

Effect of Season of Treatment on Girdling and Chemical Control of Oak and Sweetgum

R. D. Shipman

Southeastern Forest Experiment Station,
Forest Service,
U. S. Department of Agriculture

WITHIN THE LAST DECADE, information dealing with control of undesirable trees has become voluminous. However, one of the least understood factors associated with various methods of control is season of treatment and how it can be most advantageously used in forest management.

Grano (2) found that the most rapid and complete kill of southern red and post oaks in southern Arkansas was obtained by girdling in the spring, particularly in May. Girdling during this period of the growing season also materially reduced the number of live sprouts, but had no effect upon the size of the sprout clump. Arend (1) found that chemical-in-frill treatments in the summer and fall (July through October) gave best results in lower Michigan. Similar information is lacking over a wide range of species in the South.

The purpose of the study described here was to determine the effectiveness of 2, 4, 5-T applications in frills and of simple frill-girdles made at different seasons of the year. Because these treatments require a considerable period of time to be fully effective, short-term observations may be misleading. In this study observations were continued until it was evident that no more trees would die from the treatments. The results have been combined in a table that can be used to make reasonably accurate estimates of the time needed for a desired level of release under Coastal Plain conditions. Similar tables can be developed for any locality and species by determining the seasonal effect of the treatments on both the amount and speed of mortality.

Experimental Setup

The investigation was conducted on the Santee Experimental Forest near Charleston, South Caro-



FIG. 1.—Method of applying 2, 4, 5-T in a single frill-girdle.

lina. Beginning in February 1953, groups of 20 trees each of three major hardwood associates of loblolly pine were treated every month for 12 months. These associates were willow oak (*Quercus phellos* L.), post oak (*Quercus stellata* Wangenh.), and sweetgum (*Liquidambar styraciflua* L.). One-half of the trees were frill-girdled by means of overlapping ax cuts made at a convenient chopping

height, and the remaining half were frill-girdled and a water mixture of 2, 4, 5-T (4 pounds acid equivalent in 50 gallons of mixture) applied (Fig. 1). No treatments were made after January 1954.

The trees were selected at random from several loblolly pine-hardwood stands. All selected trees were within a diameter range of

TABLE 1.—THE AVERAGE DIAMETER AND THE DISTRIBUTION ACCORDING TO CROWN CLASS OF OAK AND SWEETGUM TREES SELECTED FOR CHEMICAL TREATMENT OR GIRDLING

Crown class	Distribution of stems		Average d.b.h.	
	Oaks	Sweetgum	●aks	Sweetgum
	Percent		Inches	
Dominant	2	2	12.3	12.8
Codominant	8	7	10.1	11.6
Intermediate	80	82	9.3	9.7
Suppressed	10	9	7.9	8.0

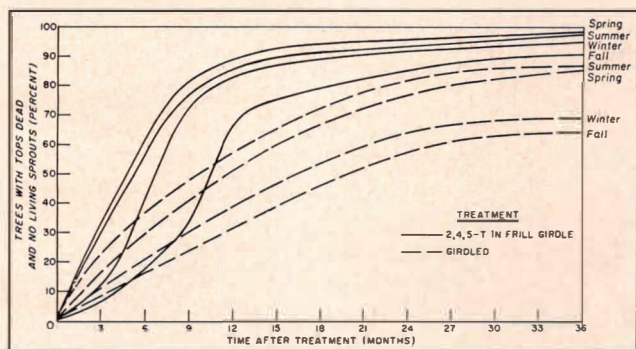


FIG. 2.—Cumulative percentage of willow oak and post oak trees dead, in relation to months after girdling or treatment with 2, 4, 5-T in frills in different seasons.

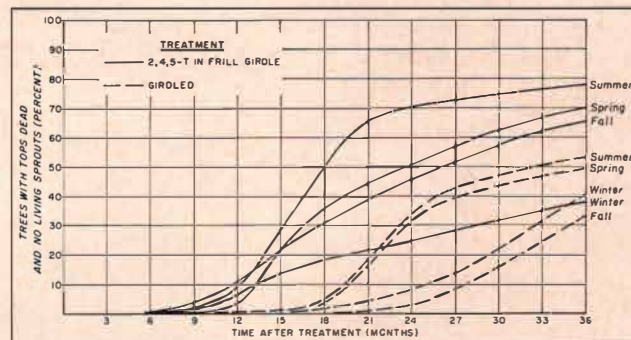


FIG. 3.—Cumulative percentage of sweetgum trees dead, in relation to months after girdling or treatment with 2, 4, 5-T in frills in different seasons.

TABLE 2.—RELATION OF SPROUTING TO TIME AFTER TREATMENT

Treatment and time after treatment	Growing season		Dormant season	
	Oaks	Sweetgum	Oaks	Sweetgum
Percent of trees with sprouts				
Girdled				
24 months	14	49	33	62
36 months	10	19	17	20
2, 4, 5-T in frills				
24 months	7	26	7	48
36 months	5	9	4	11

6 to 13 inches d.b.h., as previous investigations have shown that the chemical-in-frill treatment of trees less than about 6 inches d.b.h. is not practical or economical. Furthermore, stems above 13 inches d.b.h. usually do not sprout profusely. Only trees that appeared to be of seedling origin were selected. The majority of trees were in the intermediate crown class, as is often the case before cutting in pine-hardwood stands of this locality (Table 1).

Each treated tree was examined at 3-month intervals for the first 12 months after treatment. Subsequent observations were made at 6-month intervals and were terminated at the beginning of the third growing season after the last treatment (April 1957).

During the growing season treated trees were rated as follows: (1) dead crown, no sprouts, (2) dead crown, living sprouts, and (3) living crown. For living crowns the percent of crown dead was recorded. In the dormant season, mortality was judged by the presence or absence of live cambial tissue.

To facilitate analysis of the data,

the treatments were grouped by season as follows: spring (March, April, May); summer (June, July, August); fall (September, October, November); and winter (December, January, February). Phenologically, these groups of months in the Charleston area correspond to early growing season, late growing season, early dormant season, and late dormant season, respectively.

Results

Mortality.—Observations over a period of two or more years showed some difference between species in response to treatment and season of application (Figs. 2 and 3). Sweetgum was the most difficult to kill, while willow oak was easiest. In general, 2, 4, 5-T in frills resulted in faster and more complete kill (dead crown, no sprouts) than girdling, and growing season treatments resulted in faster kill than dormant season treatments.

There were some exceptions to these general effects. Girdling in spring or summer killed more sweetgum trees than 2, 4, 5-T applied in winter and killed almost as many oak trees as 2, 4, 5-T ap-

plied in summer, but the oaks died sooner after the chemical treatment (Fig. 3).

This test also showed that the amount and the rate of complete kill are not necessarily related. Trees continue to die for as long as two years after girdling or chemical application; consequently, at least that length of time must pass before the effect of treatment can be accurately evaluated.

Sprouting.—Approximately 30 percent of all trees had produced living sprouts two years after treatment. The major portion of this sprouting occurred on sweetgum. By the end of the third year, however, only 12 percent of all treated trees bore living sprouts (Table 2).

Close observation of the phenological development of sprouts in this test indicated that most of the remaining sprouts would die within the next two or three years. Examination of trees which sprouted after the first growing season showed a general discoloration of foliage and decline in vigor during the third season after treatment. Even where most aggressive, sprouts probably would not hinder advanced reproduction to any great extent (Fig. 4). Most of the sprouts were less than 3 feet in height and arose from the basal portion of the treated stems.

Growing-season treatments were more effective than dormant-season treatments in suppressing early sprouting, but after 36 months



FIG. 4.—The maximum degree of sprouting on an 8-inch sweetgum girdled in the dormant season. This was after three years. The test indicates that most of such sprouts die within three years after girdling.

there was not much difference attributable to the season of treatment (Table 2). Although chemically treated trees produced less than one-half as many sprouts as girdled trees, this final difference (at 36 months) was at such a modest level that it is not very important silviculturally.

The results of girdling solely, as compared with the results of girdling and treating with 2, 4, 5-T in water, have been summarized in terms of average number of months from the time of treatment till the attainment of 50 percent and 70 percent mortality (Table 3). In addition, values found in an earlier test (3) are given for frilled sweetgum treated with 2, 4, 5-T in oil. Although the results of a particular control operation will vary with weather, thoroughness of treatment, size of trees, and other factors, the table may help land managers to select a time and treatment for accomplishing a given degree of release in the South Atlantic Coastal Plain area.

Literature Cited

1. AREND, JOHN L. 1955. Chemical frill girdling in summer and fall gives best results in lower Michigan. U. S. Forest Serv. Lake States Forest Expt. Sta. Tech. Note 438, 1 p. (Processed.)
2. GRANO, CHARLES X. 1955. Behavior of south Arkansas oaks girdled in different seasons. Jour. Forestry 53: 886-888, illus.
3. SHIPMAN, R. D. 1955. Better sweetgum control with 2,4,5-T. U. S. Forest Serv. Southeast. Forest Expt. Sta. Research Note 84, illus. (Processed.)

TABLE 3.—MONTHS BETWEEN TREATMENT AND ATTAINMENT OF 50 PERCENT AND 70 PERCENT MORTALITY IN WILLOW OAK, POST OAK, AND SWEETGUM

Season of treatment	50 percent or greater mortality ¹						70 percent or greater mortality					
	Girdle			2,4,5-T in water ²		2,4,5-T in oil ²	Girdle			2,4,5-T in water ²		2,4,5-T in oil ²
	Willow oak	Post oak	Gum	Oaks ³	Gum	Gum	Willow oak	Post oak	Gum	Oaks ³	Gum	Gum
Months												
Early growing season (March, April, May)	9	17	36	5	23	6	14	33	36	7	34	8
Late growing season (June, July, August)	11	8	36	5	18	7	16	21	36	8	23	9
Early dormant season (Sept., Oct., Nov.)	17	23	36	10	26	12	27	36	36	13	36	18
Late dormant season (Dec., Jan., Feb.)	15	19	36	7	36	24	22	36	36	9	36	36
All seasons	13	17	36	7	26	12	20	32	36	9	33	14

¹Mortality means top killed and no living sprouts.

²4 lbs. acid equivalent of 2,4,5-T in a 50-gallon mixture applied in frills.

³Willow and post oaks.