Green World

AN INDUSTRYWIDE PUBLICATION OF THE NEW JERSEY TURFGRASS ASSOCIATION

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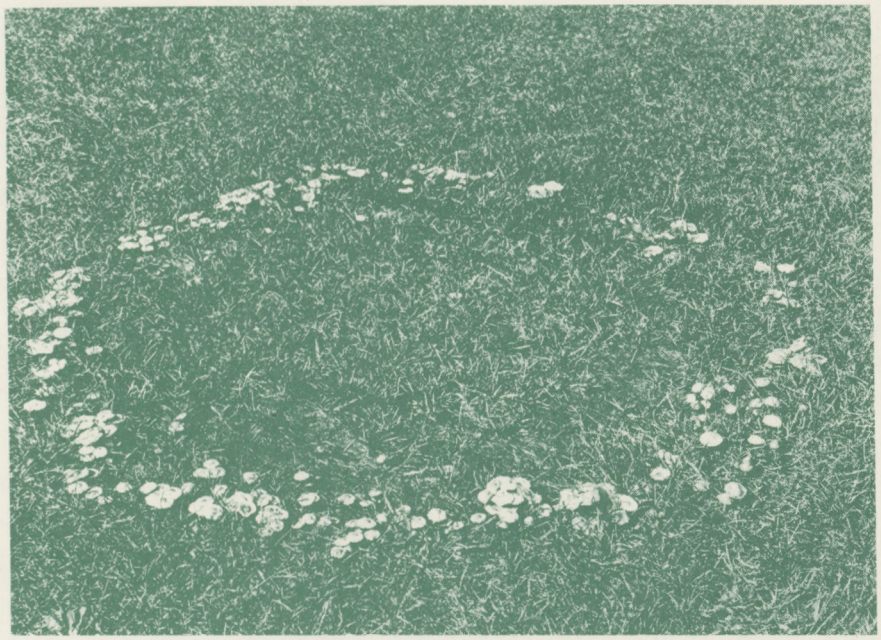

An unusually large number of mushrooms of the fungus, *Marismius oreades*, the most commonly occurring form in New Jersey, appear in this small fairy ring. Many years ago people believed that fairies danced in a circle and caused the mushrooms to grow. Now it is known that a fairy ring is a concentric growth of a fungus from a central point.

ABSTRACT

Some Effects of Subirrigation on Bentgrass During Heat Stress in the Field

J. V. Krans and Gordon V. Johnson

Agron. J. 66:526-530 (1974)

A field study was conducted to evaluate the merits of subirrigation on *Agrostis palustris* Huds. during a 4-month period of heat stress. Effects were evaluated from clipping yields, chlorophyll content and root distribution.

Three irrigation treatments were applied to artificial soils of washed mortar sand and a sand-soil mixture. Temperature adversely affected clipping yields and chlorophyll content during excessive heat stress (30 to 35 C) early in the summer. Clipping yields remained low, but color gradually darkened following the initial stress period. Reduction in clipping yields was greater for the mix than sand. Chlorophyll content was not consistently affected by the kind of soil.

Sprinkle irrigation and subirrigation from a fluctuating water table resulted in similar yields, whereas subirrigation from a single stable water table at 30 cm produced significantly

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Nature As Polluter A Recurring Theme

During an international conference on biometeorology several years ago at the then College of Agriculture and Environmental Science of Rutgers University, a speaker provoked a lively discussion when he suggested that the air over our Continent was thoroughly polluted long before the arrival of the white man.

In his view, the millions of pine trees in the primeval forest loaded the air with toxic terpenes, even creating a haze over dense forests. How else, he asked, could we explain the frequent absence of clear air over the Great Smokies?

Others have given thought to Mother Nature as polluter also, among them John M. Patek who offered his observations and opinions in "News and Views," journal of the American Horticultural Society (and later in "The Shade Tree," bulletin of the New Jersey Federation of Shade Tree Commissions.) Wrote Mr. Patek:

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"In general, no satisfactory control measure is known for fairy rings at the present time."

Fairy Ring Disease Of Turfgrasses

Philip M. Halisky, Professor of Plant Pathology, Cook College, Rutgers University

The seasonal occurrence of mushrooms and puffballs in turgrass areas is relatively commonplace. Such mushrooms create an unsightly appearance that mars the aesthetic quality of otherwise well-maintained turf. Furthermore, these fungi may present a health hazard since some of the species encountered on lawns are known to be toxic to man.

In a 1964 survey turf specialists from 30 locations in North America reported on the severity of various turfgrass diseases. In lawns they ranked fairy rings as the most serious disease encountered, while on golf courses fairy rings were ranked fourth in severity.

SYMPTOMS

Fairy rings are most commonly seen as complete rings, arcs, or crescent shapes of grass which is dark green. At times circles of bare ground or weeds are seen without any mushrooms. At other times mushrooms may appear in a circle without the presence of the dark green band of grass.

In mid-summer the affected grass wilts, turns brown, and dies. Often the ring becomes invaded by weeds. In the absence of rain or irrigation the soil in the ring may become compact and hard.

Fairy rings develop most frequently in weakened turf lacking in nutrients, or in soil high in undecomposed organic matter. Commonly they are seen in turf areas such as pastures that are dry and low in fertility. Fruiting bodies (mushrooms or puffballs) may appear when soil moisture is available.

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Comments and Opinions

BILLIONS!

As an undergraduate in the Depression Thirties, I had a mathematics professor of Scottish origin who was impressed with all the millions of dollars spent by the New Deal. He asked us students how long it would take us to count a million dollars. More recently we have moved from millions to billions. Northeast Agriculture reminded its readers recently that:

One billion seconds ago the Japanese bombed Pearl Harbor.

One billion minutes ago was a world 40 years after the death of Christ.

One billion hours ago man had not set foot on the face of the earth.

One billion *dollars* ago was yesterday. Yes, nearly one *billion dollars per day* or nearly 350 billion dollars for the 1975-76 budget according to reports from Washington. This is a lot of "grass seed"!

– R.E.E.

SAYS TIME TO CALL OFF PESTICIDE 'WITCH HUNT'

"We almost lost 2,3,5-T because they were injecting massive dosages of the chemical into pregnant mice which caused birth defects in the offspring!

"DDT has been fed to weanling mice in dosages 30,000 times what a human might ingest in a day on a weight-by-weight basis."

Gordon L. Berg, for many years an observer of the agricultural scene, thinks this kind of research should be brought to an end. In fact, the headline over his editorial in Farm Chemicals magazine shouts: "It's time to ban massive dosages."

He goes on to report that EPA now admits that the research was "unreliable" that led to its conclusion that 2,4,5-T was a severe health hazard – but only after lengthy and agonizing delays with EPA contending that exposure to 2,4,5-T "might present an imminent hazard to women of childbearing age."

In the same editorial Berg cites Dr. Emil Mrak, an internationally recognized food scientist who found something of special interest to him in a report of the Communicable Disease Center of the Public Health Service. This was to the effect that about 93 percent of the food intoxicants reported at that time were microbial and not chemical in origin.

In view of these and other circumstances, Berg suggests:

"We should all work diligently to ban the practice of injecting massive dosages of pesticides in test animals. The pesticide industry has an enviable 25-year record when it comes to effects of exposure to pesticides.

"It's high time that the pesticide witch hunt comes to an end and more effort be expended toward greater food production in this era of shortages."

WHAT'S AHEAD?

Another summer is almost upon us, bringing the ususal mixed bag of surprises, hard work, fun, frustrations, disappointments, and whatevers.

But sure to be challenging and interesting, particularly in the season of 1975.

Green World leaves you now to return in fall, possibly better than ever. You can help make it that way by sharing with other readers your experiences and opinions. No need to be literary – just helpful to the rest of us.

The editor's mailbag as usual is wide open.

IN APPRECIATION

In behalf of all members of the N.J.T.G.A. your editor wishes to express thanks for the generous support of our sustaining members who are listed for your information on this page.

Equally worthy of our thoughtful and continuing notice are the reminders of useful products offered by our advertisers. Their use of our columns helps ensure the continued success of **Green World.**

There's no more sincere way to say it than "Thank you."

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The New Jersey Turfgrass Association is pleased to receive the following sustaining memberships:

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(Fairy Ring, from Page 1)

LIFE HISTORY

Initial turfgrass infestation generally occurs when pieces of mycelium (thread-like fungus body) are introduced with soil, sod, or by wind-borne spores. Livestock and poultry manures may contain spores of fairy ring fungi. Fungus growth starts at a central point and spreads outward making an ever-widening circle or partial circle. Annual outward growth of a fairy ring may be as little as a few inches or as great as 1 to 2 feet.

The ring grows outward because the fungus seeks new food sources after having depleted its food supply. Accumulation of soil ammonia also encourages growth of the fungus outward. Apparently, stimulation of green grass inside the ring is not due to the activity of the fungus mycelium. Rather, the old mycelium in this soil region is decomposed into available nitrates by other soil microorganisms. These nitrates stimulate the grass which grows as though recently fertilized.

In the process of growth of the rings the fungi produce such a thick, heavy mat of mycelium in the upper 4 to 8 inches of soil that it becomes difficult for water to penetrate to the grass roots. Nutrients may also be unavailable. A lack of water and/or nutrients may contribute to the kill of grass.

Fairy rings may persist for years in the soil. In certain places in Europe they have been observed in the same areas for hundreds of years. In western Canada one fairy ring is estimated to be over 200 years old, while in Colorado two giant rings are estimated to be approximately 600 years old.

CAUSES OF DEATH

Three theories explain how soil-borne fairy ring fungi cause death in turfgrasses. They are:

1) The mycelium of the fungus densely permeates the soil rendering it impervious to penetration by water.
2) The roots of the turfgrasses are invaded by the parasitic fungi which cause the fairy rings.
3) These causal fungi produce a volatile, highly phytotoxic gas called hydrogen cyanide (HCN) in the soil.

Throughout the world more than 60 species of mushrooms and puffballs are known to be associated with fairy rings in turf. The exact mode of action responsible for causing death depends on which particular mushroom or puffball is involved and what type of a ring is formed.

MUSHROOMS AND PUFFBALLS ASSOCIATED WITH TURFGRASS FAIRY RINGS IN NEW JERSEY

Fungus Name	Ring Type	(1964-1968) 5-Year Total
Marasmius oreades	Type 1	55
Agaricus campestris	Type 2	41
Paneolus retirugis	Type 3	20
Lepiota naucina	Type 3	18
Calvatia cyathiformis	Type 2	13
Clitocybe species	Type 1	11
Psilocybe foenisecii	Type 3	6
Agaricus arvensis	Type 1	2
Total fairy ring fungi		*166*

TYPES OF RINGS

Fairy rings are identified by the type of ring or circle that is produced. In general, three types of rings are known.

TYPE 1 – Those rings in which the grass is killed or badly damaged, usually resulting in a circle of bare ground that is devoid of grass. The outer area in advance of this dead zone is characterized by a ring of stimulated grass that is both darker green and taller than the surrounding grass. A second ring of stimulated grass may be formed toward the inside of the dead zone. Mushrooms or puffballs may or may not be present in any of these areas. Type 1 rings impart the most severe injury to turfgrasses.

TYPE 2 – Those rings in which the turfgrass is stimulated but in which no dead zone develops. A Type 2 ring is, therefore, less injurious to turf than a Type 1 ring. Again, mushrooms or puffballs may or may not be present.

TYPE 3 – Those rings in which no effect on the grass can be detected; either by stimulation or death of grass. Type 3 rings are identifiable only by the presence of fruiting structures (mushrooms or puffballs). Type 3 rings are, therefore, least injurious to turfgrasses.

From the above descriptions it is apparent that a Type 1 or Type 2 ring can be detected whether the fruiting bodies of the responsible fungus are present or absent. In contrast, a Type 3 ring can only be identified when fruiting bodies are present.

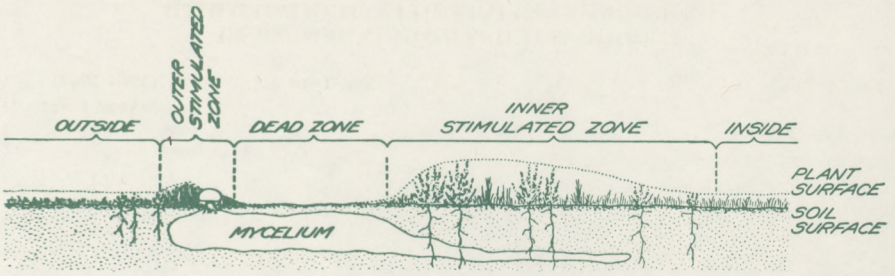
INFLUENCE OF ENVIRONMENT

The influence of environment on symptom expression and on growth of fruiting structures is evident from the fact that where mushrooms are present during a wet year they may fail to reappear during a dry year. Similarly, green bands of stimulated grass that are present one year may disappear the following year, and then reappear in later years. The unpredictable character of these phenomena indicates that symptom expression and mushroom development probably are related to the vicissitudes of the weather.

The extent of injury to turf by fairy rings is also related to the maturity of the rings. Thus, older rings are characterized by more conspicuous zones of stimulated grass than are younger rings. Very old rings, on the other hand, commonly develop zones of weakened or dead grass infested with weeds. Lack of moisture also aggravates the damage from fairy rings as indicated by their increased prevalence during periods of prolonged drought.

FAIRY RINGS IN N.J.

In 1964 a 5-year study was undertaken at Rutgers University to identify the mushrooms and puffballs causing fairy rings in turfgrasses and to categorize the type of ring each species of fungus is associated with. The fleshy fungi were collected from turfgrass areas during May through November each year from 1964 to 1968. The turf areas examined included home lawns, golf courses, public parks, school grounds, industrial lawns, pastures, roadsides, and research plots. Along with environment were noted such observations as distribution patterns, population numbers, and season of greatest abundance. The rings were classified into Type 1, 2 or 3 based on factors such as turfgrass stimulation,



Section through a fairy ring showing the area of soil occupied by the mycelium of the mushroom.

dead-zone formation, and other symptoms associated with fairy ring formation.

Fungus fruiting bodies were identified in the laboratory where spore prints were made to aid in fungus diagnosis. The results of this study showing the kinds (species) of fungi collected and the types of rings they form are given in the table.

In New Jersey the most commonly occurring fairy-ring mushroom *(Marasmius oreades)* forms Type 1 rings in turfgrasses. This is the type of ring that injures turfgrasses most severely. In fact, 41 percent of all the rings examined in turfgrass areas in New Jersey were of the injurious Type 1 category.

CONTROL OF FAIRY RINGS

Attempts to control fairy rings in turf have proven to be very difficult and the most promising treatments have been shortlived. Innumerable attempts have been made to retard or to eliminate fairy rings by use of fungicides, fumigants, removal of soil, fertilization, and the application of high levels of water. Many fungicides have been tested to find one that will completely eradicate the fungus.

To date the search for such a chemical has been fruitless.

The better fungicides appear to retard fungal growth but only temporarily. Eventually the rings reappear. In the past, phenyl mercury acetate (PMAS) and cadmium-containing fungicides were used at twice the recommended dosage for foliar application. However, these compounds are now restricted from use on turf in New Jersey.

The newer benzimidazole systemic fungicides (such as benomyl) are not effective in controlling fairy rings and may even stimulate their activity (See **Green World,** Vol. 2, No. 2, May, 1972).

FUMIGATION

Fumigation by formaldehyde or by methyl bromide is feasible if the rings are few and small. Formaldehyde fumigation may appeal to the homeowner because the method is safe and relatively simple. However, it requires the removal and discarding of sod from the area of the ring plus 18 inches around the outside perimeter of the ring. Because of the extensive work and high cost involved, removal of soil and/or fumigation is often prohibitive.

In general, no satisfactory control measure is known for fairy rings at the present time. All turfgrasses appear susceptible to this disease. Persistent soaking with water using a tree-root probe or hydrogun fastened to a garden hose plus fertilization will help to reduce symptoms of fairy rings in turf.

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If the fairways of Florida's more than 600 golf courses were aligned end to end you could tour the state by playing golf around its 1,197 miles of general coastline and then up its 447-mile length, and finally play across its widest breadth of 361 miles without ever leaving the interlocking fairways.

Contentment is the smother of invention.

(Nature, from Page 1)

"The concept of nature the purifier versus man the polluter is an emotional product of the technically uninformed, for if our air were totally free of the impurities now classified as pollutants, there would be no life. They are necessary for life. Nature itself is a great polluter, often on a grand scale. Man's problems result largely from concentrations of pollutants over limited areas.

"The oxygen in the earth's envelope of gases is attributed by some to green plants. True, they release oxygen during their daylight hours of photosynthesis, but they also take up oxygen in the process of respiration.

"Overlooked is the question of which came first, the plant or the oxygen. Moreover, when the green plants die and decay they absorb oxygen and return carbon dioxide to the atmosphre. Thus plants produce no significant net gain in oxygen.

"At the University of Utah, scientists found evidence of important atmospheric sulfur pollution from bacteriogenic sulfur released by anaerobes from muds. At particular seasons, these compounds may rival industrial sulfur effluent.

"Another instance of nature's polluting may be found with estrogens which have been cited as cancer-inducing agents. They are found naturally in lettuce, soybeans, and corn which are reported to contain quantities of estrogens above government limits established for synthetic estrogens in food products."

(Subirrigation, from Page 1)

lower yields. Subirrigated plots also had significantly lower chlorophyll production than sprinkle-irrigated plots. The reduced color associated with subirrigated treatments apparently resulted from poor aeration.

Root development was deeper (45 cm vs. 30 cm) and total mass greater in the sand than in the mix. This difference was attributed to a greater % air-filled pore space and lower N levels in the sand. Differences in root mass between irrigation treatments were related to aeration differences in subirrigated plots and N nutrition in surface irrigated treatments. Sprinkler-irrigated plots required periodic syringing while temporary wilting was not observed on subirrigation plots.

Comments by R. E. Engel, Research Professor in Turfgrass Management, Cook College, Rutgers University:

All who have labored at watering turf have thought about underground irrigation of turf. While installations of this type which are tried from time to time, serve a developmental purpose, it is equally important that we learn some agronomic facts about the turfgrass plant, soil and water. Results of special interest from this study are: (1) The better grass performance with the fluctuating water table, as compared with a fixed water table, in underground watering shows that a soil can be too wet for best growth of bentgrass; (2) The reduced color associated with subirrigated treatments shows something is needed in such systems to overcome the problems of excessive wetness and poor soil aeration; and (3) the greater need to syringe on the surface-watered cultures suggests that their daily surface watering created a more wilt-susceptible turf.

In addition, the soil moisture readings showed that surface-watered plots had lower water content below the top 5 cm of the 30 cm (12 inches) depth of soil as contrasted with the drier surface and better soil moisture at greater depth in the 30 cm of subirrigated soil. Does this indicate that we should grow turf on a soil that is drier in the two surface inches and has higher moisture below? This theory offers several advantages.

With regard to the growing of turf on a subsurface water table, I have always hoped someone would conduct a long-term study to determine the cumulative effects on root residues and other factors.

Lawn and turf are prey to 100 different disease-producing organisms.

ABSTRACT

Evaluation of Kentucky Bluegrass and Red Fescue Cultivars for Sod Production. R. H. Hurley and C. R. Skogley, from Agronomy Journal 67:79-82(1975).

Until recently, much of the commercial sod produced in the Northeast has been 'Merion' Kentucky bluegrass (*Poa pratensis L.*). Many turf authorities now feel that blends of improved Kentucky bluegrass and red fescue (*Festuca rubra L.*) cultivars should be used to broaden the genetic base of the mixture. This type of mixture would be adaptable to a wider range of environmental conditions.

'Merion', 'Baron', 'Fylking', and 'Pennstar' Kentucky bluegrasses and 'Jamestown', 'Highlight' (*Festuca rubra* var. commutata Gaud.) and 'Pennlawn' red fescues were studied singly and in mixtures for commercial sod production. Cultivar compatibility in mixtures was evaluated by turf quality ratings and tiller counts, rate of establishment, durability as measured by tensile strength of harvested sod, and rate of sod knitting after transplant.

All cultivars and mixtures provided acceptable visual turf quality with Baron, Pennstar, and Baron-Pennstar, Merion-Baron mixtures providing the highest turf quality ratings.

Tensile strength was not altered by use of improved Kentucky bluegrass cultivars alone or in mixtures. Red fescue significantly reduced sod strength when included in mixtures with Kentucky bluegrass. This reduction did not affect handling of the harvested sod when up to 67 percent red fescue by weight was included in the seed mixture.

Jamestown and Highlight red rescue produced significantly more tillers than Pennlawn, and those cultivars were better able to compete with Merion Kentucky bluegrass.

Comments by R.C. O'Knefski, Associate in Turfgrass Management, Cook College, Rutgers University:

This study shows that red fescue can be grown with Kentucky bluegrasses without serious loss of sod strength. This negates one of the reasons why we cannot provide mixed sod of Kentucky bluegrass-red fescue for the many homeowners who are looking for sod which can be grown in shade. Use of straight Kentucky bluegrass for this purpose in the Northeast is futile. Many of the newer varieties of red fescue are more aggressive and resistant to diseases. Some of these diseases have been responsible for the loss of sod in moderate or heavy shade.

Thus, we may be able to grow sod in the shade better than before.

Dr. Robert Duell of Cook College established variety trials last fall at Rutgers in moderate shade. These should help us to evaluate many of the newer varieties for shade purposes. These trials should also be on considerable value in determining the better varieties for sod mixtures.

GAS NEAR RECHARGING BATTERY CAN EXPLODE

An auto or tractor battery that's being recharged can explode into a possible faceful of battery acid and shrapnel-like pieces of battery.

Charging a battery generates hydrogen gas, and it takes only a little hydrogen, plus oxygen, to form an explosive mixture with a great deal of power. Enough to blow a battery apart.

Obviously, it's foolish to smoke near a battery that's being charged, but equally important, be careful about making sparks when you connect or remove terminal cables.

To be safe, when you "boost" a battery, do this:

* Remove the cell caps from both batteries.

* Connect the positive (+) terminals of the two batteries first, making the first terminal connection to the live battery. Then make the negative (–) connection to the live battery.

* Connect the negative terminal of the dead battery to the frame, bumper, engine block, or some other good grounding spot *away from the battery.* Then, if you make a spark it will be farther away from the battery that is emitting the explosive hydrogen.

When you charge a battery remove the cell caps. Connect the charger to the terminals of the battery, positive to positive, negative to negative, before you plug the charger into the electrical outlet. After charging, first unplug the charger, then take off the terminal connections.

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