. One approach that can be initiated in this situation would be to cut, crush, or doze the brush, then burn and dispose of it at a safe time of year. In a study accomplished at the Hopland Field Station by Jones and Laude (1960) it was found that cutting chamise when the plant's food reserves or starch levels were low would result in poor plant survival. They determined that growth rate was most rapid at a low starch percentage, usually in June or July. Twig moisture was high in June and this increase in moisture usually preceded the rapid growth and low starch reserves. In other parts of California, where seasons are earlier, this stage of low food reserves probably occurs at an earlier date. This does signify that the physiological characteristics of the chamise plant could be used in a management program to reduce the amount and density of plant material.

Another aspect of fire protection is to break up the large concentrations of brush so that extensive unbroken areas do not exist. This can be accomplished by an annual burning program, in the less hazardous time of year, so that the area of recently burned brush will be interspersed with the unburned portions. If a program for a given chamise brush area was developed so that all areas could be burned on a ten-year rotation, a tremendous reduction in fuel accumulation could be accomplished. Presently, our public fire agencies spend millions of dollars annually to suppress fires but a mere token amount is spent on fire prevention in the form of reducing brush accumulation on our hillsides.

Many research workers and ranchers, over the past decade, have assembled a wealth of information on how to handle brushlands, chamise included. As described previously, burning, seeding, chemicals, grazing and other information is available for application. The question is whether this information is being put to work for its full value. Many ranchers and other land owners feel that a more aggressive program should be achieved so that the problem of brush accumulation can be solved before it becomes a blazing hazard threatening property and life. A program of education for urban dwellers is needed so they may appreciate the beneficial aspects of

controlled burning and support action for greater use of fire for hazard reduction and range improvement. The brush will be here for many decades into the future and the people that associate with it will become more numerous, thus an active program for brushland management is essential for future development of California's rural lands.

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