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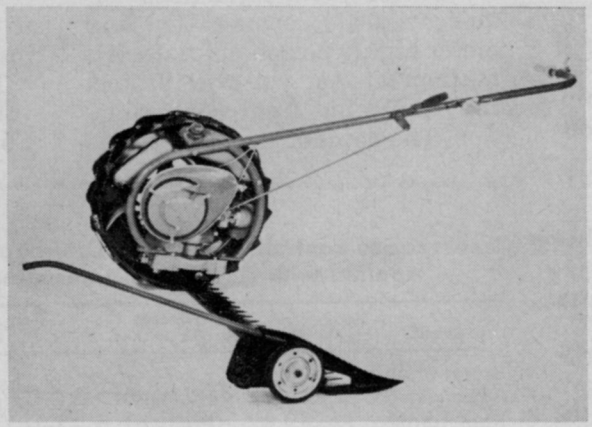

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New Injection System for **Killing or Curing Trees**

By MICHAEL NEWTON
Assistant Professor of Forest Science
Oregon State University, Corvallis

CONVENTIONAL equipment used to control undesirable trees is often bulky, wasteful of chemical, and awkward to use on multiple stems or many-forked trunks. A new injection instrument, the Hypo-Hatchet, has given consistent plant control results on a variety of hardwoods and conifers. Unlike most injectors and hand spray equipment, it can be operated without serious problems.

Impact Injects Dose

This new, lightweight hatchet is a precision instrument. It weighs about 3 lbs. and operates automatically upon impact. No chemical is released until the blade has penetrated its target. A check valve system eliminates drip from chemical outlet holes in the hatchet blade, and the chemical reservoir is lightweight plastic, carried or worn anywhere that is comfortable for the user. A self-priming, positive-dislacement pump supplies a consistent chemical flow, even if the reservoir is worn below the hatchet usage level. Under steady use, one full reservoir, about 2½ lbs., should last roughly one-half a day at injection rates of 0.5 ml. per cut. Any dosage volume up to 1 ml. may be calibrated, and production models will deliver more.

Hatchet injector blade is wedged into the vascular system of a tree for treatment. Only small, predetermined chemical doses are injected at each impact.

New Hypo-Hatchet injects tree curing or killing chemicals through small holes just above the sharpened edge of its blade. Liquid is fed from the flexible tubing through the hatchet handle and is closely metered by a check valve system.

Many injected compounds are effective and have limited foliage toxicity (see Table). Additional combinations of chemicals for the treatment of more species will be found.

Hatchet Used for Systemics

Use of the Hypo-Hatchet is not limited to tree killing. Control of insects with systemics requires a sealed system that will meter highly poisonous materials with precision, yet will protect the applicator from contamination. The hatchet is ideally suited for insecticides now in use. Antibiotics for tree disease control, such as Actidione in blister rust control, may be applied more efficiently with this system than with current methods. However, formulations of healers or killers first must be matched for compatibility with the vascular system of the treated tree or plant species.

This system should find wide usage in many aspects of vegetation management. Benefits will be labor savings for tree thinning, forest and tree stand improvement, rights-of-way conifer control and other uses, combined with its versatility for systemic insect and disease control.

The Hypo-Hatchet is being developed by the Ansul Chemical Co. in Marinette, Wisconsin.

Chemical reservoir is worn at waste level and a pump supplies a constant even flow of liquid to the hatchet's check valve system. This worker is injecting a modern chemical which minimizes sprouting.

Tree species controlled with undiluted compounds. All treatments were applied with 0.5 ml. injections spaced at various distances.

Species	Herbicide (0.5 ml.)	Cut Spacing (inches)	Trade Name (remarks)
Sugar maple	2,4-D amine	3	Weedar 64
	Picloram + 2,4-D	6	Tordon 101
Red maple	Picloram + 2,4-D	3	Tordon 101
Prunus spp. (cherries)	2,4-D amine	9	Dow formula 40
	Picloram + 2,4-D	9	Tordon 101
	Cacodylic acid	9	Ansar 160
Bigleaf maple	Picloram	6	Tordon 22K
	Potassium silvex	6	Kurosal SL
Red alder	2,4-D amine	3	Dow formula 40
	Dicamba	6	Banvel-D
Douglas fir	Cacodylic acid	9	Ansar 160
	Picloram + 2,4-D	9	Tordon 101 (Root graft problems)
	Picloram	9	Tordon 22K (Root graft problems)
Sitka spruce	Picloram + 2,4-D	6	Tordon 101
Western hemlock	Cacodylic acid	6	Ansar 160
	Picloram + 2,4-D	6	Tordon 101
Grand fir	Picloram + 2,4-D	6	Tordon 101
	Cacodylic acid	6	Ansar 160
Eastern white pine	2,4-D amine	6	Weedar 64

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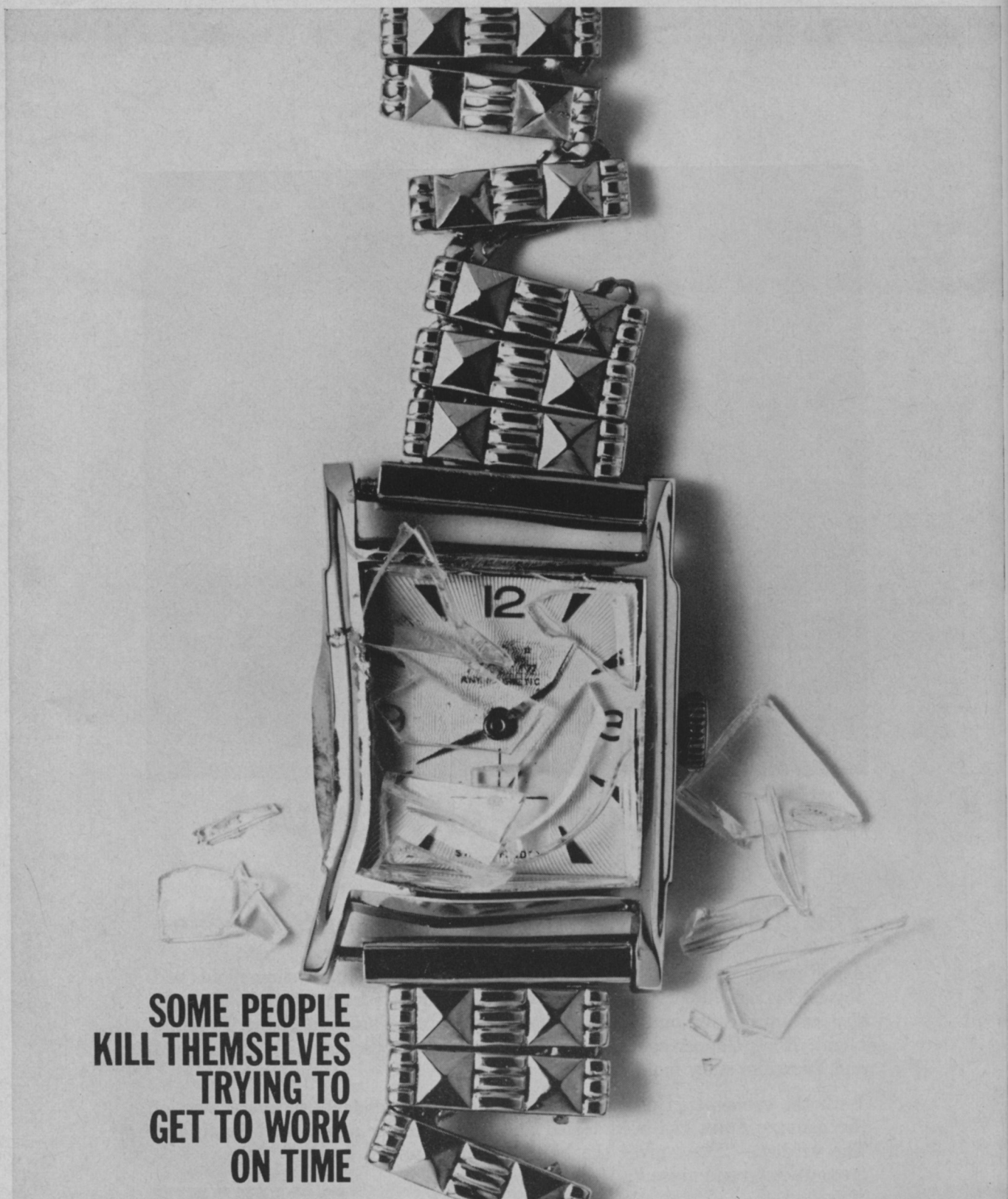

SOME PEOPLE KILL THEMSELVES TRYING TO GET TO WORK ON TIME

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Hydraulic boom with three 8 ft. sections, that can be operated independently of each other, are part of this truck used by California highway department.

How We Control Vegetation at the California Division of Highways

By DAN CASSIDY

Landscape Specialist, California Division of Highways, Sacramento

IT IS THE POLICY of the Maintenance Department of the Division of Highways to replace as much as possible the blading, discing, and mowing, with the less expensive chemical methods. Low rates of chemicals are being used to eliminate fire hazardous grasses and to leave within the sprayed areas those plants that do not cause a fire hazard or problem to the maintenance of the highway or to the surrounding farmers or home owners. Plants such as Turkey mullen, Baccharis, Alfalfa where no seed crops are being grown, and many other low growing plants may be left within these areas.

Objective: Fire Prevention

In the past, the chemical spraying was limited to a 4 foot strip placed to prevent fires from spreading from the right of way. The present chemical control is now started from the edge of the pavement outward to prevent fires from starting. An added benefit of the spraying has been a reduction in the noxious weed population. A reduction in the amount of mowing needed has reduced the cost of roadside care and eliminated the duff caused by repeated mowings. This dry material is believed to be responsible for many roadside fires. Certain weeds have been a host for insects that damage surrounding farmers' crops and spray rates may be adjusted in these areas in the annual spray program to eliminate such weeds. Some of these insects have been the beet leafhopper in the Imperial Valley and aphids in the Salinas Valley.

This spray program is planned to be done annually and is started in the late summer or fall of each year. We feel this annual program is the safest possible method of controlling vegetation. We use a basic spray rate of 4 lbs. of Simazine in 100 gals. of water per acre. Addition of Amino-Triazole is sometimes necessary when spraying is done later in the year after the annual grasses have germinated. In landscaped areas, low rates of soil-acting herbicides are being used after the plants are established, ones that have been in the ground one year. Materials such as Simazine at 1 to 2 lbs. active per acre in 100 gals. of water may be sprayed directly over the plantings with no damage to existing plants. Some other materials being used in landscape plantings are Dymid or Enide and Casaron. In areas where spraying of vegetation control chemicals would be objectionable, such as areas with very erodible soil, diamonium phosphate has been sprayed on the mature annual vegetation. This has been moderately suc-

Two 60-gal. stainless steel tanks, mounted behind 2000 gal. water tank, are shown in this rear view of, all-purpose vegetation maintenance spray rig described in this article.

This article is based on a paper given at the 18th Annual California Weed Conference in San Jose, Jan. 18-20, 1966.

cessful but there is need for a better method of making this material stick to annual grasses through the entire fire season, because light rain or heavy winds can dissipate this material.

Testing Growth Inhibitors

Growth inhibitors are being tried under varying climatic conditions. As yet no material or method has been found to control annual fire hazardous vegetation at a height that would make it unnecessary to mow. Some satisfactory results have been obtained on inhibiting the growth of shrubs that formerly were pruned often, such as those around headlight screens in narrow median divider strips, or shrubs in planter boxes on freeway islands that must be kept low for sight distance. These plants can be sprayed rather quickly in comparison to the time it takes to prune and haul the brush, to say nothing of the hazard caused to the traveling public and the men doing the work.

We believe that one of the greatest needs is for effective growth inhibitors, or better methods to apply these growth regulators that can be used at different times of year and will not cause noticeable damage to the plant.

The past year has seen increased use of contact sprays on freeway ground cover plantings. These materials are being used to edge ice plant and ivy, doing away with a very expensive method of cutting with mechanical edgers and the problems of hauling and disposal after cutting.

Built Versatile Spray Rig

A number of different types of spray rigs are used by the spray crews in different areas of California. Several years ago the Division of Highways Equipment Department took a commercially available hydraulic boom and adapted it for use on the front of the spray truck so the equipment operator could work from the cab and both he and the driver could see the spray operation. This boom has three 8 ft. sections that can be operated independently of each other to follow the contour of the ground or be moved out of the way of obstructions. Nozzles in each section may be independently or collectively operated. During the past year a further improvement in spray equipment has been made by the Equipment Department. A 2000 gal. tank was mounted on a truck frame with two 60 gal. stainless steel tanks mounted behind the large tank. Two separate chemicals may be mixed in a heavily concentrated form in each of these tanks; a proportioner pump will measure and mix the material from either or both 60 gal. tanks at any rate per acre that is desired. The 2000 gal. tank needs to carry only water, so the unit may be taken off vegetation spraying and be used for watering planted trees and shrubs without the need of cleaning out tanks or the danger of some chemical being left in the unit after cleaning which might damage plantings.

Different areas of the state of California, variable climatic conditions and diversified land use adjoining the highways and freeways, call for different methods of vegetation control. We feel we have been progressive in trying new chemicals and developing new equipment for this program.

Liquid vs. Solid Fertilizers

(from page 10)

that 1 quart of the concentrated liquid fertilizer be diluted to 15 gals. with water (1:60 dilution) and applied to 500 sq. ft. of turf, approximately 0.01 acres. Nitrogen concentration in this diluted solution is about 0.4%, and when applied at the recommended rate it will supply about 50 lbs. of N per acre.

It will require about 26 gals. of the concentrated liquid to supply 50 lbs. of N per acre of turf. When this is diluted 60 times, volume will be 1,560 gals. which weigh nearly 12,500 lbs. In contrast, ammonium sulfate, which does not require dilution, will supply 50 lbs. of N in 238 lbs. of material.

When liquid fertilizers are applied by broadcast methods to turf or foliage, considerable dilution must be made to prevent plant injury. This dilution results in a marked decrease in the amount of nutrient contained in a unit of the diluted solution and makes large-volume application necessary.

An alternative procedure would be to inject it in a more concentrated form below the ground surface to minimize burning. However, this can be an undesirable practice for turf. Another solution to the problem is to apply concentrated liquid forms into the irrigation water when sprinkling and avoid hauling the large quantity of water. Various metering devices can be obtained for this purpose.

The fact that a large quantity of diluted material is necessary when using liquid fertilizers on turf does not mean that liquid forms are more costly than solids. Ease of handling liquids by pumps or gravity, and their application in irrigation water, may keep cost of using liquid fertilizers relatively low. However, each operator must decide this on the basis of what handling and application costs are for his set of conditions and with his facilities. The cost of the *entire* operation must be considered when the decision is made.

Liquid and solid fertilizers, when properly applied, have been equally effective in producing crop response when compared on a per-pound-of-plant-food basis. In the use of each form, there are certain advantages and disadvantages, and these must be considered. Under certain conditions, the increased ease of handling liquids by pumps or gravity and application in irrigation water or by other means may make liquid fertilizers most economical. Hence, cost to handle and apply the two forms must be considered as well as the cost per unit of plant food in the two forms of fertilizer.

Selective Weed Control Advancing, Mullison Tells 19th Southern Weed Conference in Jacksonville

Changing concepts in weed control was the theme at the 19th Annual Southern Weed Conference, Hotel Robert Meyer, Jacksonville, Fla., where nearly 1,000 representatives of colleges, industry, and government gathered Jan. 18-20. The three-day conference included nearly 20 talks on practical weed control methods for lawns, public and private grounds and rights-of-way, streams and ponds, rangelands, and forests.

Selective Herbicides Coming

"Tomorrow's weed controller will use the prescription approach," Dr. Wendell R. Mullison, of The Dow Chemical Co., Midland, Mich., viewed as the keynote speaker. "Herbicide X," he said, "will have greater biological activity and selectivity from the point of physiological tolerances. Herbicide persistence and decomposition will be controlled. We want the material to last exactly as long as it's needed, then disappear. New products will be safer to use, safe to man, animals, wildlife, and our environment in general.

"In addition to the Herbicide X, a selective seedicide may be developed, and certainly the related properties of desirable nematocidal and soil fungicidal action are being investigated."

Prior to 1940, Mullison recounted, only about 14 chemical weed killers were known, most of them inorganic compounds. Today, there are more than 125 well-known herbicides.

"The increased availability of a variety of materials," he added, "makes possible another concept in weed control, and I call this the 'prescription approach.' As our knowledge of weeds and herbicides grows, there will be not only more combinations available for the operator to mix in his tank, designed to solve specific problems, but there will also be more than one active ingredient in many commercial formulations."

Mullison explained that because of a higher level of education and the increasing labor shortage, the future weed controller will be much quicker to adopt new weed killers and novel application methods.

Chemical Mixes Kill Herbs

Recapping the modern trends for combination herbicide products, T. J. Hernandez, E. I. duPont de Nemours & Co., Wilmington, Del., said, "Bromacil or diuron weed killers are often used in combination with other weed killers. Some of these are chlorates, TCA, weed oils, and hormone-type weed killers. Bromacil or diuron combined with these materials makes use of the different vegetation control properties of each compound and therefore provides more efficient weed control."

Reviewing a few of the standard combinations used in the weed control industry, Hernandez outlined the dosages and mixtures available. "A combination of 3 to 8 lbs. of bromacil or 10 to 20 lbs. of diuron with 120 to 150 lbs. of chlorate-borate or chlorate-chloride mixtures has been used extensively by railroads and other industrial concerns. Chlorates in this combination provide good contact action. Also, they are highly soluble and readily move down into the root zone of deeply rooted plants. Bromacil and diuron prevent seedling regrowth by remaining near the surface. Higher rates are used for initial treatments and lower rates after perennials are eliminated.

"Bromacil or diuron applied at similar rates combined with 80 to 120 lbs. of TCA per acre have been very effective where bermudagrass is prevalent. TCA in the mixtures gives both contact and systemic toxic action.

"When hard-to-kill broadleaf weeds or vines are present, hormone-type weeed killers, 2,4-D or 2,4,5-T, with bromacil or diuron will improve overall control. Amine formulations are preferred because they are easier to mix and are less hazardous to adjacent desirable vegetation."

Hernandez stated that weed oils in combination with bromacil or diuron have been successfully used in the northern areas of the country to provide rapid top kill and residual control of annual weeds. "This combination has not been readily accepted in the southern areas of the country. There, oils contribute little to the control of hard-to-kill perennial grasses, such

New Southern Weed Conference officers elected to reign in 1966 are (from left): President-elect, Robert A. Mann, Tennessee Valley Authority, Chattanooga, Tenn.; Donald E. Davis, new President from Auburn University, Auburn, Ala.; Site Selection Chairman, James L. Taylor, Thompson-Hayward Chemical Co., Gainesville, Fla., and Secretary-Treasurer, H. H. Funderburk, Auburn University, Auburn, Ala.

as johnsongrass, bermudagrass, nutgrass, vasey, and dallisgrass."

Rain Affects Herbicides

Discussing the influence of rainfall on herbicides, Dr. Anson R. Cooke, Biological Research Director, Amchem Products, Inc., Ambler, Pa., pointed out that rainfall can influence the performance of certain preemergence herbicides.

"How much rainfall is necessary to activate a preemergence herbicide? How much rain must fall before the herbicide is leached from the zone of germinating weed seeds? How much rain does it take to move the herbicide to where the crop seed is germinating, with resulting injury to the crop?" Cooke attempted to answer these three questions by setting up a controlled study concentrated into a single growing season.

"From our tests," he announced, "conducted with artificial rain, we found that by substituting common, soluble formulations with less soluble derivatives of the same products, weed control often remained constantly high. This happened even when initial rainfall varied from 0.5 to 2 inches. The more soluble forms, on the other hand, often gave poorer weed control when carried too deeply by a single heavy rain of an inch or more."

Dr. Wendell R. Mullison, Dow Chemical Co., Midland, Mich., said, "Tomorrow's weed controller will use the prescription approach," adding trends will be toward more selective and predictable herbicides to give modern control.

With such knowledge, Cooke concluded, it may soon be possible to formulate preemergence herbicides on a more-or-less custom basis depending on the average normal rainfall for a given area. In an area with normally high rainfall, for example, a rather insoluble form of herbicide might be provided, while a more soluble form of the same weed killer might be furnished areas of normally low rainfall.

Weeds Crumble Asphalt

William J. Bowmer, of the Range Science Department, Texas A & M University, College Station, told attentive conferees that plants growing up through asphalt cause it to crumble and make repairs necessary. Bowmer announced that a pilot project is underway to study herbicides in asphalt by the Texas Transportation Institute at the university.

"In preliminary tests," Bowmer explained, "seven herbicides were selected and applied in three different methods: applied to open areas and left uncovered, applied to open soil and covered with an asphalt cap, and mixed with the asphalt before it was laid down. Results indicate that some oil-soluble herbicides may be effective when applied directly in asphalt, although the other methods show some promise." He added, past experience has shown that herbicides applied to the base material should be distributed through approximately the top ¼ inch to be most effective. However, a great deal more work needs to be done with herbicides in asphalt before recommendations can be made, he said.

'gatorweed Controls Tested

"The most effective control for floating mats of alligatorweed in Louisiana tests was obtained with 4½ lbs. of 2,4-D and 15 lbs. of diglycolic acid applied in 300 gals. of water per acre," Dr. J. A. Foret, Professor of Horticulture, University of Southwestern Louisiana, Lafayette, reported. Dr. Foret explained the testing of control methods for alligatorweed in Louisiana conducted by himself, Dr. S. L. Solymosy, and Dr. F. W. zurBurg, both Southwestern Louisiana U. staffers.

"One of our main weed troubles stems from the Chagres

River that flows at an average of 2,000 cu. ft. per second," J. S. Hearne, Chief of the Dredging Division of the Panama Canal Co., announced. "The river brings with it many thousands of all kinds of aquatic growths: waterhyacinth, waterlettuce, elodea, coontail, cabomba, many cords of driftwood, and grasses, to name a few.

Booms Used to Catch Drift

"Driftwood is caught by a huge boom across the river which funnels the drift into a lagoon where it is removed by a large rake. Much of the drift passes over or under the boom and must be gathered up by workboat crews," Hearne said while explaining methods used to keep the Panama Canal clear of aquatic plants.

"As far back as 1913, the waterhyacinth was a primary cause of trouble, and even today it has not been eradicated," Hearne explained. "In areas where there is a continuous stream flow entering the Canal channel and Gatun Lake, spraying is not the answer. The use of log booms, which are on all the streams emptying anywhere near the Canal channel, is one reason we have been able to keep water hyacinth under such good control," he added. "The booms have failed to resolve the problems of submersed weeds, because they slide under the floating booms and move with the currents to infest other areas." Hearne noted that elodea and coontail were controlled with outstanding success by using copper sulfate applied by hand or mechanical sprayers.

New experiments are being conducted with the assumption that each area in the Canal Zone will have its special set of characteristics. Underwater earth samples will be taken from the bottoms of various areas and placed in test containers to observe weed regrowth. Raw copper is one product being studied that may deter regrowth for long periods. One handicap, Hearne said, is that only a limited number of chemicals will be allowed in Gatun Lake because that water is used for drinking, swimming, cooking, and fishing.

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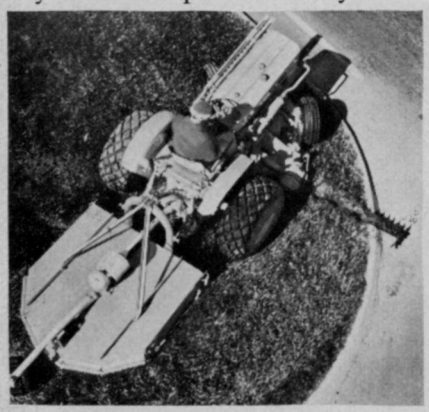

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