pallets without sides. This is especially true of peat based sod which is much lighter in weight than that grown on mineral soils. On Mork's turf rack, the weight of the sod holds the hinged sides of the turf rack together.

Also, according to Mork, there is no damage to sod from the tie-in. Pallets will carry more sod, thereby permitting maximum capacity from the forklift. Mork points to the greater safety of sod during highway transport because of the extra stability provided by the container system. This is also a helpful factor in moving pallets by forklift on side slopes. Pallets can be stacked up to 5 deep in open position, making it easy to return stacks of empties to the field.

Turf racks are built of ash hardwood with steel brackets. Quality construction, Mork says, is the key to units on which a patent is pending.

Fine grading equipment designed and being produced by Mork includes a series of flat bed scrapers for turf preparation finish work. These are made in 78 and 96 inch widths, both of which are 48 inches in depth. Weights are 300 and 350 pounds respectively. Optional ballast adds 200 to 250 pounds to the units.

Advantage of the flat bed scrapers is that they level in both forward and reverse direction. Hand raking, according to Mork, is eliminated. He has found that unskilled operators can successfully level rough graded or loose material such as blacktop, crushed rock or dirt. The units are made to fit any Category 1 three point hitch. They can be adjusted for pitch and side slant by means of the tractor's right lift arm and top link.

Mork grows and installs 50 acres of sod yearly from his own firm of Orrie Mork Landscaping. In addition to some custom landscape work he also buys cultured sod from other sod growers. Mork believes that the sod industry can be expected to grow as more home owners and industries demand the so-called instant lawn. He also feels that growers will have to continue to mechanize and automate their operations to cope with the labor problem. Not only does labor cost more today, he says, but responsible help is more difficult to find and to keep on the job.

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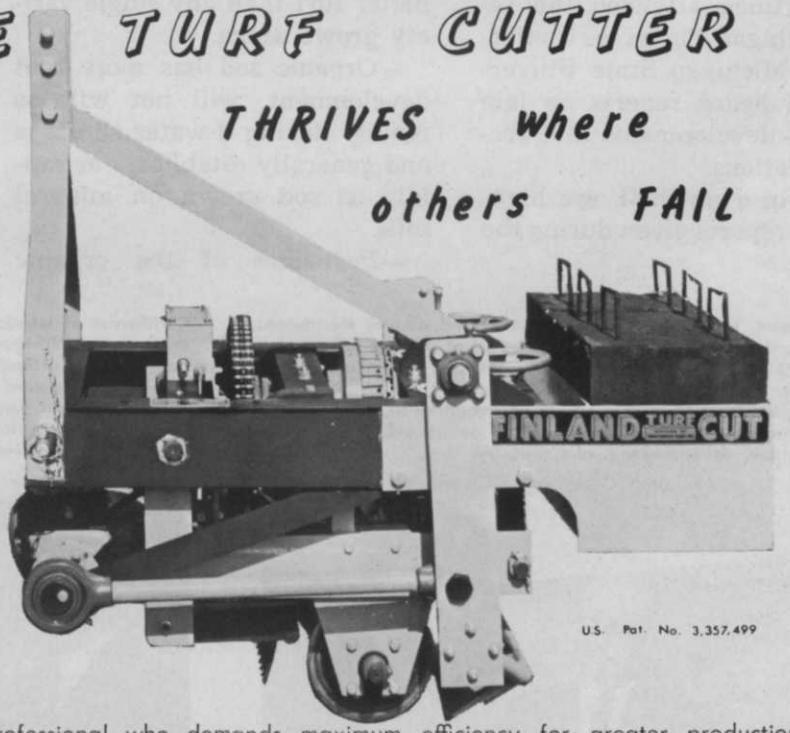

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Dr. James Beard, left, MSU turfgrass researcher, and Dr. Paul Rieke, right, MSU soil scientist, confer with Dr. Marvin Ferguson, Mid-Continent Director, USGA, and Dr. Joseph Duich, Penn State University agronomist.

Research Report

Michigan Turf Conference

MORE than 500 professional turfmen attended the recent Michigan Turfgrass Conference at Michigan State University and heard reports on late research developments and recommendations.

Here, in a nutshell, are highlights of reports given during the meeting:

—Variety "blends" produce better turf than any single variety grown alone.

—Organic sod has more root development, will not wilt as readily during a water shortage and generally establishes as rapidly as sod grown on mineral soils.

—Pesticides of the organic phosphate type can stimulate turfgrass growth by making nitrogen more readily available to the turfgrasses.

—The best all-around control of broadleafed weeds can be provided with a combination of 2,4-D and 2,4,5-TP.

—A mixture of soil, sand and organic matter in the proper ratio provides a good base for establishing putting greens, if this layer is above coarse sand and gravel to allow good drainage.

Variety "Blends" Best:

The report on variety "blends" producing better turf than any single variety grown alone was made by Dr. James Beard, MSU turfgrass researcher. Since there are no "ideal" varieties, he said, blending together several varieties provides a higher quality turf adapted to a wider range of soil management and environmental conditions.

An example would be a blending of Merion, Newport and Delta to establish a good bluegrass turf. Merion is attractive and resistant to leafspot disease, but it requires high management and does not adapt to shade. Newport is better adapted to shade and is fairly resistant to powdery mildew. Delta requires

C. J. Chapman, left, Detroit, receives the second annual Meritorious Service Award from Dr. K. T. Payne, chairman of Michigan State University's crop science department. Payne presented the award on behalf of the Michigan Turfgrass Foundation. W. Bruce Matthews, center, accepted the first annual award on behalf of Dr. James Tyson, MSU soil scientist. Tyson was presented the award posthumously for his contributions to Michigan's turf industry.

Certificates of scholarship awards were presented to two outstanding students in Michigan State University's two-year turfgrass maintenance course offered by MSU's Institute of Agricultural Technology. Receiving the award were Frederick McMullen, left, East Lansing, and Scott Sincerbeau, center, Flint. The awards were presented by Norman Kramer, right, Benton Harbor, a board member of the Golf Course Superintendents Association.

low management and is resistant to stripe smut.

Blends, said Beard, give professional turfmen a better chance to establish more hardy grass under a variety of conditions.

Organic vs. Mineral Sod:

John King, another MSU turfgrass researcher, reported on research which showed organic sod to have some advantages over sod grown on mineral soils.

In seven different trials, noted King, organic sod exhibited more root development and better establishment than mineral sod.

In another study, King saturated sod grown on mineral and organic soils, then allowed both types to dry. He found that the organic sod lost more water, but the sod grown on mineral soil showed wilting two days earlier. Watering is more critical in the establishment of mineral sod.

Beard and King also noted that sod cut at normal thickness (¾ inch) had better rooting and establishment than sod cut at either ⅜ or 2 inches thick.

They also reported data showing that soil should be moist at the time of laying to insure good establishment.

Best Nitrogen Carriers:

Dr. Paul Rieke, MSU soil scientist, discussed the importance of fertilizer, particularly nitrogen, and he pointed out some of the shortcomings of some nitrogen carriers.

In a comparison of soluble nitrogen carriers vs. organic carriers, Rieke found that the soluble carriers are both faster acting and less expensive. The ureaform aldehyde types do not give quick "green up" to turf, particularly during the cool times of the year.

He also advised turfmen to be wary of applying fertilizer through their irrigation systems. While this may seem like a more convenient method, he said, it is only effective if distributed evenly over the turf. The irrigation system must be properly designed to achieve this uniformity.

Dr. Beard noted that sod which had been produced with high levels of nitrogen tended to heat up more quickly during shipping. In early trials, however, there has been no indication that the faster heating has caused greater damage.

Pesticides Increase Nitrogen:

In another report, J. Timmerman, MSU graduate assistant in soil science, reported on his study which showed that pesticides, particularly organic phosphates, can increase turfgrass growth by making nitrogen more readily available.

Apparently, he said, certain organic pesticides stimulate the microorganisms that make nitrogen available, but he admitted that more research needed to be done to determine why these

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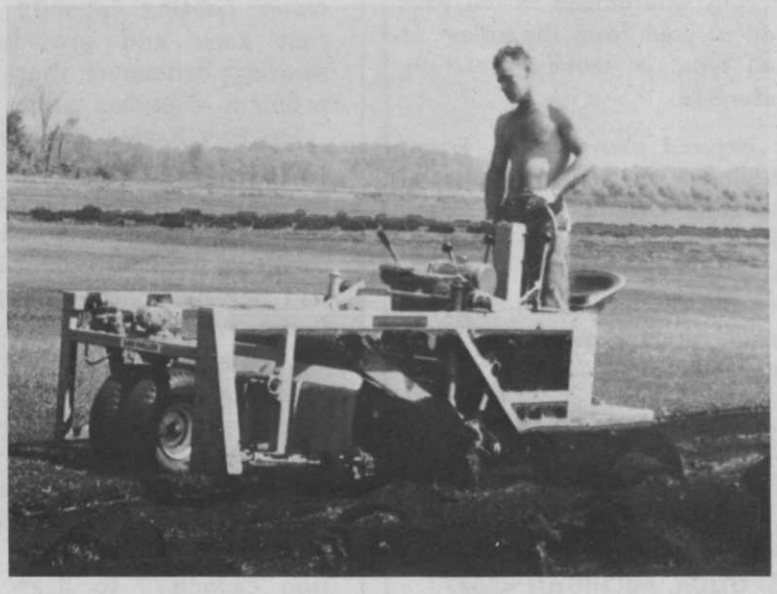

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organic pesticides have this effect.

Weed Control:

Dr. William F. Meggitt, MSU crop scientist, noted that there weren't any recent spectacular "breakthroughs" in turfgrass weed control, but there were some useful guidelines to follow for an effective control program.

He said good management is the key to many weed problems, because a well-kept turf gives the grass a fighting chance against competing weeds. Herbicides can be a big help, he added, but there is no herbicide label that will claim the chemical will grow grass.

Meggitt said a combination of 2,4-D amine and 2,4,5-TP, applied at the rate of one pound of active chemical per acre, will control dandelions, plantains, clover, chickweed, black medic, creeping charlie, red sorrel and round-leaved mallow.

Soil Mixtures:

Three researchers commented about the importance of a good soil mixture to the establishment of turf. And all three suggested mixtures that would reduce compaction, maintain adequate water holding capacity in the root zone and provide good drainage whenever there was a problem of excess water.

Dr. Ray Kunze, MSU soil scientist, recommended a special mixture for putting greens. This included a layer, about 12 inches thick, of a mixture of soil, sand and organic matter. Below this layer would be coarse sand (about 4 inches), then pea gravel and, finally, subsoil. Tiling would be placed in the area just under the sand in the pea gravel.

Dr. Kunze explained that the coarse sand and pea gravel did not have the "capillary attraction capacity" to draw water from the upper zone. As a result, water does not move down until the upper area is saturated.

Dr. Joseph Duich, Penn State University agronomist, pointed to a project which he had started in 1960 which showed that many turfmen pay too much attention to the quantities in soil mixtures rather than the quality of the sand, soil and peat. For example, he said, the important thing in concrete sand is the particle size distribution. He urged turfmen to examine this particle size to determine how well it will hold water and allow drainage.

Duich noted that with 10 per cent peat in a mixture, turfmen would need 40 per cent coarse sand to get any infiltration at all. They would need at least 60 per cent sand for good infiltration (drainage) of water.

Duich also studied mixtures which had undergone two years of compaction. He found that the best infiltration rate was given with a mixture made of 40 per cent Turface, 10 per cent peat and 50 per cent soil.

Dr. Marvin Ferguson, Mid-Continent Director, U.S. Golf Association, Greens Section, Texas A & M University, noted that the relationship of pore space between soil particles had the biggest influence on soil mixtures.

He noted that by constructing different textural layers in the proper order, a surface could be constructed that would hold enough water and still allow enough drainage for good turfgrass establishment.

Plant Diseases:

Dr. M. Britton, University of Illinois plant pathologist, listed the major turfgrass diseases, noting that there has been very little success in finding a control for them. But he did have a recommendation for getting rid of much of the guttation water which encourages turfgrass diseases.

Guttation water, he explained, is a solution from within the leaf which contains nutrients that encourage turfgrass disease. Most of this solution can be removed with light applications of water (syringing) before mow-

ing. Syringing washes the guttation water off the leaves.

Britton also noted that temperature, light and mowing affect the severity of diseases. He pointed out that most disease causing organisms have survival mechanisms (such as spores) to grow under any conditions. Free moisture keeps fungi alive outside of the plant.

Decreased light decreases photosynthesis and increases carbohydrates, said Britton, making the plant more susceptible to diseases. This decreased light also affects temperature which, in turn, affects various organisms, depending on which temperatures they need to survive.

Britton also pointed out that close mowing increases plant numbers, decreases plant size and increases the effect of a single infection on turf. The smaller plants in a denser population are weaker and less able to fight off disease.

Manage Fertilizer For More Heat Tolerant Bent

Using less nitrogen and boosting the potassium rate when hot weather arrives may reduce heat damage to creeping bentgrass. This type management may increase the use of bent on southern golf courses.

Results from experiments on Pencross bentgrass indicate proper fertilizer will improve year-round performance of the grass, even in warm, humid climates. Results show that nitrogen should be reduced and potassium increased at the start of hot weather. This hardens the grass against high temperature.

Research was conducted at the University of Arkansas, Fayetteville, Ark., by Dr. C. L. Murdoch, agronomist. It was supported in part by a grant from Arkansas State Golf Association. A number of Arkansas golf course superintendents, have found bentgrass hard to maintain during the summer when temperature and humidity are high.

Experiments by Murdoch were based on the common knowledge that nitrogen will increase succulence of plant tissue, and at the same time decrease hardiness. It is also known that potassium decreases succulence and increases hardiness. Purpose of the research was to determine if Pencross bentgrass could be hardened against heat injury by varying applications of potassium and nitrogen fertilizers.

Pencross bentgrass seeds were grown for 30 days on a greenhouse bench at 80° F. They were in soil which contained adequate nutrients for favorable plant growth. Plants were clipped to ½ inch and kept at this height throughout the experiment. After 30 days, the various fertilizer treatments (listed in table) were applied to the plants and they were kept on the bench for an-

(Continued on page 38)

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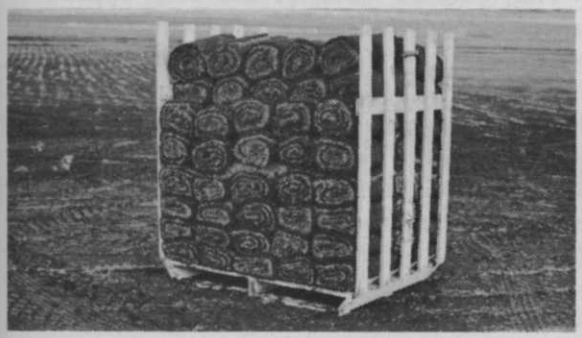

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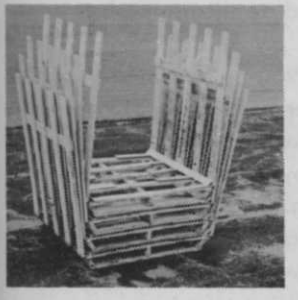

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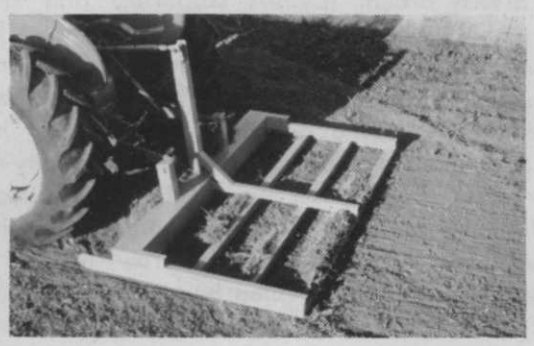

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SCOTCH BROOM

(Cytisus scoparius)

Drawing from: Ivon Watkins-Dow Ltd., New Plymouth, New Zealand.

Prepared by: O. A. Leonard, Botanist, assisted by B. J. McCaskill, Senior Herbarium Botanist, Botany Department, University of California, Davis.

Scotch broom (**Cytisus scoparius**) and French broom (**C. monspessulanus**) are ornamental leguminous shrubs that have escaped from cultivation on the Pacific Coast and have become problems in both wooded and pasture areas. Another introduced leguminous shrub which is potentially even a worse problem on the Pacific Coast is gorse (**Ulex europaeus**). In New Zealand gorse was introduced as a shrub for fence row hedges, but escaped and has occupied hundreds of thousands of acres of first-class pasture lands. Great effort has been expended in controlling both Scotch broom and gorse in that country. Interestingly, these shrubs are not serious problems in Scotland, a country from which they were introduced. Some effort, however, toward controlling them is also practiced in that country. There are about 80 species of **Cytisus** native to Europe, the Canary Islands, northern Africa and western Asia.

Scotch broom is an erect shrub with green branches from about 3 to 10 feet high. The foliage is sparse and deciduous. On young plants the leaves are trifoliate and from ¼ to 1 inch long, with the petioles being about the same length as the blades. On older plants, the leaves may be from ⅛ to ½ inch long, with the petioles again being approximately the same length as the blades. The flowers are yellow, legume or pea-like in shape, about ¾ inch long, and occur solitarily or in pairs in the leaf-axils. They are extremely showy during their flowering period which extends from January to June.

While this plant is a useful and beautiful shrub when kept under control, it can be a serious problem if left to grow unchecked. It is noted for its ability to produce a large number of seeds with long-lasting viability. On the Pacific Coast these seeds germinate from fall through spring. Since Scotch broom is a leguminous plant with nitrogen-fixing bacteria, its small seedlings quickly develop nodules on their roots and thereafter can take care of their own nitrogen requirements. Therefore, these seedlings often grow very rapidly and extend their roots sufficiently deep to withstand competition from grass and other vegetation during the dry summers common to the Pacific Coast.

Although Scotch broom is not a vigorous sprouter, cutting a plant off near the ground line does not prevent it from sprouting. However, a severe fire will kill the entire plant. Incidentally, Scotch broom is highly flammable when conditions are right and can, therefore, be a fire hazard. It burns with such intense heat that many forest trees have been killed by Scotch broom fires.

Young Scotch broom plants can be controlled with 2,4-D. Periodic sprayings will be necessary, however, because seedlings will keep appearing. Even the older plants can be killed with 2,4-D when the treatments are made when they are most sensitive, i.e. when they are in bloom and there is sufficient soil moisture for good growth to occur. Good coverage of the plants is required for best kill and esters should be used. When the plants are old, especially when conditions are not ideal, 2,4,5-T should be used. Again esters should be employed. Mixtures of picloram and 2,4-D or 2,4,5-T are being used in New Zealand to control this shrub.

Like many woody plants, Scotch broom is susceptible to basal sprays. Esters of 2,4-D and 2,4,5-T, or 2,4,5-T alone, are mixed with diesel oil and sprayed on the stems above the ground line. Control is assured if a good application job is done.

Biological control tests on Scotch broom were begun in the U. S. in 1960 when moths of the Scotch broom stem miner (**Leucoptera**) were released in northern California. The use of seed weevils (**Apion**) to destroy broom seed has also been started in California. Reducing the vigor of the plants and destroying their seed with these insects should aid in slowing the spread of this menace.

Classifieds

When answering ads where box number only is given, please address as follows: Box number, c/o Weeds Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

Rates: "Position Wanted" 10c per word, minimum $3.00. All other classifications 20c per word, minimum $4.00. All classified ads must be received by Publisher the 10th of the month preceding publication date and be accompanied by cash or money order covering full payment. Boldface rule box: $25.00 per column inch, two inch minimum.

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Cover Story

(from page 5)

use were carted away by hand prior to the replacement planting.

Forest City is one of the oldest and best known tree care companies in business, originally being started in 1910 by the father of William and John C. Lanphear, both vice-presidents. The Lanphears carry from 10 to 30 employees during the year and operate a complete tree care business. Both began part-time work in the business as youths, in the 1930's. They have continued with the company following college and are active in both the International Shade Tree Conference and the National Arborists Association.

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Manage Fertilizer

(from page 35)

other 7 days. Plants were then transferred to a growth chamber.

The chamber maintained a 95° F day temperature and 85° F at night (14 hour light period) and 90 percent humidity. After 14 days in growth chamber, the plants were rated for vigor and then clipped at the soil surface.

A close relationship was found between vigor ratings and dry weight of clippings for all fertilizer treatments. Dry weight and vigor were increased as levels of potassium fertilizer increased, while applications of nitrogen reduced dry weight and vigor. Best growth was at the highest level of potassium with no nitrogen.

Field experiments are now being made to find the best schedule of nitrogen and potassium fertilization.

Response of Bentgrass Grown under High Temperature and Humidity to Nitrogen and Potassium[1]

Lb. N/ 1000 sq. ft.	Lb.K/1000 sq. ft. 0	1	2	N average
0 lb.				
Gm. dry wt.	.30	.46	.48	.41
Rating[2]	1.88	3.22	3.38	2.99
2 lb.				
Gm. dry wt.	.22	.27	.34	.28
Rating	.81	2.12	2.88	1.76
4 lb.				
Gm. dry wt.	.36	.30	.38	.35
Rating	1.94	2.50	2.44	2.26
K averages				
Gm. dry wt.	.27	.34	.40	—
Rating	1.54	2.61	2.70	—

[1]Applied as solutions of NH_4NO_3 and KCl.

[2]Rated on a scale of 0 to 5 with 0 representing no vigor and 5 high vigor.

Chad Research Fund Up By $4,000

The L. C. Chadwick Memorial Research Fund was increased by $4,000 at the recent 39th annual short course for vegetation care management personnel.

An exhibitors' auction raised the money for the fund which sponsors research in landscape horticulture at Ohio State University.

Herbicide Persistence Varies By Soil Type

Many conditions affect the length of time herbicides will remain in soil. These include application rate, rainfall, and soil type and temperature. In addition, herbicides differ in solubility and resistance to degeneration.

Generally more persistence occurs in dry, cold, clay soils, low in organic matter, and with a low rainfall. Persistence is less in moist, warm, sandy soils, high in organic matter content, and under high rainfall.

Following is a table of some commonly used herbicides. It should be used only as a guide. It was prepared from observation, references, technical sheets and other literature by Dr. Edward Stroube, agronomist at Ohio State University, Columbus, Ohio. Rates of application can be found on the respective labels.

Persistence of Herbicides in a Moist Clay Loam Soil with Little or No Leaching under 60° to 80° F. Soil Temperatures

Chemical	Rate per Acre (Active Ingredient)	Type of Treatment	Persistence in Time
Amitrole	2-10 pounds	Postemergence	3-5 weeks
CIPC	4-8 pounds	Preemergence	3-5 weeks
Dacthal	6-12 pounds	Post or pre-emergence	3-6 weeks
Dalapon	5-20 pounds	Postemergence	1-6 weeks
Diphenamid (Dymid or Enide)	4-8 pounds	Preemergence	6-12 weeks
EPTC (Eptam)	2-6 pounds	Preemergence	3-8 weeks
Simazine	1-4 pounds	Preemergence	6-18 weeks
Trifluralin (Treglan)	¾-1½ pounds	Preplant (inc.)	1-5 months
2,4-D	½-3 pounds	Pre and post-emergence	1-4 weeks
2,4,5-T	½-3 pounds	Postemergence	2-5 weeks

Trimmings

How About Herbicides. Councilmen for the city of Dallas have bemoaned the fact that the city's ordinance for weed control is only about 10% effective. Of 1006 reported violations involving high weeds only 103 were satisfactorily disposed of. Problem seems to be that no city department has the equipment to keep up with the cutting job. We can't advise Dallas councilmen but we think the spraymen of the area need to enlighten the city on the use of custom contract applicators and tree care companies. There should be a chance for some good contracts in helping solve this problem via herbicides, not only in Dallas but in other cities as well.

* * *

Oak Trees Make Superior Campgrounds. Robert A. Bartlett, president of the tree care company bearing his name, said recently that areas with oak trees make the best camp and picnic grounds. Heavy foot traffic, he said, slows up circulation of soil oxygen which is vital to the root system. Oaks, Bartlett says, have roots which search far and wide for nutrients and are thus not hurt as badly by ground traffic. Beech, maple, dogwood, yellow poplar and other shallow-rooted trees suffer.

* * *

'Tis The Season. *Time again to warn people, and especially your clients who should know better, that opportunists in the tree spraying business abound. We haven't heard of any specific cases but were reminded on reading that as of now no Dutch elm disease exists in Denver. City Forester George Stadler was issuing the same type warning last fall. He told homeowners to ignore itinerants who solicited them for spraying elms. Since a cleanup program in 1949, no positive cases of DED have been found.*

* * *

Fertigation? It's a new word for us too. Seems that it describes the injection of liquid fertilizer into irrigation systems. The system isn't too new and has the advantages of cutting labor and getting nutrients to the plants in an available form more quickly. The system definitely has some advantages and we may see lots more of it. But we can't say the same for the newly coined "fertigation."

* * *

Congratulations to ASCA. The newly organized American Society of Consulting Arborists will be a boon to the vegetation care industry. Qualified, unbiased opinions are needed regularly by organizations and individuals who are willing to pay for consultation and technical advice. We hope the group expands to guarantee service throughout the country.

Insect Report

WTT's compilation of insect problems occuring in turfgrasses, trees, and ornamentals throughout the country.

Turf Insects

LEAFHOPPERS

(Cuerna spp.)

Wyoming: Large numbers on rangeland near Burns, Laramie County.

Insects of Ornamentals

APHIDS

(Neophyllaphis podocarpi)

California: Nymphs and adults heavy on podocarpus nursery stock at San Jose, Santa Clara County. *Takecallis arundinariae* nymphs and adults medium on bamboo plants at Sacramento, Sacramento County. **Arizona:** *Aphis nerii* moderate on oleander terminals in plantings in Salt River Valley, Maricopa County; parasitism heavy.

LESSER PEACH TREE BORER

(Synanthedon pictipes)

Alabama: Constant girdling killed about half of 40 laurelcherry shrubs (5-8 feet tall) used as highway ornamentals: several others dying. First adult emergence occurred from these plantings. Pupae ranged 20-50 per plant under bark.

SPIDER MITES

(Oligonychus spp.)

Arizonia: *O. ununguis* heavy on juniper and *O. platani* heavy on many pyracantha shrubs in Tucson, Pima County.

Tree Insects

A BARK BEETLE

(Orthotomicus caelatus)

Delaware: Adult collected in blacklight trap in Dover, Kent County. Occurs in eastern Canada and in the United States as far south as Florida. Breeds in all species of pine and in spruce, larch, and fir. This bark beetle is an important secondary invader, often attacking weakened trees. With other bark beetles, often attacks and kills apparently healthy trees.

EASTERN TENT CATERPILLAR

(Malacosoma americanum)

Alabama: First and second instars 25-100 per small tent in many wild cherry trees from gulf coast counties north through central area. **Oklahoma:** Second instars on native plum trees in Major and Payne Counties.

SPRING CANKERWORM

(Paleacrita vernata)

Nebraska: Males abundant at lights in Lincoln, Lancaster County. **Wisconsin:** Males flying at windows on warm evenings.

NOCTUID MOTHS

(Lithophane laticinerea)
(Eupsilia morrisoni)

Wisconsin: Appearing in blacklight trap at Madison.

WHITE-MARKED TUSSOCK MOTH

(Hemerocampa leucostigma)

Nebraska: Egg masses common on deciduous trees in and around Lincoln, Lancaster County. Some defoliation possible.

A CONIFER SAWFLY

(Neodiprion taedae linearis)

Arkansas: No egg hatch observed in southern area week of March 11. Hatch well underway in mid-March 1967. Probably due to cool weather in 1968.

Compiled from information furnished by the U. S. Department of Agriculture, university staffs, and WTT readers. Turf and tree specialists are urged to send reports of insect problems noted in their areas to: Insect Reports, WEEDS TREES AND TURF, 9800 Detroit Ave., Cleveland, Ohio 44102.

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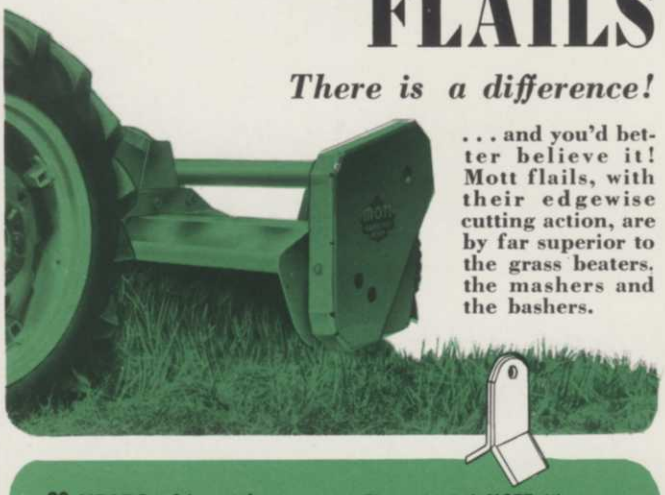

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