# Some Effects of Chopping Saw-Palmetto-Pineland Threeawn Range in South Florida

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**Highlight**: *The cutover pinelands of south Florida are fire-dependent communities dominated by saw-palmetto and pineland threeawn, two low-quality species. Land managers interested in cattle, wildlife, or timber production seek effective ways of controlling these species. Chopping is generally used to accomplish such control. This study was designed to discover differences in forage production and species composition as a result of season of chopping. Although important differences were not revealed, chopping during periods of low soil moisture appeared to give best results. Generally, saw-palmetto was reduced from 24% to 3% coverage, while the yield of pineland threeawn decreased from an average of 80% to near 20%. Desirable species such as bluestems, panicums, paspalums, and razorsedge became abundant. After 2 years, total herbage production increased from a normally expected 3,600 lb per acre to an average of 5,400 lb per acre.*

The cutover pinelands of south Florida are managed primarily as cattle ranges. Game and timber production are important byproducts. The pinelands are fire-dependent communities dominated by highly flammable plants. Most abundant are saw-palmetto (*Serenoa repens* (Bartr.) Small) and a wiregrass, pineland threeawn (*Aristida stricta* Michx.)—two low-quality species. Between fires, they form dense roughs competitive with desirable cattle forage and game food species. Buildups of dry fuels are also a fire hazard to developing pine stands.

In a continuing effort to improve cattle forage, wildlife foods, and timber production, land managers seek more effective ways of controlling the less desirable vegetation. Chopping for plant control is widespread and is generally considered to give satisfactory results. When ranges are double-chopped, i.e., cross-chopped at right angles with heavy drum choppers, the sod is cut into foot squares, resulting in soil disturbance to a depth of 4 to 6 inches. In trials close to the study area in south Florida, double-chopping greatly reduced the abundance of saw-palmetto and pineland threeawn (Hilmon et al., 1963; Lewis, 1970). In greater abundance were bluestems (*Andropogon* spp.), panicums (*Panicum* spp.), paspalums (*Paspalum* spp.), and perennial goobergrass (*Amphicarpum muhlenbergianum* (Schult.) Hitchc.). After chopping, flatwoods ranges yielded higher quality and quantity of forage and a number of grasslikes and forbs which are important game foods.

Although chopping is known to benefit forage production, best time of treatment, changes in species composition, and effects on game food production have not been completely determined. In an effort to better understand the effects of chopping, a study was installed during 1965-66 in Glades County in south Florida.

## Study Area

The study was carried out on a flatwoods site that was clearcut during the 1940's. The original pine component consisted of longleaf (*Pinus palustris* Mill.) and South Florida slash (*P. elliottii* var. *densa* Little & Dorman). Since 1940, the site has been subjected to yearlong grazing by livestock and to burning every 2 or 3 years; hence, no pine regeneration has occurred.

Soils are Leon fine sand, an Aeric Haplaquod characterized by deep, undifferentiated sands except for an organic "hardpan" (B horizon) 4 to 6 inches thick and 1 to 2 ft below the surface (Soil Conservation Service, 1971). Leon, one of the better-drained flatwoods soils, is imperfectly to poorly drained. Although saw-palmetto and pineland threeawn were the prevailing species, dwarf live oak (*Quercus minima* (Sarg.) Small), fetterbush (*Lyonia lucida* (Lam.) K. Koch), lyonia (*Lyonia fruticosa* (Michx.) G. S. Torr.), and a variety of bluestems and panicums were also present (Fig. 1).

The subtropical climate is characterized by hot, rainy summers and mild, dry winters. Annual rainfall is 52 inches, of which nearly two-thirds occurs in June through September. Soils become saturated and often inundated during the summer. Deep sands lose moisture rapidly, however, and the dry winter period culminates in a distinct and often severe drought in April and May.

## Methods

A series of ½-acre plots was double-chopped in each of 4 months—November, January, May, and August—with tandem Marden drum choppers pulled by a D-4 Caterpillar tractor (Fig. 2). Treatments were applied in a randomized complete block design, replicated three times. For estimates of shrub response, the design included an unchopped control, whereas the design for estimating herbage response did not. The experimental design included burning in winter, 1 year before installation of treatments, and protection from wildfire and livestock grazing.

Stem density and crown coverage of shrubs were estimated on 1- by 100-ft belt transects 12 and 24 months after chopping. Composition and production of herbs were estimated on 9.6-ft$^2$ circular subplots. Estimates were made 6, 12, and 24 months after chopping.

Data on stem density and crown cover-

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**Fig. 1.** *Saw-palmetto and pineland threeawn are dominant species on cutover pinelands of south Florida.*

age were summarized by species, and their means were compared by treatment. The significance of differences were examined by analysis of variance tests on the four most abundant shrubs (approximately 90% of the total) as well as on total shrubs. Herbage data were also summarized by species and groups for comparison by treatment. Differences were examined by analysis of variance.

## Results

### Shrubs

Chopping greatly reduced shrubs, and the treatment appeared to be slightly more effective when done during drier periods. However, differences among months of treatment (season) were nonsignificant ($P > 0.05$) statistically, with one exception: May chopping resulted in significantly less saw-palmetto kill (a 70% reduction) than did chopping during other months (average 94% reduction).

When means for season of chopping were combined and then compared with unchopped controls, reductions in both stem density and crown coverage were significant ($P < 0.05$) for each of the four species tested.

**Fig. 2.** *Drum choppers pulled in tandem give effective mechanical control of unwanted vegetation.*

*Stem Density*

Shrubs numbered 53,000 per acre when observed 1 year after chopping, as compared with 167,000 observed on unchopped controls (Table 1). Dieback on chopped plots continued with time, and by the end of the second growing season shrubs had declined an additional 12%, a total reduction of 80%. Of the four most abundant species, dwarf liveoak was the least affected but had a 67% stem reduction after 2 years. Fetterbush had the greatest loss, an 86% kill during this same period. Saw-palmetto, normally regarded as the most troublesome shrub on these ranges, was reduced by 83%.

Dwarf liveoak, the most important shrub with wildlife food value (acorns), comprised 28% in the normal shrub population (control plots) but increased to 44% 2 years after chopping. Fetterbush, on the other hand, comprised 36% of the shrub population on the control plots and only 24% 2 years after chopping. Percentage composition of lyonia (14%), saw-palmetto (10%), and other shrubs (12%) remained about the same.

Total stems increased an average of about 1% between the first and second year on control plots. Species with wildlife food value, mainly dwarf liveoak, increased almost 14% during this period.

*Crown Coverage*

Chopping reduced shrub crown coverage, which averaged 44% on the control plots, to 8% 1 year after chopping (Table 2). It was apparent that chopping killed a

majority of the shrubs and greatly reduced the size of those surviving, although many remaining plants appeared to be recovering. Despite natural thinning, crown coverage in most instances increased slightly, about 3% the second year. Dwarf liveoak was again the least affected, while fetterbush recovered the most rapidly. Saw-palmetto, although few in number, accounted for over one-half of the total shrub coverage on control plots. Chopping reduced the cover of this plant from 24% to 3%.

The shrub cover on untreated range was composed of 54% saw-palmetto, 16% dwarf liveoak, 16% fetterbush, and 7% lyonia. Two years after chopping, saw-palmetto was reduced to 31%, while dwarf liveoak increased to 29% and fetterbush increased to 28%. Lyonia's percentage composition was unchanged.

Total shrub cover on the control plots increased from 44% the first year to 57% the second year (2nd and 3rd year after burning), a 28% increase in cover. Saw-palmetto cover increased 26%, dwarf liveoak 56%, and other shrubs about 18%.

**Table 2. Shrub cover 1 and 2 years after chopping and percentage change as compared with unchopped controls.**

| Species | % Cover | | | % Change | |
|---|---|---|---|---|---|
| | Control | 1 year | 2 years | 1 year | 2 years |
| Saw-palmetto | 24 | 3 | 3 | 88 | 88 |
| Dwarf liveoak | 7 | 2 | 3 | 67 | 63 |
| Fetterbush | 7 | 1 | 2 | 88 | 64 |
| Lyonia | 3 | 1 | 1 | 82 | 79 |
| Other | 3 | 1 | <0.5 | 48 | 81 |
| Total or average | 44 | 8 | 9 | 82 | 79 |

### Herbage Production

Analysis of variance did not indicate significant differences in herbage production among treatment periods. A number of plots were discarded as a result of accidental heavy cattle grazing; therefore, data on herbage production were meager and probably were not sufficiently sensitive to prove whether season of chopping had a significant impact. Numerical differences were not great, however, and there is some question as to whether these differences would be important had they been statistically significant.

Control plots were not a part of the design for estimating herbage response because the primary purpose of this part of the study was to determine the best season for chopping. However, chopping generally is known to have significant, long-term effects on herbaceous vegetation (Hilmon et al., 1963; Lewis, 1970; Yarlett, 1965; Yarlett and Roush, 1970). Ocular comparisons with adjoining untreated range seemed to further substantiate this generalization. Two years after chopping, range recovery appeared to have reached maximum herbage production, which averaged 5,400 lb/acre dry weight (Table 3). This average can be compared with a production of 3,600 lb/acre 2 years after burning on nearby unchopped, ungrazed native range (Hilmon and Lewis, 1962).

### Composition Changes

The most obvious effect of chopping herbaceous vegetation was the drastic reduction of pineland threeawn and subsequent replacement by a variety of more desirable species. Two years after chopping, pineland threeawn comprised only 22% of the total herbage by weight. This figure can be compared with the 80% normally expected on wiregrass range 2 years after burning (Hilmon and Lewis, 1962). Differences in reduction of pineland threeawn did not appear important with respect to season of chopping.

Species observed on sample plots after treatment consisted of 18 grasses, 5 grasslikes, and 18 forbs. The relative importance of these changed with time. Among the dominant species, for example, percentage of distribution among the plots at each sampling time was as follows:

| | 6 months | 12 months | 24 months |
|---|---|---|---|
| Grasses | 46 | 67 | 100 |
| Grasslikes | 27 | 22 | 0 |
| Forbs | 27 | 11 | 0 |
| Total | 100 | 100 | 100 |

Species that were rated as good cattle forage by Hilmon (1964) were most important on 60% of the sample plots at the end of the first growing season and on 92% of the plots after two seasons. Most abundant were delicate panicum (*Panicum chamaelonche* Trin.) and broomsedge bluestem (*Andropogon virginicus* L.). These comprised about one-half of the desirable herbage.

Plants of value to wildlife were the most important species on 57% of the plots after 1 year but on only 17% of the plots after 2 years. The most important were delicate panicum and little razorsedge (*Scleria georgiana* Core). A number of low panicums (mainly *Panicum polycaulon* Nash), barestem paspalum (*Paspalum longepedunculatum* LeConte), and downy milkpea (*Galactia volubilis* (L.) Britt.) were also common. Little razorsedge and several desirable forbs, although present, were of little importance by the end of the second year.

## Discussion

Saw-palmetto crown cover averages about 20% on south Florida ranges but may frequently be higher (Hilmon, 1968; Yarlett, 1965). Hilmon and Lewis (1962) found shrub weight to be variable, at times totaling 400 lb/acre or more. Over 90% of this total is typically saw-palmetto. They also found total herbage production on ungrazed ranges to average about 3,600 lb the second year after burning, of which some 75 to 80% was pineland threeawn. This species is desirable forage during a period of only 3 or 4 months after the range is burned. Desirable forage grasses, such as bluestems, panicums, and goobergrass, normally account for up to 10% of the yields, while grasslikes and forbs make up the remainder.

Flatwoods ranges are typically burned every 2 or 3 years during the winter to slow the spread of saw-palmetto coverage and to improve pineland threeawn forage (Hilmon and Lewis, 1962). When the

**Table 1. Stems per acre 1 and 2 years after chopping and percentage change as compared with unchopped controls.**

| Species | Thousand stems/acre | | | % Change | |
|---|---|---|---|---|---|
| | Control | 1 year | 2 years | 1 year | 2 years |
| Saw-palmetto | 17 | 4 | 3 | 75 | 83 |
| Dwarf liveoak | 47 | 24 | 16 | 50 | 67 |
| Fetterbush | 60 | 12 | 8 | 79 | 86 |
| Lyonia | 23 | 8 | 5 | 66 | 78 |
| Other | 20 | 5 | 3 | 74 | 83 |
| Total or average | 167 | 53 | 35 | 68 | 80 |

**Fig. 3.** *After chopping, unwanted vegetation is replaced with species more useful to cattle and wildlife.*

range is burned, accumulated mulch is removed and plants are stimulated to produce a more nutritious regrowth. This practice also temporarily produces a greater variety of annuals and other plants, a condition beneficial to quail (Frye, 1954) as well as cattle. Without frequent burning, saw-palmetto will increase annually at a rate of between 2 and 3%, and pineland threeawn will build up a dense, low-quality rough virtually devoid of other herbaceous species. Forage nutrient content rapidly drops below acceptable levels, and desirable forage and wildlife food species soon disappear.

When cattle grazing or wildlife habitat is the management objective, a long-lasting treatment that favorably alters species composition seems much more desirable than frequent burning. Chopping appears to accomplish this alteration. In the present study, a shrub cover of nearly 50% was reduced to less than 10%. The two most troublesome species, saw-palmetto and pineland threeawn, were reduced by almost 90%. Although herbage production was reduced the first year, range recovery appeared complete by the end of the second year (Fig. 3), with a significant increase in herbage yield (avg 5,400 lb/acre). Other workers have obtained similar results (Hilmon et al., 1963; Lewis, 1970; Yarlett, 1965; Yarlett and Roush, 1970). Less desirable species were replaced in part by a variety of plants more useful to cattle and wildlife and less hazardous as wildfire fuels.

**Table 3. Accumulated herbage yields (lb/acre) at 6, 12, and 14 months after chopping.**

| Herbage | 6 months | 12 months | 24 months |
|---|---|---|---|
| Pineland threeawn | 100 | 300 | 1,200 |
| Other | 600 | 2,700 | 4,200 |
| Total | 700 | 3,000 | 5,400 |

Increases in saw-palmetto cover the second year after chopping were the result of increased plant size rather than increases in numbers. Other shrubs observed in this study, however, appear to recover rapidly. Most flatwoods shrubs with the exception of saw-palmetto are rhizomatous, fire-resistant, and tend to sprout when injured. For example, common gallberry (*Ilex glabra* (L.) A. Gray), a troublesome shrub in the flatwoods of Georgia and Florida, is only temporarily reduced by chopping (Wilhite and Harrington, 1965). Fetterbush, and possibly dwarf liveoak, appeared to react similarly on the south Florida flatwoods site.

Desirable quail foods—mainly *Scleria* spp. and miscellaneous forbs—were abundant the first year but were rapidly replaced by perennial grasses. Frye (1954) found annual razorsedge (*Scleria muhlenbergii* Steud.), paspalum, and partridgepea (*Cassia aspera* Muhl.) to be greatly increased following disking with a farm-type harrow, but production fell off drastically the second and third years. After 2 years, the only useful quail food of importance was delicate panicum.

For best kills of saw-palmetto in south Florida, chopping should probably be done during dry weather (Hilmon et al., 1963; Lewis, 1970, 1972). For example, Lewis (1972), working on range adjoining that of the present study, observed a saw-palmetto coverage of less than 1% within 6 months after chopping in May, 1965. In the present study, plots chopped in May, 1966, resulted in a residual saw-palmetto cover of 7% when sampled after the first growing season. May, 1966, had above-average rainfall. May normally receives about 4 inches of rain, but less than 1 inch fell during the month in 1965. These kills may be compared with those for earlier, drier months during which saw-palmetto cover averaged 1% to 2% after one growing season.

In summary, evidence of this study and similar studies suggests that double-chopping is an effective, long-lasting treatment for the improvement of cattle ranges in south Florida, especially when completed during dry weather. This practice also benefits wildlife, especially quail, but the effects are short lived. If a sustained supply of important quail foods (mainly annuals) is to be provided, frequent soil disturbance will be necessary.

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