Coppicing: Using A Forester's Tool on Rangelands

Linda Howell Hardesty

The phenomenon of coppicing, widely used by foresters, can also be an important range management tool. Coppice is defined as "all regeneration that is derived from vegetative sprouting of dormant or adventitious buds." Range managers talk about sprouting in conjunction with brush control, generally in a negative sense, as in: "mesquite's sprouting ability makes control almost impossible."

While most people know what sprouting is, coppicing is only vaguely familiar as a management tool. Foresters use coppice methods to insure a rapid, economical return to full stocking after wood is harvested, to maintain a desirable species and genetic composition, and to shorten rotation times. Following this more positive vein, what advantages might coppicing have for the range manager interested in improving forage production?

Cutting back coppice growth of Auxemma oncocalyx.

Some woody plants are important as forage, although many problems are caused by less desirable trees and shrubs. If brush management is considered as minimizing the undesirable effects of woody plants while maximizing their contribution to sound management, then coppicing can be a useful tool for the range manager also.

Coppicing results from injury to, or removal of the aboveground plant parts. It is a common response to fire, mechanical treatment, heavy browsing, and some herbicide treatments. The coppicing stump uses the root system and reserves of the original plant, and under the influence of a chemical "contingency plan" reinitiates growth with properties very different from seedling growth. These properties can affect forage production and quality.

Coppice regeneration and uncut caatinga woodlands in northeast Brazil.

The most familiar phenomenon is the speed with which coppice shoots emerge and grow. Most range managers have seen coppice shoots emerge from charred shrubs within days of a range fire, or have cut a tree in the yard only to have it begin almost immediately to fight back. The forestry literature notes that coppice shoots may out-grow seedlings for as long as 40 years (Daniel et al. 1979). Coppicing stumps can provide browse in a hurry.

In addition, stumps which coppice once can usually do so repeatedly. Some European woodlands have been managed for centuries for short rotation fuelwood production. Each stump has produced many generations of regrowth. We don't have much data on the prolonged sprouting performance of rangeland shrubs, but the persistance of sprouting species such as mesquite, and salt cedar suggest that repeated sprouting is possible under rangeland conditions.

Not only do sprouts grow differently, but the crowns they produce are different as well. Coppicing can cause a shift from a tall, tree-like growth form to a lower shrub-like form. This change may be short lived, or may persist for many years. This increases accessibility for browsers, and can improve fuel conditions if burning is planned. In many cases, coppice shoots produce proportionally greater amounts of

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Stump of Caesalpinia pyramidalis *sprouts within days of cutting.*

foliage and tender stems to inedible woody growth.

Phenology is also affected by coppicing. In northeast Brazil coppice growth of deciduous species may shift to a more evergreen pattern when regrowing. In 1983, undisturbed woodlands shed their leaves in June. Coppice growth retained its leaves an additional 60 days. More remarkable were coppicing stumps whose regrowth had been heavily browsed by goats. These stumps leafed out again in June and July, with the dry season already underway, and maintained green foliage for the duration of the 6-month dry season. With no further treatment, this pattern persisted into the 1984 dry season (Hardesty 1987). Dried fallen leaves of several tree species are the major component of sheep and goat diets during the dry season (Pfister and Malechek 1986). If accessible, coppice shoots, with their delayed leaffall, can be used to extend the period when green feed is available, or can be deferred until the leaves have cured and be used late in the dry season when other forage sources are exhausted. Similar observations have been reported in Africa, Costa Rica, and the California chaparral. As yet there is no clear explanation for these shifts but reduced water stress or the effects of growth regulators have both been suggested.

In addition coppice shoots are often quite palatable, even those of species which are not normally browsed. Animals selected coppice even in the rainy season when ample supplies of normally more palatable herbaceous forages were available. Similar observations have been reported in the literature, and this preference for coppice shoots is recognized by deer hunters who seek out disturbed areas. Differences in succulence, mineral, and nutrient levels have all been proposed to explain this tendency. To date few studies have compared the nutritional quality of coppice and mature growth of the same species. However, these reports generally support the idea that the nutritional value of browse is enhanced by coppicing (Reynolds and Sampson 1943, Leege and Hickey 1971, Hallisey and Wood 1976).

Although this discussion of coppicing is primarily in terms of forage production, two points related to site quality should be mentioned. Treatments which stimulate coppicing, such as nonlethal herbicides, light fires, slashing, or browsing, create less site disturbance than some treatments which remove or kill roots and eliminate coppicing. Intact root systems help stabilize the site and rapid regeneration pro-

First year's coppice growth of Caesalpinia pyramidalis.

Mature coppice of Caesalpinia pyramidalis. *Note decadent stump in center.*

vides protection for the soil surface and a more moderate environment for understory growth. When the roots of woody plants remain alive, the deep root space is occupied and may be more resistant to woody invaders, while still allowing growth of shallow-rooted herbaceous species (Smith 1970).

Numerous factors influence the coppicing ability of trees and shrubs, the most obvious of which is genetic. Some species do not sprout at all, while others have varying ability depending on the site. Blaisdell and Mueggler (1956) report that bitterbrush does not sprout in Oregon, but does sprout in eastern Idaho and Utah. They suggest that sub-specific genetic differences may be involved.

Age and size are also a factor, as the ability to coppice varies during the life of a plant (Blake 1973). Production of sprouts from dormant buds may decrease with age due to thickening of the bark or damage to the buds. Age may not be as important a factor in plants which readily produce adventitious buds, except in terms of a general decline in vigor with age or site changes. None of these variables are within our control, but when recognized they can be used to predict the response to a particular treatment.

There are other factors however which can be manipulated directly. One of these is the height of the remaining stump. The height of the stump affects both the origin and the number of sprouts produced. Adventitious sprouts appear

Goats eagerly browse coppice growth of Mimosa acutistipula. *The foliage of uncut trees is out of reach of browsers.*

more rapidly and may have a different growth potential than dormant bud sprouts. Thus you can influence the sprout type and density most consistant with your goal for a particular species, be it control or propagation.

The season of injury has a great effect on the ability to resprout. Generally, injury during the dormant season produces the strongest coppicing response. Conversely, injury shortly after the canopy leafs out hits the plant at a time when regrowth is more difficult and pathogens and insect pests are most active. Often plants cut during the growing season resprout, but with only the remainder of the growing season in which to recover, they do not survive the following year. Secondary stresses such as drought, browsing, fire, or disease, may further reduce survival or vigor. Mixed stands of species with varying phenologies can be manipulated through precise timing of treatments or selective seasonal treatments. Preferred species can be cut when coppicing will be most vigorous and less desirable species when coppicing will be least likely.

The extent of the original treatment also influences regrowth. Some species root graft with neighbors of the same species resulting in a vascular connection similar to that of clonal species. Coppicing is inhibited by growth regulators translocated from the crown. To encourage abundant coppicing, the aboveground parts of all individuals of a species should be killed to prevent growth regulators produced by intact neighbors from inhibiting sprouting in connecting stumps (Wold and Lanner 1965). This same principle suggests that leaving some intact individuals of less desired species might reduce coppicing of nearby stumps of the same species. This would be most advantageous with species which do not reproduce well from seed, as is the case with prolifically sprouting species such as aspen and some chaparral species (Keely and Zedler 1978).

Further manipulation is possible through the subsequent management of the coppice stand. As mentioned earlier,

browsing, burning, and mechanical treatment can all be used to reduce the vigor of coppice stands, or to renovate them and keep them in a young and productive stage. Both the timing and degree of the treatment determine the effect. In one study, two periods of heavy goat browsing during the initial period of regrowth stimulated additional regrowth by 4 tropical browse species and prolonged the period when green foliage was available (Hardesty 1986). This treatment reduced total browse production the following year. Perhaps more importantly, this caused high mortality of stumps of several species. Among species considered forage producers, no mortality occurred. Only the species which are not usually considered browse succumbed to this treatment. This suggests that browse species are more tolerant to repeated defoliation, and that defoliation treatments can be used to favor the persistance of browse species in the stand.

Describing the possible advantages of coppicing to improve forage production, does not mean that this response isn't a problem at times. The point is that with our broadened understanding of the role of wood plants on rangelands and the increasing emphasis on brush *management*, this is an ideal time to take a lesson from the foresters, to reconsider coppicing, and to gain better understanding of how we can manipulate this response to further our management goals.

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Taking the Great Animal Crusades Over the Top

Robert H. Schmidt

Animal rights and animal welfare issues receive a great deal of media attention. Although many would argue that this attention is undeserved because only a small minority of people are involved, it is important to realize that animal welfare issues strike a response chord in many people. I firmly believe that these issues will not disappear anytime soon; indeed, the evidence indicates that these organizations are continuing to consolidate their power. This evidence includes newly formed animal care committees on many university campuses, passage of the federal Dole/-Brown Bill ("Improved Standards for Laboratory Animals Act"), revisions of the Public Health Service's animal care guidelines, and withdrawal of funding from institutions found in violation of animal care regulations (Holden 1986).

In addition to concerns about the use and welfare of laboratory animals, there is a good amount of attention being focused on the production of animals for food (Mason and Singer 1980, Curtis 1980, CAST 1981, Baker 1983). For example, an injunction forced the USDA to modify their Dairy Termination Program to exclude the provision requiring the hot-iron face branding of dairy cows (Animal Welfare Institute 1986). Specific concerns about farm animal welfare, along with concerns about hunting trapping, and predator and rodent control, will keep these issues "boiling" in the future.

The Animal Welfare Institute (API), a major animal welfare group based in Sacramento, California, held their annual conference 17-19 October 1986. The theme for the conference was "Taking the Great Animal Crusades Over the Top." In this article I review some of the major points raised during the conference.

The underlying theme for most of the keynote speakers was that animal rights activists need to approach people on a totally rational level and avoid emotional debates. "Arm yourself with the facts," said Donna Ewing of the Illinois Hooved Animal Society. John Livingston, author of *The Fallacy of Wildlife Conservation,* declared that activists should "Never accept the burden of proof; shift the burden of proof to the other side." This is because ugliness, suffering, and beliefs cannot be quantified. Donald E. Doyle, advisor to API on medical science, noted, "If you scratch an intelligent person deep enough, you'll uncover ignorance." This information must reach the general public. Luke Dommer, of the Committee to Abolish Sport Hunting (CASH), reported that "Unless you crack the media, you're wasting your time."

Issues covered during the major presentations included egg production using hens in battery cases, veal production, the trade in primates, project WILD (a wildlife-oriented teaching curriculum designed for grades K through 12), hunting and trapping on national wildlife refuges, the Dairy

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Editor's Note: Everyone should heed the message in this article.