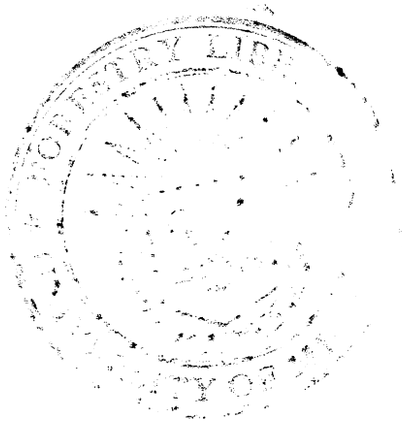

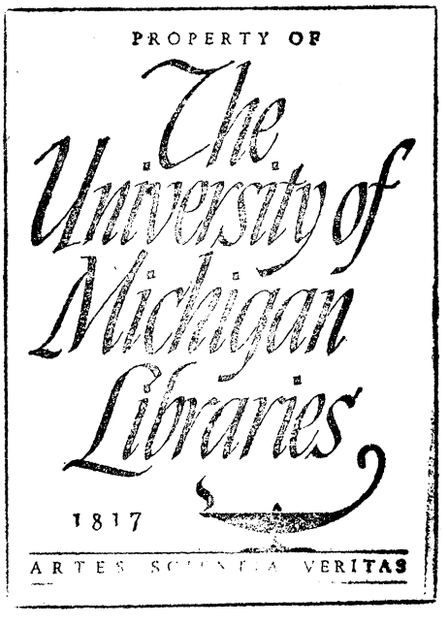

A

Treatment of Hardwood Stumps to Prevent Sprouting

Elton C. Twork

School of Forestry & Conservation

University of Michigan

June 1936

Silvicultural Problem
by
Professor L. J. Young.

Table of Contents.

Treatment of Hardwood Stumps to Prevent Sprouting

Introduction.

One of the thorns in the side of the silviculturist is the competition which sprouting stumps give seedling reproduction. No small amount of time and money has been spent in cutting-back stump sprouts in order that seedlings will have a chance to survive this coppice reproduction.

Chapman and Bull (1) in their work on "Killing Undesirable Hardwoods in Southern Forests" indicate that poison is a quick method of killing undesirable trees. MacKinney and Korstian (2) in a similiar study recommend poisoning as the most ecomonical and most effective way of eliminating certain undesirable hardwood species from the stand.

Experiments have been carried on at the University of Michigan for a number of years on the poisoning of stumps to prevent sprouting. Experiments by L.J.Young have shown good results from the use of creosote. S.D. Anderson in 1921 working on ironwood stumps showed that creosote gave best results when applied to a complete girdle or "Frill" around the base of the stump, and that the application of the poison to auger holes

---

(1) Bull,Henry and Chapman,R.A. "Killing Undesirable Hardwoods in Southern Forests". Southern Forestry Exp. Sta. Occasional Paper N). 50.

(2) MacKinney,A.L. and Korstian,C.F. "Felling, Girdling, and Poisoning Undesirable Trees in Forest Stands". Journal of Forestry, Feb. 1932, pp. 169-177.

bored into the side of the stump was very unsatisfactory. Further work by Ronald L. Bird and others has shown the merits of stump frilling over gashing.

Various chemical compounds and mixtures have been used in experimental studies on sprout prevention. Results thus far have shown trends rather than any definite conclusions as to the classes of chemicals best suited for stump poisons. Ronald L. Bird obtained fair results using zinc sulphate, kerosene, ferric sulphate, and creosote, but his results were not definite and he advised further study. D. Manley Knight experimented with Ferric sulphate and kerosene, and obtained the best results with kerosene.

Chapman and Bull (1) used sodium arsenite, sodium chlorate, calcium chlorate, copper sulphate, ferric sulphate, zinc meta-arsenite, crude carbolic acid, and creosote. Of the 8 miscellaneous poisons in these tests, copper sulphate, ferric sulphate, and a sodium arsenite-sodium chloride-potassium nitrate mixture killed the trees most rapidly, and creosote and crude carbolic acid killed the trees most gradually. Except for the sodium arsenite, copper sulphate, and ferric sulphate treatments, the poisoned trees did not die appreciably more quickly than the merely girdled trees.

Since different investigators using the same poisons have frequently obtained different results, and the results of any one investigator with any one poison frequently show a variability, it is difficult at present to draw any specific conclusions. Con-

sequently further investigations are in order.

Having this in mind and knowing some of the properties of of Picric and Chromic acid, and their use as a fixitive of plant and animal tissue, it seemed reasonable to believe that these materials would work to prevent the sprouting of stumps.

Method of Application.

As past studies have shown that the frill method of applying poison to the stumps gave the best results, this method was used on all of the larger stumps. On the smaller stumps which had been cut close to the ground and where it was impossible to frill the stump without digging around each stump, a method of splitting the cambium away from the wood was used. (See Plate I, Fig.2) . This latter method is similar to frilling but requires more accurate chopping in order that the cuts are not made too deep into the wood,and thus hampering the penetration of the poison. In both methods the cambium is exposed by a complete girdle around the stump. A small hand axe was used for both operations.

Immediately after preparing the stump to receive the poison, the poison was poured into the crevice made between the bark and the wood so as to thoroughly wet the exposed cambium and sapwood. Each stump was tagged and the species and diameter recorded. The different chemical solutions were applied from gallon jugs used in conjunction with rubber stoppers into which were inserted short lengths of glass tubing.

PLATE I.

Condition of Stumps and method of Girdling

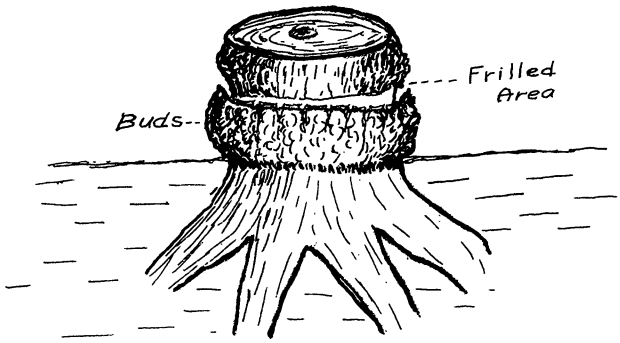

Figure 1

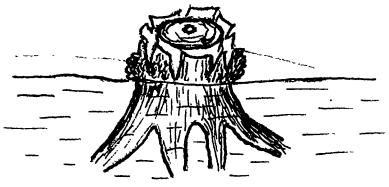

Figure 2.

A total of 100 stumps were poisoned. All of which were located on two plots in Saginaw Forest, the propertry of the School of Forestry & Conservation of the University of Michigan. On the first plot only the stumps of Box-Elder (Acer negundo) were poisoned. Most of these stumps had large masses of well developed buds just above the root collor forming burl-like projections which greatly deformed the stumps, and made treatment difficult. On the second plot, only the stumps of White Ash (Fraxinus Americana) were treated. These were stumps from which sprouts had been cut many times previously. As most of the stumps were very short(nearly level with the ground), the method of splitting the bark away from the sapwood was found to be the most convenient means of exposing the cambium. Upon preparing the stumps for poison, all sprouts were removed.

Season and Weather Conditions

The stumps were treated during the spring months beginning before active growth had started and again when sprouts began to show .

As weather conditions, especially heavy rains immediately following treatment, might effect the results of treatment with these very soluable poisons, a record of the weather was kept from the time of treatment until a week following.

Table 1. Dates of Poisoning and Weather

Date Poisoned	Stump Numbers	Weather condition for week following Treatment
1936		
March 21	101-130	Cold, and cloudy with snow flurries and light showers.
April 17,	131-153	Bright and warm followed by heavy rains two days after treatment.
April 23	154-187	Warm and clear, followed by light rains 3 days after treatment.
May 18	188-200	Warm with highrrelative humidity followed by heavy rains two days after poisoning.

Table 2. Poison Solutions Used

A. Picric Acid -- -- -- Saturated solution-- one gram of Picric acid saturates about 75 c.c. of water

B. Chromic Acid -- -- - 10 gr. Chromic Acid
10 c.c. Glacial Acetic Acid } in one liter of water.

C. Picric Acid & Corrosive Sublimate

Saturated solution of picric acid with 10 grams of Corrosive Sublimate added per liter.

Plot number 1, where frilling was used on Box-Elder stumps numbering from 101-130, were examined on May 9, and showed the following results:

Table 3.

Stump Number	Diameter	Poison	Number of Sprouts	Location of Sprouts
101	12"	Picric Acid	20	Mostly below frill
102	6"	"	5	Root collar
103	6"	"	8	" "
104	6"	"	3	" "
105	8"	"	6	" "
106	12"	"	10	" "
107	6"	"	8	" "
108	15"	"	15	" "
109	5"	"	5	" "
110	6"	"	4	" "
111	6"	"	5	" "
112	7"	"	5	" "
113	8	"	5	" "
114	6	"	None	" "
115	4	"	None	" "
116	3	Chromic Acid	4	" "
117	3	"	3	" "
118	3	"	5	" "
119	10	"	8	" "
120	4	"	None	" "
121	5	"	6	" "
122	6	"	7	" "
123	4	"	4	" "
124	12	"	14	" "
125	2	"	4	" "
126	2	"	6	" "
127	3	"	5	" "
128	3	"	3	" "
129	4	"	7	" "
130	2	"	None	-

Two stumps girdled without treatment gave the following results:

1	10"	42	42	22 sprouts below girdle, 20 above.
2	5		26	18 below girdle, 8 above " .

The poison was found to penetrate downward from the bottom of the girdle for a distance of 4 inches and above the girdle for about an inch, when applied to the normal portions of the stump.

Where the frill was made through the large bud masses, the poison penetrated only about two inches, and beyond this the buds sprouted.

Since the poison worked well to kill those portions of the stump which were without large abnormal masses of buds, a different method of preparing these stumps was used . By this method the projecting masses of buds were cut from the stump, and poison applied to the exposed sapwood and cambium. Stumps numbering 188 to 200 were treated by this method on May 18.

June 9, stumps numbering 188 to 200 on plot 1, and 131 to 187 on plot 2 were examined and showed the following results:

Table 4.

Species- White Ash			Poison- Picric Acid & Corrosive Sublimate Mixture.
NO. of Stump	Diameter	No. of Sprouts	Location of Sprouts
131	5"	4	On root collar
132	4"	5	"
133	6	7	"
134	5	3	"
135	7	6	
136	4	8	Root suckers
137	4	8	" "
138	4	5	On root collar
139	5	8	Root suckers
140	4	9	" "
141	5	6	" "
142	5	10	" "
143	4	4	From root collar
144	4	9	" " "
145	4	5	" " "
146	4	6	Root suckers
147	10"	Basswood,9	One side of stump killed.
148	5	7	Root suckers
149	4	7	" "
150	5	5	" "
151	4	10	Root collar
152	4	6	" "
153	5	6	Root suckers
154	5	8	" "

Table 4 (continued)

Species- White Ash		Poison-Picric Acid & Corrosive Sublimate mixture	
NO. of Stump	Diameter	No. of Sprouts	Location of Sprouts
155	4"	2	Root suckers
156	4	4	Root collar
157	4	8	" "
158	5	7	" "
159	4	10	" "
160	4	8	" "
161	4	4	" "
162	8	4	" "
163	4	5	" "
164	4	3	Root suckers
165	5	5	" "
166	4	5	" "
167	5	4	Root collar
168	5	3	" "
169	4	none	
170	5	none	
171	4	none	
172	4	2	" "
173	6	3	" "
174	7	none	
175	6	none	
176	4	none	
177	5	3	" "
178	3	none	
179	4	2	" "
180	5	4	" "
181	4	none	
182	6	5	" "
183	3	none	
184	2	none	
185	3	2	" "
186	4	none	
187	7	none	
188			

Species Box-Elder		Poison Picric Acid	
188	14"	None	
189	6	None	
190	6	7	Root collar, sickly foliage
191	6	None	
192	7	None	
193	12	8	Root collar
194	6	None	
195	16	8	Root collar, foliage sickly
196	5	None	
197	6	None	
198	7	None	
199	6	none	
200	9	4	Root collar

The average number of sprouts from stumps girdled but not treated was 17 for Ash, and 22 for Box-Elder.

Examination of Results, and Conclusions:

From examination of results it is evident that Picric Acid is a successful stump poison. In all case where it did not prevent sprouting, it decreased the number of sprouts from each stump. The principal reason that more stumps were not killed was the difficulty in completely exposing the cambium close enough to the root collar to prevent this area from sprouting. Only in a few cases did the Ash stumps sprout above the girdle; and in these cases it was because of the difficulty of completely girdling these queer shaped short stumps.

On the Box-Elder stumps, a frill made throught the bud masses at the root collar was unsatisfactory. The structure of this abnormal wood made the penetration of the poison difficult so that the inward penetration was not deep enough to kill the sap wood supplying these buds. It was not until these bud masses were removed and poison applied close to the root collar that satisfactory results were obtained. (Stumps numbering 188-200).

Chromic acid has given fair results in reducing the number of sprouts per stump. The penetration of this poison is more difficult to determine than is Picric Acid which dyes the wood. However, no sprouts occurred where the structure of the wood below the frill was normal.

The mixture of Picric Acid and Corrosive Sublimate did not show any merits above the use of Picric Acid alone. In all

cases sprouts resulted from failure to completely expose the cambium to the effects of the poison. In many cases, most of the area of the stump was killed.