CHEMICAL SPOT DISSEMINATOR:

a new aid in reforestation

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Dybar and Simazine used in combination have shown promise for chemical site preparation in spots where competition and frost damage cause heavy white spruce losses in clearcut areas. Three foot diameter spots treated in August 1968 in Ontario showed complete eradication of a wide variety of weeds. Spots thus treated, devoid of weeds with partial coverage all around, provide ideal conditions for early establishment of white spruce. Development of the Swastika Chemical Spot Disseminator in the spring of 1970 allows treatment of larger areas at relatively low cost.

Parts of the boreal forests of Ontario are areas consisting of sandy loam, loam, silt loam, fine sands, clays and tills, and supporting either a mixed crop (aspen, birch, spruce, fir) or stands of predominantly hardwood species (aspen and white birch) . Large acreage cuts every year in these areas cause great difficulty in regeneration because of the heavy competition stimulated. The main problem is the profuse growth of grasses, brush, and other weeds following logging operations, which impede the growth of planted seedlings by intercepting light and mechanically smothering. Various methods of site preparation - such as aerail spray with 2,4-D and 2,4,5-T, prescribed burns, mechanical scarification, and combinations of these - have been tried with only marginal success. Mechanical treatment of these areas in most cases induces more competition.

Because of its ability to withstand some competition, white spruce is the main species planted on such sites. When trees in these areas do push through the weeds, they are usually frost-damaged year after year, become bushy in form, and grow very little. However, in many areas, attempts to successfully regenerate white spruce in pure stands under clearcutting have generally failed (less than 50 percent survival) .

Treating Weedy Areas

To overcome the two main factors responsible for losses (competition and frost damage) , an attempt was made in August 1969 in Sharpe Township, Swastika District, to chemically "sterilize" spots 3 feet in diameter, 8 feet apart from center to center, in rows 7 feet apart, for subsequent planting with white spruce. The idea was to have weed-free spots of reasonable size with partial coverage, an ideal growing condition for white spruce - which would also protect against frost damage. The chemical used was a mixture of Dybar (25 percent active fenuron, in pellet form) and Simazine (4G) (4 percent granular), applied at the rate of 80 lbs. of Dybar (20 lbs. active) and 150 lbs. of Simazine (6 lbs. active) per acre, by hand, with cups which measured the exact amounts.

The amount of Simazine and Dybar applied to each spot 3 feet in diameter (7 square feet) was as follows:

$$\text{Simazine 4G} = \left\{\left\{\begin{array}{l}100 \div \\ 4\ (\text{ai}^*/100)\ \times 6\ (\text{desired rate})\ \times 453.59\ (\text{grams/lb.}) \\ \qquad\qquad \times 7\ (\text{spot area}) \\ \qquad\qquad \div 43{,}560\ (\text{square feet/acre})\end{array}\right\}\right.$$

$$= 10.9 \text{ grams}$$

(equivalent to 6 lbs. active ingredient per acre)

$$\text{Dybar} = \left\{\left\{\begin{array}{l}100 \div \\ 25\ (\text{ai}^*/100)\ \times 20\ (\text{desired rate})\ \times 453.59 \times 7\ (\text{spot area}) \\ \qquad\qquad \div 43{,}560\ (\text{square feet/acre})\end{array}\right\}\right.$$

$$= 5.8 \text{ grams}$$

(equivalent to 20 lbs. of active ingredient per acre)

Total mixture per spot = 16.7 grams.

* ai stands for active ingredient per 100

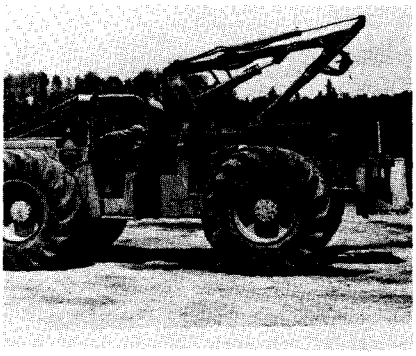


Figure 2. Spot disseminator shown mounted on pulp forwarder

The area was a poplar cutover (cut during 1959) on fresh silt loam, scarified in the fall of 1968 with shark finned barrels, and completely overgrown with weeds by July 1969. The predominant weed species in the area were: grasses, raspberry, bush honeysuckle, asters, bracken fern, fireweed, yarrow, pearly everlasting, spreading dogbane, poplar suckers, alder, and pin cherry.

About 800 spots were treated per acre over an area of 5 acres. By spring of 1970, all the weeds within the treated spots had been killed. Encouraged by the results, we developed a piece of equipment (completed in June 1970) to spot-treat larger areas at relatively small costs. It is described in the following paragraphs.

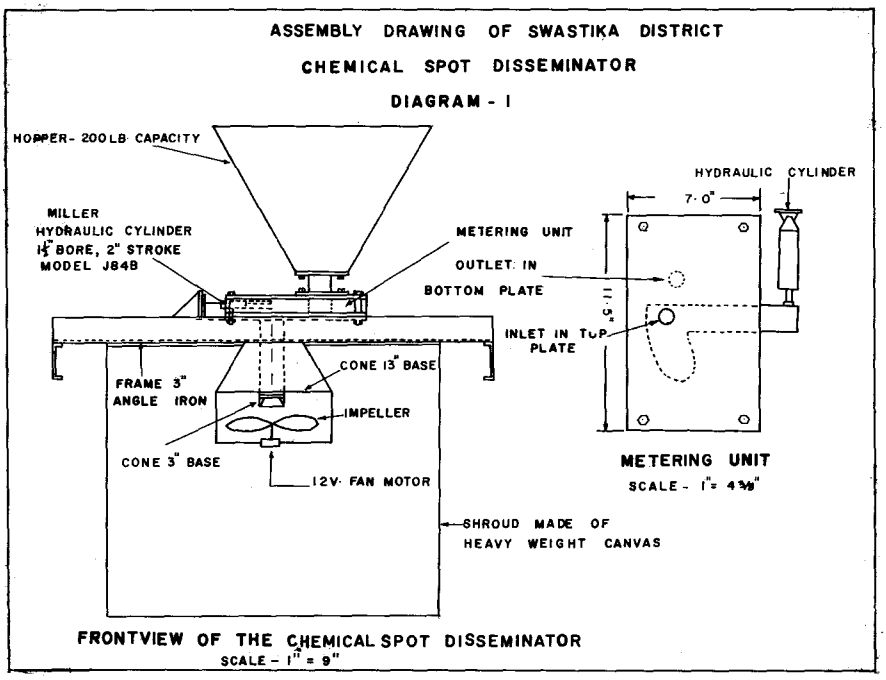
The Equipment

The key mechanism in the *spot disseminator is* a metering unit, w h i c h takes a predetermined amount of chemical from a hopper (200 lbs. capacity) fed by gravity, through an inlet and oscillates in a clockwise direction, dropping the chemical through an outlet and coming back to the starting position in a fraction of a second.

The chemical flows down through a plastic pipe and is spread by an electric fan the instant it hits the blades, and a 3 foot diameter spot is created by a shroud made of heavyweight canvas hanging around the fan, at a height of 21/4 feet from the ground. The hopper, metering unit, fan, and shroud are attached to a frame mounted on a Timberjack Pulp Forwarder (230) (diagram 1).

The rate of chemical flow can be changed by placing an appropriate ring in the measuring cup. The metering unit is made of stainless steel, precisely machined. The metering block is actuated by a 2-inch stroke industrial hydraulic

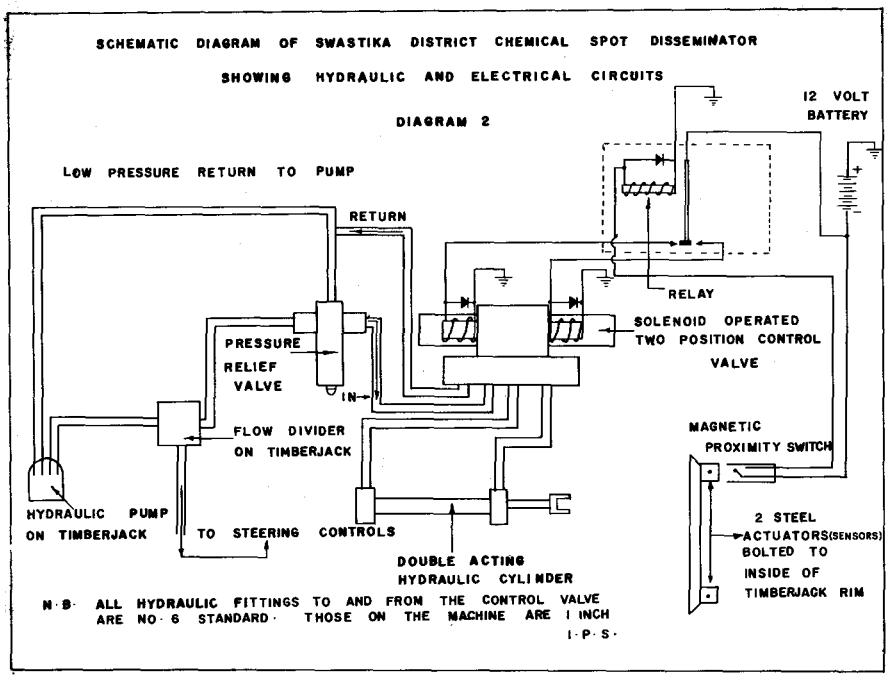
Figure 1. A view of the untreated area



cylinder 1 1/2 inches in diameter. The stroke of the cylinder is controlled by a solenoid-operated (12 volt D.C.), two-position control valve, which is hooked to the main hydraulic system of the Timberjack Forwarder on one side and the hydraulic cylinder at the other end (diagram 2). The solenoid is actuated by a magnetic proximity switch ("go switch") located near the axle of the forwarder and positioned in such a way that when a steel sensor (bolted to the rim inside of the wheel) comes within 1/2 inch of the switch, as the forwarder moves, the whole mechanism is triggered, dropping the chemical.

There are two sensors (opposite each other) on the rim, and since the circumference of the forwarder wheels is 15 feet, the spots are made every 71/2 feet from center to center. Two spots are made in one complete revolution of the wheel. The whole mechanism is controlled by a switch mounted in the operator's cabin.

The hydraulic and electrical layout of the Spot Disseminator is shown in diagram 2.



Field Trials

An old poplar cutover with heavy slash and an abundant growth of weeds (130 acres) was treated with this disseminator between June 15 - July 10, 1970, during frequent rainy period. The machine's performance was impressive, proving that the Spot Disseminator can work under all weather conditions, on most difficult sites. The spots were made at equal intervals irrespective of the speed of the tractor. Spot size was uniform and exactly the same amount of chemical was applied to each spot matched by manual application. The pulp forwarder moved at an average speed of 3 miles per hour and treated the area at the rate of 2 acres an hour. The cost of development of the equipment was $1,750.00, which also included some unforeseen expenditures incurred on debugging some of the problems.

Following is the breakdown of operating costs per acre:

Figure 3. A close-up of a treated spot

(Number of spots per acre = *830*)	
Chemical	
Simazine (4G) required per acre (830 spots) gross area @ 10.9 grams/spot.	= 19.9 lbs.
Dybar required per acre (830 spots) of gross area @ 5.8 grams/spot.	= 10.6 lbs.
Cost of 19.9 lbs. of Simazine (4G) @ $0.50/lb.	= $ 9.95
Cost of 10.6 lbs. of Dybar @ $1.34/lb.	= 14.20
Total cost of chemical per acre	= 24.15
Application	
Cost of forwarder per acre ($10/hr. (rental) [1] x 0.5 hr./acre)	= $ 5.00
Overhead cost per acre	= 3.00
Cost of application per acre	= 8.00
Total operating cost per acre (chemical + application)	= 32.15

[1] Includes operator