closer to the trunk than the top cut. When jump cuts are used, surgeons must be exact and alert, as always. Just as the limb comes off at the upper and lower cuts, give it an upward push, and the limb will snap free and clear lines and other obstacles on its way down, butt end first.

Butt Rope: Object For Hinge Safety

A "butt rope" is a rope tied to the butt of a limb or trunk near where it is to be sawed. To be effective, the rope is threaded through a nearby crotch and is used to control or guide the big end of a limb or trunk section. The butt rope may be used to support a hinge cut as a safety measure to prevent breaking the hinge. Sections of limbs or trunks guided by a butt rope are controlled so protected objects are not damaged.

Cradle Limbs In Space

Butt ropes are also used as one end of a "cradle." The cradle is formed where a limb, trunk section, or even a whole treetop is swung by two ropes, one fastened to each end of the tree part. When working the cradle, we often use the crotch of a nearby tree for rope support, then we swing a cut tree section into space and carefully lower to avoid damage.

Nylon Stretch: Trick For Big Bruisers

We have one trick which is our own discovery. It's based upon the stretching qualities of the nylon rope. It has served us long and well, and we could not have done many of our difficult removal jobs without it. We use the "nylon stretch" on those old, big trees which lean backwards over buildings, fences, lines, and other protected structures. Big bruiser trees must be lifted or tilted in the opposite direction from their incline before they are felled.

Most firms use a winch or crane for such jobs. Others employ modified- or developed-tricky techniques commonly used. We are a small outfit and our heaviest piece of equipment is a power saw, but we get more

than our share of difficult removals.

We put a nylon rope in the treetop and lead the rope to another tree, or another anchor, using a "come-along" as our power. The "come-along" is a portable pulley system and is worked like a hand hoist. A 12-foot, steel cable with a hook on the end rolls up on a cylinder that is locked and kept from spinning by ratchets. We use it in treetops, mending split trees, and in cabling and bracing. Come-alongs are made in one- and one-half-ton capacity sizes for lifting different weights.

With the come-along, we tilt the tree away from structures in danger of being crushed by the felled tree. On trees up to two feet in diameter, with an average sized top, one 3/8-inch nylon rope is sufficient. This size is adequate for nearly any tree if it has been topped. On extremely huge trees, however, we use two ropes and two come-alongs. Weight of the tree is not as important as the fact that we tilt heavy trees against a hinge.

Before cutting, we rig our ropes and come-along. As we cut on the back side of the tree, we increase the pressure on the cable by tightening it. Pressure is kept on the treetop as the cut opens. This indicates that our tilt method is working. The tree must be inclined in the right direction, away from the protected structure, before the cut is completed.

Kickback Dangerous Near Building

One danger in the use of a heavy hinge and strong pull on a large tilted tree when its base is near a building is that the trunk may split at the hinge and kickback against the building. This is especially true of ash and red oak, and with other trees depending on how easily they split and how much tilt pressure is applied. To prevent kickback, we sometimes use a fall cut, but a tree cannot be tilted as far when a fall cut is used as it can be with a hinge. Trees that split easily cannot be tilted as far as one with greater internal cohesion and flexibility such as a gum. The kind of tree must always be considered.

Falling trees are often crowd-gathering events in a neighborhood. We have had audiences of 30 to 40 people on adjoining lots and across the street. It does not hurt customer relations one iota to do a job that spectators know only an expert could do!

Marlow Spray Film Available

A film entitled "A Fact of Life" has been produced by Marlow Division of International Telephone and Telegraph Corp. The sound and color movie, which runs 25 minutes, illustrates and demonstrates the advantages and disadvantages of both high concentrate and conventional type spraying.

Marlow, manufacturer of Econ-O-Mist mist blower, offers the film free of charge, except for return postage, to all groups involved in agricultural enterprises. For information write: "Econ-O-Mist," ITT Marlow, P.O. Box 200, Midland Park, N.J.

R. F. Lederer New AAN Executive Vice President

Robert F. Lederer, 37, was appointed executive vice president of the American Association of Nurserymen by the organization's board of directors, meeting early last month. He had been serving as acting executive vice president.

After graduation from college in 1953, Lederer joined the staff of the National Cotton Council in Washington, and served that organization as assistant Washington representative until 1958, when he left for a position with the Home Life Insurance Co.

He returned to association work early in 1959 as AAN administrative assistant, whose executive vice president at that time was Dr. Richard P. White. Lederer later became legislative assistant, and in 1961, when Dr. White retired, became executive associate. In his new post, Lederer succeeds Curtis H. Porterfield, who resigned late last year.

A chartered association executive, Lederer is a member of Directors of the National Council on Business Mail, Inc., Washington Trade Association Executives, National Association Executives Club, National Press Club, Atlantic State Shippers Advisory Board, American Society of Association Executives, National Farm Labor Users Committee, Food Transportation Group, past president of Washington Legislative Luncheon Group, honorary life membership in Delta Kappa Phi Fraternity of America, Inc.

Allis-Chalmers Catalog Out

A complete rundown on the Allis-Chalmers Series II, D-21 turbocharged diesel wheel tractor is contained in a new 20-page illustrated color catalog.

Featured is a series of spreads covering the turbocharged power, construction, and versatility of the tractor. Optional equipment and complete tractor specifications are included.

For a copy of Catalog FE-286 write to the Farm Equipment Division, Allis-Chalmers, Milwaukee, Wis., 53201.

Electricity *Warms Soils* for Sport Turf

By DR. WILLIAM H. DANIEL, Turf Specialist, Department of Agronomy, Purdue University,
and JOHN R. BARRETT, JR., Agricultural Engineer, Department of Agricultural Engineering,
Purdue University, and Agricultural Research Service, U. S. Dept. of Agriculture, Lafayette, Indiana

SOIL WARMING is now eligible for acceptance as a part of turf management programs. Most perennial turf grasses, including Kentucky bluegrass, tend to grow continuously except when limited by climatic extremes. Rootzone heating of turfgrass plants can keep the soil from freezing, promote root growth, keep the turf greener, and aid in melting snow. Such improved turf conditions would reduce player injury and increase the precision of games. Also, numerous outdoor activities, such as horseracing and golf, could be extended beyond the present active seasons.

Escritt's early work at the Sports Turf Institute in England has led to several electric heating installations there. Everton Football Club was the first to install electric soil warmers in their ground at Goodison Park. Electric, off-peak (low rate) pitch warming is built into the Arsenal ground at Highbury. Edinburgh, Scotland's Murrayfield rugby football grounds were equipped with electric heating in 1959. At least one stadium in Sweden has electric, and another has water soil warmers.

Turf Heat Tests Started Feb. 1962 at Purdue

Preliminary soil warming studies at Purdue University, Lafayette, Indiana, started on a 20- by 50-foot plot in Feb-

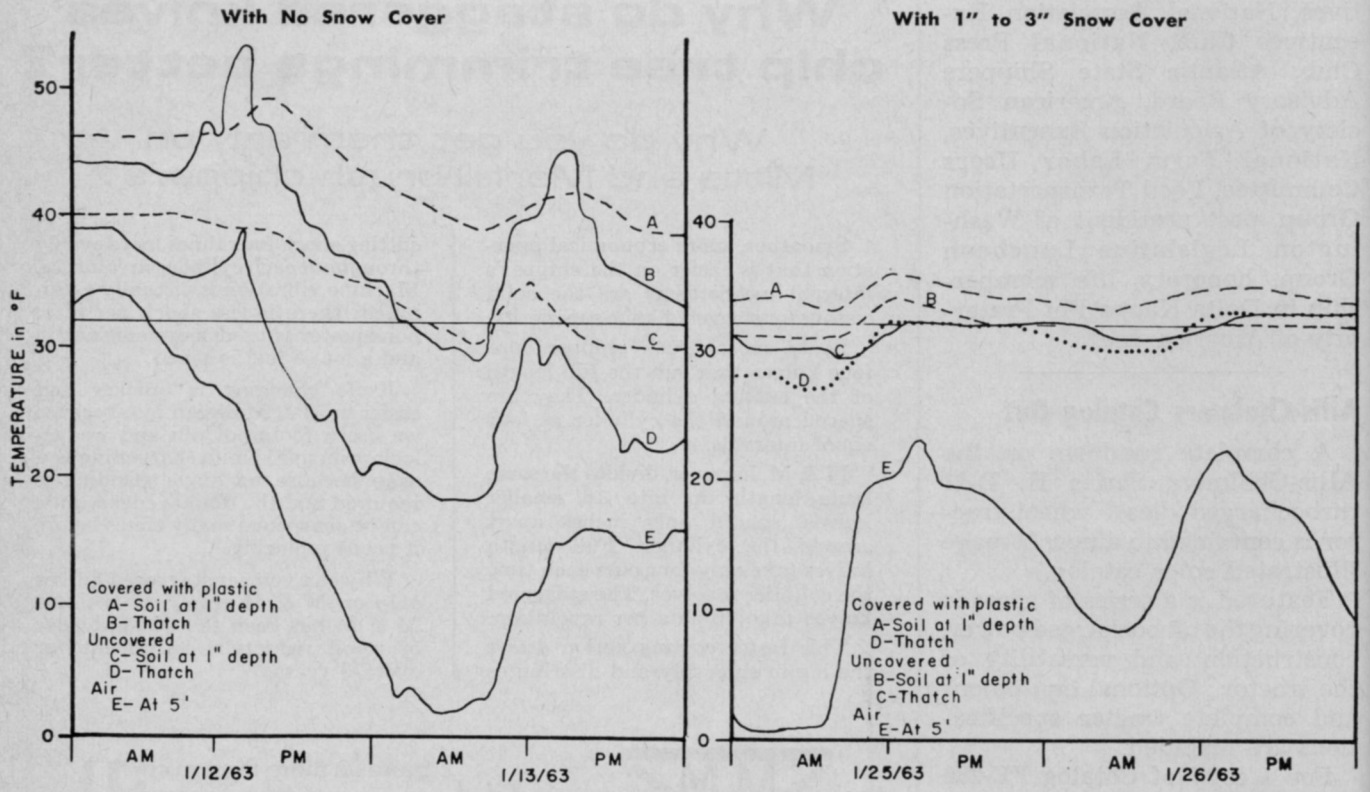


Fig. 1. Temperature fluctuations recorded in thatch, soil 1 inch deep, and in air over electric soil-heating cables that dissipated 1.2 watts per square foot. **Right** graph shows temperatures recorded when there was a 1- to 3-inch snow cover. **Left** graph represents temperature changes recorded when plot was not snow covered.

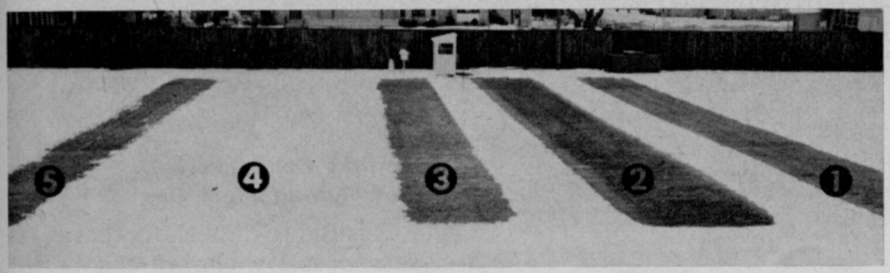


Fig. 2. Snow melting pattern on five electric heated turf plots, installed August 1963, shows that during the 1963-64 winter snow remained on Plot 4. Cables in Plot 4 were spaced 15 inches apart, at least twice as far apart as in the other plots. See Table 1.

ruary 1962. Aluminum and copper heating cables insulated with poly-vinyl chloride were tested. Six different cable spacings and clear plastic sheet covering were also evaluated. Constant soil heating produced soil temperatures of 65°F. Within a 10-day period in early March, excessive bluegrass growth was apparent while unwarmed turf remained dormant on frozen soil.

An improved experiment was installed in October 1962. Soil was removed from an area 20 by 60 feet, and cables were placed at 4-, 6-, and 8-inch depths with spacings, 6, 12, 18, and 24 inches apart. Different spacing and depths established wattage densities that ranged from 0.8 to 10 watts per square foot. Soil was replaced and firmed over the cables; soil thermostats were buried at 1-inch depths; power cables were laid; then bluegrass sod was placed over the entire area. Energy consumption, soil moisture content, rainfall, relative humidity, and snow-melting data were recorded. To sense abrupt changes in weather, air thermostats were wired in parallel with soil thermostats allowing either to operate the cables.

Plastic Covers Retain Sun's Heat

Plastic covers .004 inch thick utilized solar radiation and warmed the turf by reducing heat loss (Fig. 1). Covers provided both an insulating air layer over the turf and served as a barrier to reduce wind action. Benefits given by plastic covers were:

1. Grass blades desiccated less in cold, dry winds and remained essentially a normal green at low temperatures.

2. Covering reduced energy required on lower wattage densities. Cables spaced up to two feet and wattage densities as low as 0.8 watt per square foot kept the soil thawed throughout the winter under plastic.

3. Sod roots developed early and were more uniform under plastic covering.

4. Turf, under cover, grows more readily as any warm period arrives, responding much better to sunny weather and rising air temperatures than uncovered turf.

Disadvantages of plastic covers are:

1. Covers prohibit casual use and decreases aesthetic value of turf areas.

2. Hot, sunny periods may force unwanted, excessive growth.

3. Risk of cold damage to tender foliage is increased when the plastic must be removed in early spring. Extra care is needed when covers are removed and replaced in variable spring weather.

4. Disease (leafspot) incubation on leaves may be favored by unusually high humidity and warmth under covers.

Safe Depths Recommended For Heat Cables

Little difference was found in soil or turf conditions above cables 4, 6, or 8 inches deep. For better safety and normal protection from mechanical damage, depths of 6 to 8 inches are suggested.

Rootzones Extend Rapidly When Heated

Soil warming offers valuable rootzone benefits. Freshly cut sod placed in nonwarmed areas on November 10, 1962, developed almost no roots before winter. However, on heated soil new root extension was 3 to 5 inches by December 31. By April 1963, new white, active roots of the heated sod were 9 inches deep, but only 5 inches deep in unwarmed sod. Such root extension provided greater sources of nutrients and assured minimum damage from drouth or active sports. Top growth continued well into late fall and again in early spring, 1963.

Temperatures only sufficient enough to keep rootzones thawed and porous produced obvious top growth in early March, three weeks ahead of unwarmed turf. Higher heat inputs that maintained soil temperatures above 45°F, at 1-inch depths favored top growth throughout the winter. Wattage densities of 10 watts per square foot kept the turf thawed at all times. Soil temperatures above 55°F forced some turf growth, even during extended, severely cold weather. However, sharp drops to low temperatures caused some leaf tip damage to rapidly growing grass.

Interestingly, warmed turf areas produced seed heads six weeks earlier than unwarmed areas, indicating more crown growth through the winter period. All uncovered turf areas looked normal in density and uniformity after heating was stopped. Additional root development and continued tiller and rhizome growth indicated improved playability for warmed turf areas. Important to games use, the warmed areas were

Editor's Note: Practicality of turf heaters was shown last winter when they successfully kept snow off and turf green at a golf course practice green in South Bend, Ind.

never muddy, superwet, or slick from frost action.

Melted Snow Layer Easy To Remove

In plots with heat applied at 10 watts per square foot, snow melted rapidly when air temperatures were above 15°F. At colder air temperatures, melting was slower, although soil remained thawed and turf remained green. In cold weather, snow melting from underneath left an air pocket with a crust of snow or ice laced on the grass-blade tips. Heavy snow can be removed quickly by machinery for sport field, turf clearance.

Table 1. Design and time of actual operation of plots in 1963-64 tests.

Plot	Cable Spacing	Watts per sq. ft.	Max. time plots could operate per day	Max. time plots operated per season
	inches	watts	hours	%
1	1.5	4.5	24	74
2	7.5	9.0	24	71
3	7.5	9.0	7	95
4	15.0	4.5	7	97
5	7.5	2.5	24	99

Cables Buried by Knife and Guide Tube

Five plots, 10 by 120 feet, each separated by a 10-foot-wide unheated strip, were installed in the Purdue varsity football practice field (Fig. 2) in August 1963. Poly-vinyl chloride insulated, nylon-jacketed, electric heating cables were laid six inches deep in existing sod. Cables were laid by using a rolling coulter followed by a vertical knife and guide tube for wire burying; all were fastened to the toolbar of a tractor. Cables were spaced either 7½ or 15 inches apart and provided 2.5, 4.5, or 9 watts per square foot. Soil thermostats, air thermostats, and timeclock switches were wired in the control circuits. Turf was smooth enough for football practice immediately after the cable was installed and rolled.

Air Temperature Turns Heat On, Soil Temperature Turns Heat Off

Soil is warmed to prevent it from cooling below root growth temperatures. Air temperature is the best indicator of when heat should be applied. Temperatures in the soil indicated the heat reserve present and soil thermostats were used as maximum temperature limit-switches to prevent overheating the soil.

Preset timeclocks facilitated using heaters during off-peak (low rate) periods during early morning hours. Plots 1 and 2 were heated any time the air temperature was less than 40°F, or when soil temperature, 1-inch deep, was less than 45°F, regardless of air temperature. Conversely, heat was not applied when the 1-inch soil temperature was above 60°F, regardless of air temperature. The first test season lasted from November 6, 1963, through April 6, 1964, a period of 152 days (Data are given in Tables 1, 2, 3, and 4).

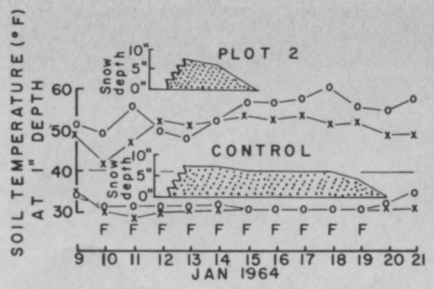


Fig. 3. Temperature changes during a period with snow cover in January 1964. Lines labelled "X" are readings taken at 8 A.M.; lines marked "O" are readings taken at 4 P.M. "F" indicates that the turf was frozen at 8 A.M. Dotted areas in the small graphs show the depth of snow cover and its removal.

Table 2. Average soil temperature one inch deep at 8 A.M. (F°), 1963-1964.

Plot	Dec.	Jan.	Feb.	Mar.
1	43	40	41	44
2	54	49	52	54
3	42	40	40	46
4	37	35	36	41
5	40	38	38	44
Control	34	32	32	37

Table 3. Number of days turf medium was frozen at 8 A.M., Jan. 1 to March 31, 1964 (91 days).

Plot	Jan.	Feb.	Mar.	Total
1	4	0	0	4
2	0	0	0	0
3	8	1	0	9
4	10	7	2	19
5	11	1	0	12
Control	24	19	7	50

The second test season lasted from October 9, 1964 to April 12, 1965, a 186-day period (See Fig. 3).

Heaters Ready For Turf Management Use

Results to date show that cold-season soil warming can be included in modern turf management programs. It can be used as a tool to improve playing conditions by thawing soil, melting snow, and maintaining more vigorous turf.

Four seasons of research have been completed at Purdue, and new plots are being installed. Demonstration plots are also located at St. Paul, Minnesota; St. Louis, Missouri; Washington, D. C.; and South Bend, Indiana. Some work has been done in Arizona and Texas under bermudagrass and st. augustinegrass. Turf heater installation in several stadiums where both football and baseball are played is now being considered. However, the first one is yet to be installed.

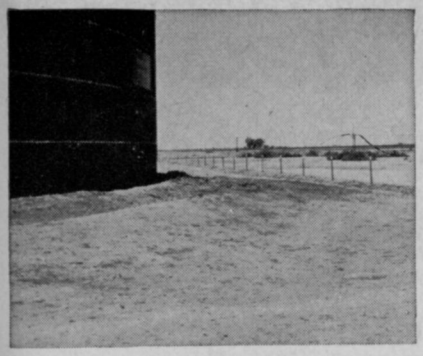
Obviously, the area and use for each turf plot or field, location related to climatic conditions, availability of power, and the grass species used will determine the design of the heating system. An index on which installation requirements may be based is day-degrees (sum of daily average temperature below 65°F for one season). St. Louis, Missouri has approximately 4600; Indianapolis, Indiana has 5500, and St. Paul, Minnesota has 8000.

Specifications for controls and cables, giving 5 watts per square foot, off peak, have been prepared for the new Busch Stadium in St. Louis. Bids are being taken now for installation before sod is laid, and the stadium will be finished by May 1966.

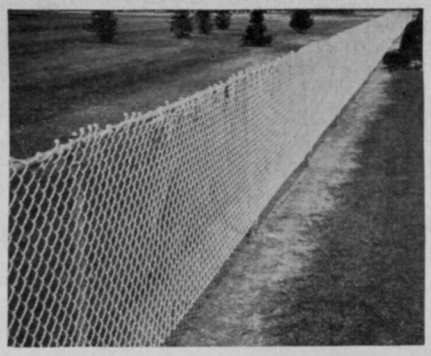
Table 4. Temperatures (F°) at 8 A.M. on January 29, 1964

Soil Depth	Plot 2	Plot 5	Control
Thatch	37	31	29
1 inch	46	34	31
6 inch	61	40	35
1 foot	63	44	37
2 feet	61	45	40
3 feet	60	50	42

Shaded air temperature was 18 F°

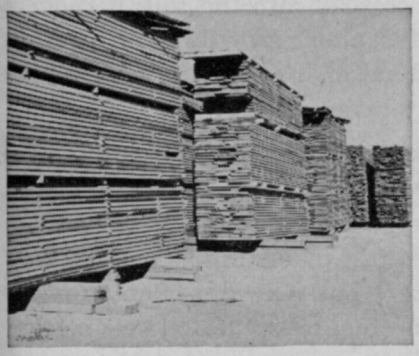


Around this oil pumping station—Hyvar® X bromacil weed killer controlled fire-hazardous vegetation all season. Other products containing bromacil, such as "Hyvar" X-WS, give equally effective control.



Under fence lines—Just one application of "Hyvar" X will control perennial weeds and grasses (such as Johnson, Bermuda, nut, horsetail, plantain, wild carrot, and bouncing bet).

Around fire hydrants—"Hyvar" X is ideal for initial treatment of weeds and grasses because it offers broad-spectrum control and persists in the soil to give long-term, low-cost control.



In lumber yards—Control moisture-holding vegetation that tends to decay lumber. Unwanted vegetation also creates fire hazards during dry periods. Applying "Hyvar" X-WS bromacil prevents these problems.

Around storage warehouses, parking or work areas—Eliminate unsightly weeds that rust equipment, improve the over-all appearance of the sites with "Hyvar" X-WS.

On railroad sidings—Increase the operating efficiency of men and equipment by controlling perennial as well as annual weeds and grasses with "Hyvar" X-WS.

Profit by expanded business— Offer weed control service to your customers based on Du Pont Weed Killers

There's profit in weed control—it's a multi-million dollar industry. Du Pont weed killers make custom weed control jobs easy, effective, and profitable for you around industrial sites, lumber yards, storage areas, fence lines, railroad sidings, substations, poleyards, tank farms, utilities... wherever unwanted vegetation is a problem.

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New "Hyvar" X-WS bromacil weed killer is a soluble powder designed primarily for situations where agitation in the spray tank is impractical or marginal. Once stirred in solution, "Hyvar" X-WS doesn't require additional mixing or agitation. Time-proven Karmex® diuron weed killer gives versatile, effective, long-term control of a wide range of weeds and grasses.

In addition to weed control, you can offer your customers effective brush control with Du Pont Ammate® X weed and brush killer and Dybar® fenuron weed and brush killer. You can control brush without injury to nearby vapor-sensitive crops with "Ammate" X because it's non-volatile. On light-to-medium stands of brush or in areas equipment can't reach, easy-to-use pellets of "Dybar", applied right from the package, do an effective job. Be of additional service to your customers by offering them weed and brush control with dependable Du Pont products.

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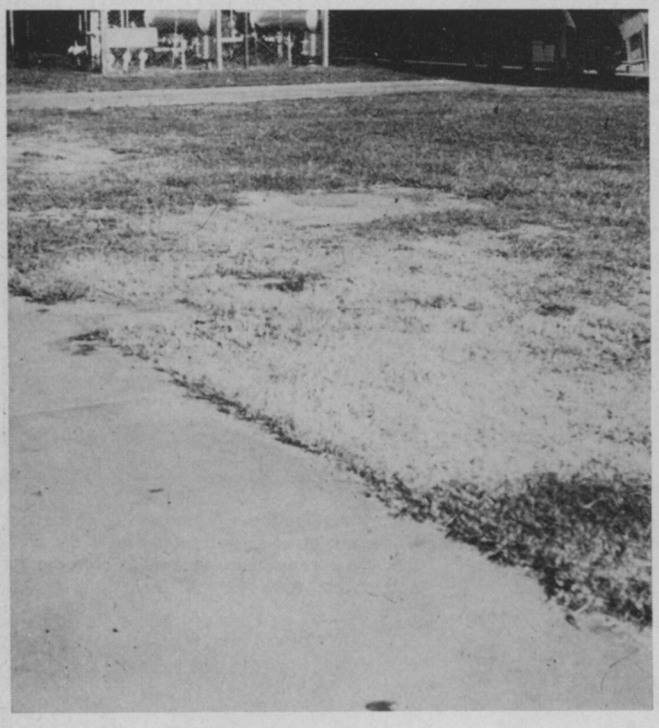
Turfgrass Photo Pointers

By TOM MASCARO, President, West Point Products Company

Problems caused by the misuse of turf chemicals and what to do about them



Fuel Oil Damage

Turfgrasses around fuel oil intakes on lawns are often subjected to this type of damage. When fuel oil is spilled on turf, it kills the plant. If enough is spilled to soak into the soil, it renders the soil useless for plant growth. The fuel oil cannot be leached out of the soil, and will remain in it for extremely long periods.

The only solution is to dig the soil out and replace it with new soil. Depth of the soil removed should be well below the layer that is saturated. If this is not done, grass plants in the new soil may germinate and grow but may die later on when the roots reach the fuel-oil-saturated soil below.

Loose stone, sand, or any porous material can be used around the intake pipe to catch drippings from the delivery hose. A circle 8 to 12 inches in diameter is sufficient.

If the problem occurs again, the best solution would be to change fuel oil dealers!

Weed Killer Damage

Although all good weed control chemicals carry detailed instructions regarding rates of application, etc., it still requires the ultimate user to use good judgment and common sense regarding how and when they are applied.

In this case (and one that occurs quite often) the material was carefully applied on the road shoulder between the road and the lawn. It was heavily infested with weeds. Unfortunately, a heavy downpour immediately following application of the chemical washed the materials down into the turf. As advertised the chemical did a good job of eradication on the weeds—and the lawn.

(Two more photo pointers on page 20)

Geigy now offers you five industrial herbicides.

All five Geigy industrial herbicides deliver long-lasting residual control of annual and perennial weeds. With once-a-year application, too. Yet, each one has special features to solve specific problems. As a group, they'll handle just about any weed problem you encounter. On level land, or slopes. In and along paths, drives, lots, and roads. Around buildings, signs, markers, fences, and poles. Everywhere weeds are not wanted.

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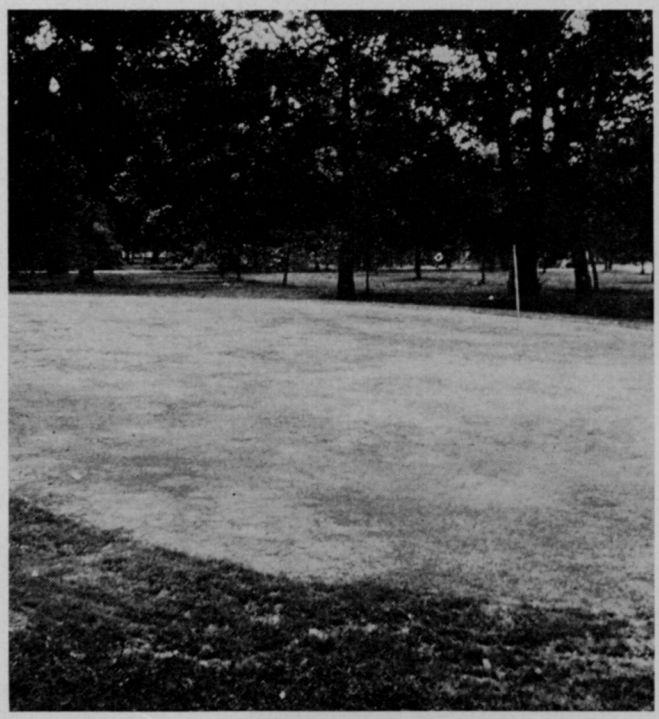
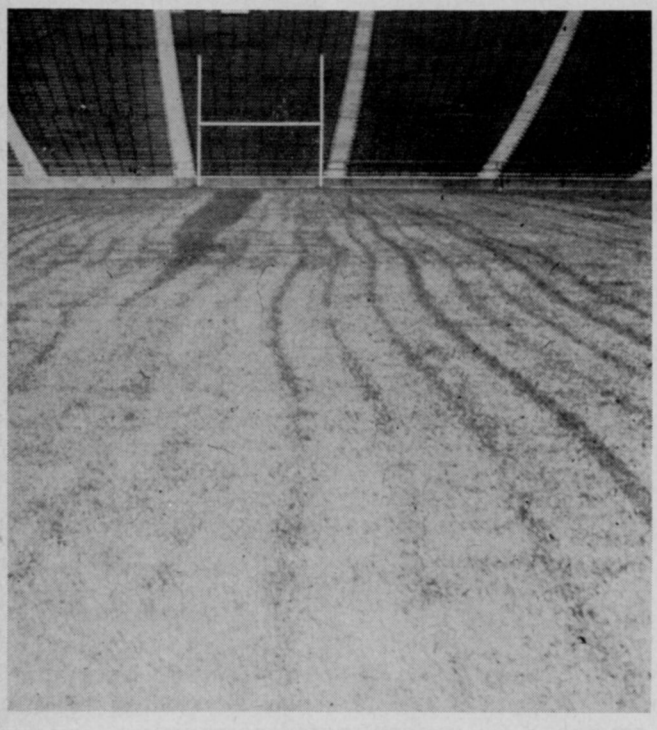
Fertilizer Burn

Some fertilizers will severely burn turf under certain conditions. Nitrogenous fertilizer materials can be classified into three groups. They include:

Inorganic chemical compounds
Natural organics
Ureaform compounds

Natural organics and ureaform compounds are relatively safe and do not burn the turf. The Inorganic compounds commonly called chemical fertilizer contain ammonium sulphate and ammonium nitrate, or synthetics such as urea and cyanamid. These materials are highly water soluble and convert quickly into ammonia and nitrates. When any of these materials are applied to turf, they will cause severe burning, unless watered in promptly.





Poor Weed Control Application

This photo shows what can happen when an inexperienced operator applies weed control chemicals. The dark strips are where the operator missed. Accuracy of application is extremely important. The best and most expensive spray equipment is worthless without a trained operator. Calibrations, pressures, width of boom, and speed of travel are all inter-related. Training the operator is as important as selecting the chemical.

Only when all these factors are considered, can one be assured of a good weed control program.

Over $75 million is spent annually on chemicals for turfgrass maintenance. Keep up to date on how to use them properly. Follow label instructions, attend regional conferences, and read *Weeds Trees and Turf*.