APRIL 1989

LAWN INSTITUTE

Harvests

Volume 36 Number 1

THE HARVEST MIX

This issue of Harvests features Part IV of the series "The Lawnscape - An Ecological Wonder", this one on The Living Soil.

Twelve Threshing the Journal articles are reviewed to help keep you current on research findings which have been published.

An article from the Florida Turf Digest by Ed Davis brings us up-to-date on Xeriscape, a concept which is getting more and more attention in areas where water for the landscape is short in supply.

Statistics from three United States state surveys and one Canadian province survey are of interest. We receive many calls for such figures.

The booklet "Lawn and Sports Turf Benefits" has been in great demand. In one state they have been distributed to state legislators. Several people have sent us additional information and we hope this continues so that our files are as complete as possible on this important subject.

THE LAWNSCAPE — AN ECOLOGICAL WONDER

Part IV ~ The Living Soil

by

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The sounds of frogs and insect life in wetlands calls our attention to the ecology of these places. Biologically lawns are rather quiet, but even so, they are composed of plant and animal life that is teeming with activity.

A lawn cut at a two inch height is a very small "forest", but within this vegetative canopy are fascinating organisms that influence one another's life style and respond dramatically to changes in the environment.

Wetlands may be located some distance from us, but chances are good that you walk on a lawn most every day. Isn't it time to become more familiar with those organisms that contribute so much to the enjoyment of lawns and sports turf ?

Six groups of plants and animals live on or within the soil to a six inch depth and within the two inch lawn foliar canopy. These are:

- turfgrasses;

- weedy plants;

- organisms that cause turfgrass diseases;

- insects that feed on turfgrasses;

- soil microorganisms - generally beneficial to turfgrass;

Then there is "bigfoot" - those of us that walk and play on the lawn. At times we do more harm to the turf by compacting the soil and scuffing the grasses than is caused by all the diseases and insects combined.

Have you noticed that sometimes lawn quality will vary from very good to very poor within a short distance ? Poorly maintained lawns may look awful. On the other hand, some of the best lawns I've seen were just left alone most of the time. Other lawns respond well to tender loving care, and yet, still others are over-maintained to the extent that they are less hardy and persistent and may even die. Why is this ?

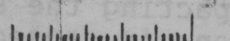
It's all related to the ecology of the lawn, that branch of science that is concerned with relations between plants and animals and their environment. Lawns and sports turf provide good examples of ecological principles and the understanding of these can help make you a lawn expert. This is not only good for improving environmental quality of your neighborhood, it is also likely that you can make your school grounds more attractive and your sports fields safer for play.

The Living Soil continued

Space Relationships in Lawn Root Zones

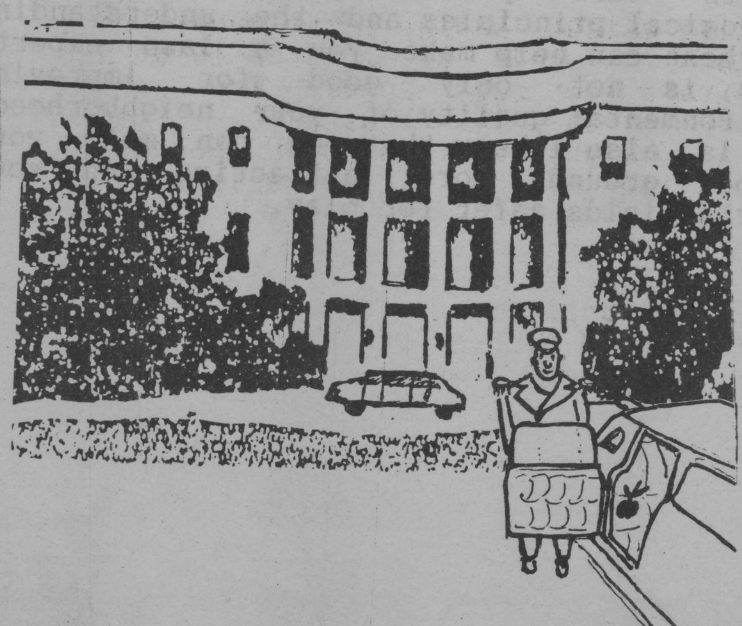
- Soil particles are very small - so small that we must measure them in metric units. Stones are generally 10 to 100 millimeters in diameter [some may be even larger]; gravel is 2 to 10 millimeters in size; coarse sand, 0.2 to 2 millimeters; fine sand, 0.02 to 0.2 millimeter; silt 0.002 to 0.02 millimeter and clay, smaller than 0.002 millimeter. Clays are so small that they are measured in microns [0.002 millimeter is equivalent to 2 microns]. Sands are graded in various sized fractions with the biggest being about 40 times larger than the smallest.

1 inch



25 millimeters per inch

- Since we seldom deal with particles this small, it's necessary to compare sand, silt and clay sizes with some things we are familiar with in order to picture how small a clay particle really is. If we start with a medium sized sand particle magnified to the size of the White House in Washington, DC, then a silt particle would be about the size of a limosine parked at the front door, and a clay particle would be about the size of an orange or apple on the front seat.



- With particles this small, there are very many of them in the soil. For example, a pound of medium sand only contains about 2 1/2 million particles, while a pound of silt will contain more than 2 1/2 billion particles and a pound of clay will contain over 40 trillion particles. On the basis of total particle surface, this amount of sand would have 20 square feet; the silt would generate 220 square feet of surface and the clay would have 5,500 square feet of particle surface.

- Now, if we think a clay particle is small, relative to sand, how about a molecule of water that is associated with the clay.

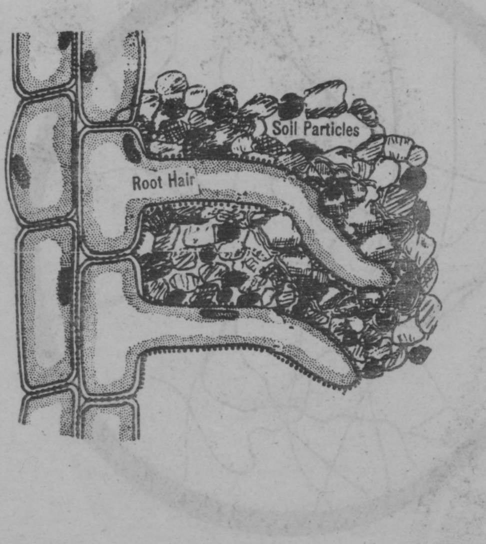
- If you empty the beverage from a 2 liter bottle and fill it with sea water; then tag each molecule of water in the bottle and empty it back into the sea, followed by a mixing of the water in all oceans and seas so that the tagged water is equally dispersed the world over, then withdraw 2 liters of sea water from any where in the world, there will be about 30,000 tagged water molecules in that bottle. A water molecule is very small!

The Living Soil continued

- Thus, when we are considering chemical and microbial reactions that are taking place in colloidal systems, we are concerned with very small particles that have very large surface areas. That is, they are very surface active. In fact, it is this high surface activity combined with living organisms that make the soil a living, dynamic system.

- Large numbers associated with soil particles, with micro- and macro-organisms and with molecules that enter into soil reactions are not limited to just the soil. They also are noted in the numbers of grass plants that produce quality lawn turf - some 35 million plants per acre. One single grass plant can produce 375 miles of roots consisting of almost 14 million individual roots that have a surface of 2,500 square feet.

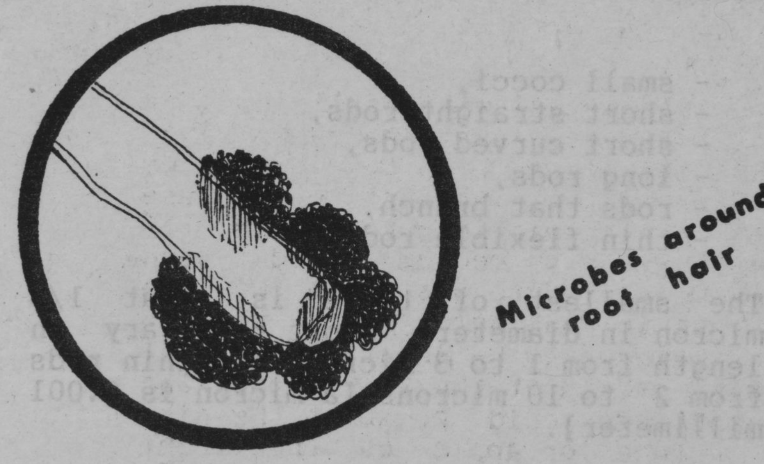
- So, turf culture involves large numbers of grass plants with the potential for extensive root contact with soil particles, nutrients in solution and microbes that are all a part of the most amazing system ever created or devised.



Soil Microorganisms

- Populations of microorganisms vary considerably in the soil. High populations are favored by adequate moisture, warm temperatures and the presence of organic matter. Localized dry spots, cool temperatures and low organic matter levels cause these organisms to be less prevalent. Population changes can take place quickly as conditions become more or less favorable.

- A good lawn or sports field soil should maintain more than 900 billion microbes for each pound of soil within the root zone. Highly sandy soils often contain much less than this, but they are far from sterile. Most of these microbes are bacteria - about 910 billion per pound of soil. There will probably be about 20 billion actinomyces and 670 million protozoa and 450 million fungi. Some of the protozoa will be flagellates, some ciliates and others amoeba.



- On a live weight basis, there should be more than 70 pounds of microbes in each 1000 square foot root zone. The soil component of that 1000 square foot root zone will weight close to 50,000 pounds; so the weight of the microorganisms is relatively small for the large populations present. On the average, there may be 35 pounds of fungi, 17 pounds of actinomyces, 12 pounds of bacteria and 8 pounds of protozoa per 1000 square feet of root zone.

The Living Soil continued

- These microorganisms are of most value as they function as living entities. Many, such as bacteria, are short lived. As they die they release nutrients back to the soil. For example, for each 100 pounds of dry [dead] bacteria, the soil will receive:

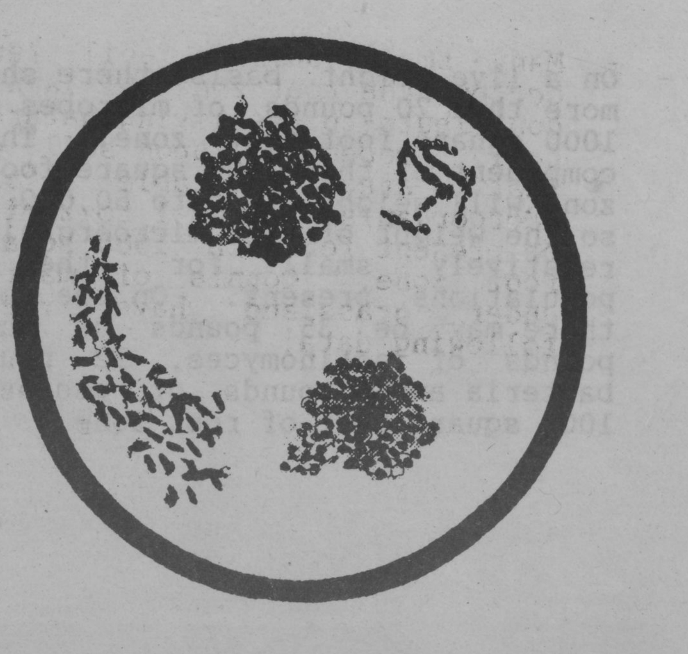
  * 10 pounds of nitrogen,
  * 5 pounds of P_2O_5,
  * 2 pounds of K_2O,
  * 1/2 pound of CaO,
  * 1/2 pound of MgO,
  * 1/3 pound of SO_3.

Bacteria

- There are many types of bacteria and they are among the most important groups of soil organisms. Generally they are classified as:

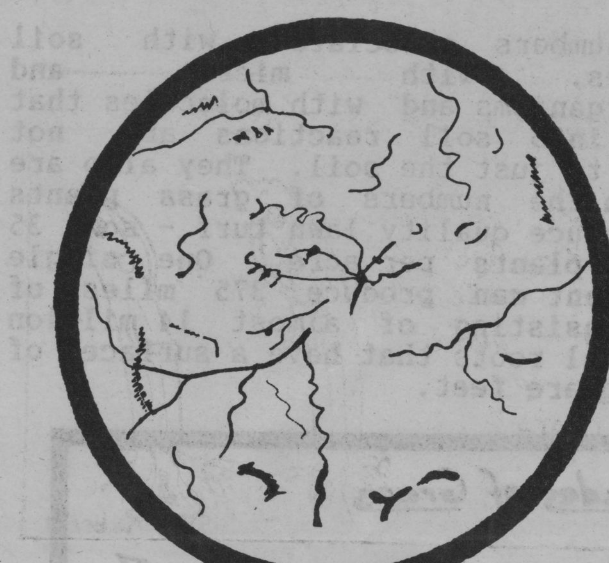
  - small cocci,
  - short straight rods,
  - short curved rods,
  - long rods,
  - rods that branch,
  - thin flexible rods.

The smallest of these is about 1/2 micron in diameter. Short rods vary in length from 1 to 3 microns and thin rods from 2 to 10 microns [a micron is 0.001 millimeter].



Actinomyces

- These microscopic organisms are a transition between bacteria and fungi. They are classified within the genera Streptomyces or Micromonospora. They form very fine, often highly-branched hyphae when growing. These develop spores that give the soil its characteristic good earthy odor.

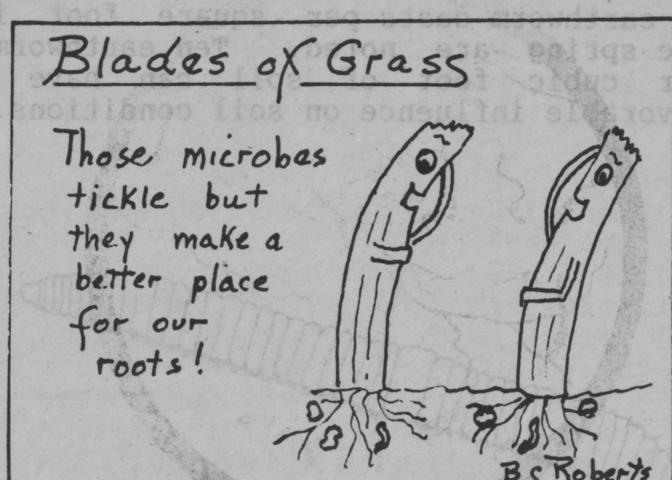


Fungi

- Soil fungi belong to the group that form filaments or mycelia with the exception of some organisms that are myxomycetes or slime fungi and some yeast-like organisms. They are mostly Phycomycetes, which have branched unseptate mycelia, or Moniliaceae, a group of Fungi Imperfecti, or to a related group of Ascomycetes, which have branched septate mycelia, or Basidiomycetes that are mushroom-like. Some fungi live on dead organic matter and others are parasitic.

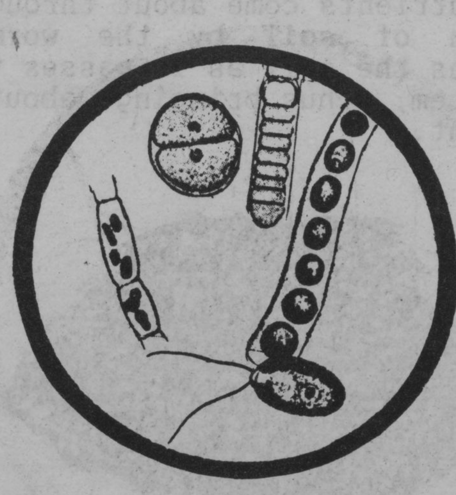
Fungal Endophytes

- Some lawngrasses are naturally or systemically infected by mycelium of the fungal endophyte Epichloe typhina (Fr) Tul. The fungus is systemic and perennial , living in the crown and rhizomatous parts of the plant. Neurotoxins, alkaloids and other compounds associated with endophyte infection are involved in resistance mechanisms to some insects and possibly some plant-pathogenic microorganisms. The endophyte does not injure lawngrasses in any way but protects them from insect injury.



Algae

- Soil algae are microscopic chlorophyll-containing organisms and belong mainly to the Myxophyceae [blue-green], the Xanthophyceae [yellow-green], the Bacillariaceae [diatoms] and the Chlorophyceae [green] groups. They occur as simple unicellular organisms or as simple filaments or colonies. They live on the soil surface and just under the surface, where sunlight can penetrate and also below the soil surface. Functions are different for each of these three types.



Protozoa

- Protozoa are minute animals found in soils. They consist mainly of rhizopods and flagellates. A few ciliates can also be found. The rhizopods include the amoebae. These vary enormously in size from the smallest [10 to 40 microns] to the largest forms that are several tenths of a millimeter in size. The flagellates have one or more flagellae that help them move and are usually 5 to 20 microns in length. The ciliates have many short cilia covering their bodies and are usually 20 to 80 microns in length.

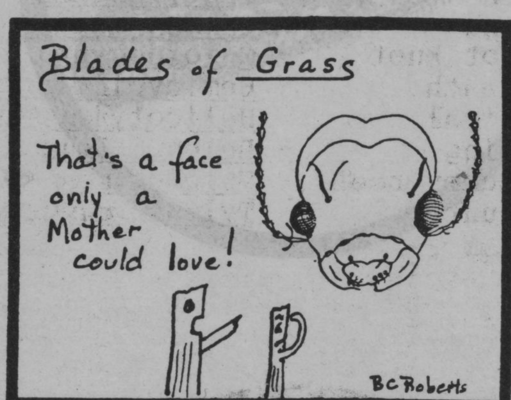
Soil Macroorganisms

- Many small animals [soil fauna] also occupy the root zones of lawn turf and contribute to the living nature of the soil. Depending upon soil conditions that are favorable for these macroorganisms, from 1 to 2 million may be present for each 1000 square feet of root zone. Counts of macroorganisms under grassland have yielded the following data:

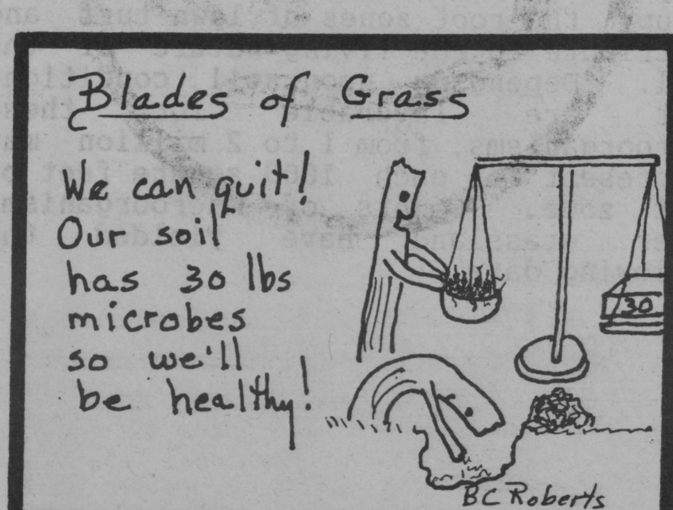
The Living Soil continued

	Millions/Acre *
- insects:	
springtails [Collembola]	54
beetle larvae [Coleoptera]	2
fly larvae [Diptera]	11
other insects	11
- myriapods	2
- arachnids	
mites [Acarina]	3
spiders [Araneae]	1
- oligochaetes	8
- nematodes	8
	100

* E J Russell. 1950. Soil Conditions and Plant Growth. Longmans, Green & Co, London, England. Page 173.

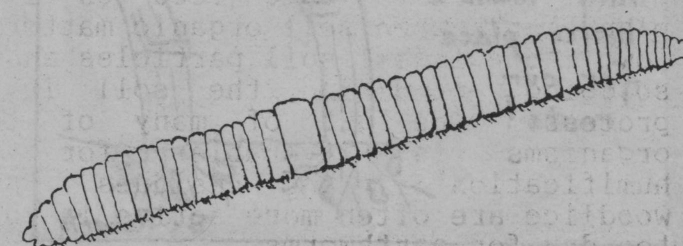


- The live weight of these macroorganisms would range from 15 to 30 pounds per 1000 square feet of root zone. Where conditions are much less favorable than under grassland, the numbers and weights of macroorganisms are greatly reduced.

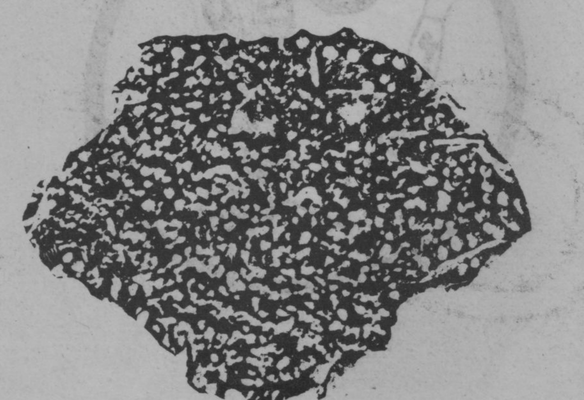


Earthworms

- Earthworms [Annelida and Oligochaeta] are perhaps the best known of soil macroorganisms. Again, depending on how favorable soil conditions are, there may be as many as 70,000 per 1000 square feet of root zone. Frequent counts of 20 earthworm casts per square foot in the spring are noted. Ten earthworms per cubic foot of soil can have a favorable influence on soil conditions.



- Earthworm casts in a years time may amount to as much as 40 pounds of soil deposited on the surface for each 1000 square foot of root zone. These casts are greatly enriched in comparison with the surrounding soil. For example, the nitrate content of casts can be increased by over 300 percent; the phosphorus content may be increased by over 600 percent and the potassium content by over 1000 percent. Calcium and magnesium increases are usually less; i.e., 40 percent for calcium and 200 for magnesium. These increases in plant nutrients come about through the ingestion of soil by the worm. It conditions the soil as it passes through its system, thus bringing about this enrichment.



The Living Soil continued

Arthropods

- Common soil arthropods belong to a restricted number of orders which include:

  - Arachnids - spiders and mites
  - Myriapods - millepedes, centipedes
  - Collembola - springtails
  - Coleoptera - beetle larvae
  - Diptera - flies, ants, termites.

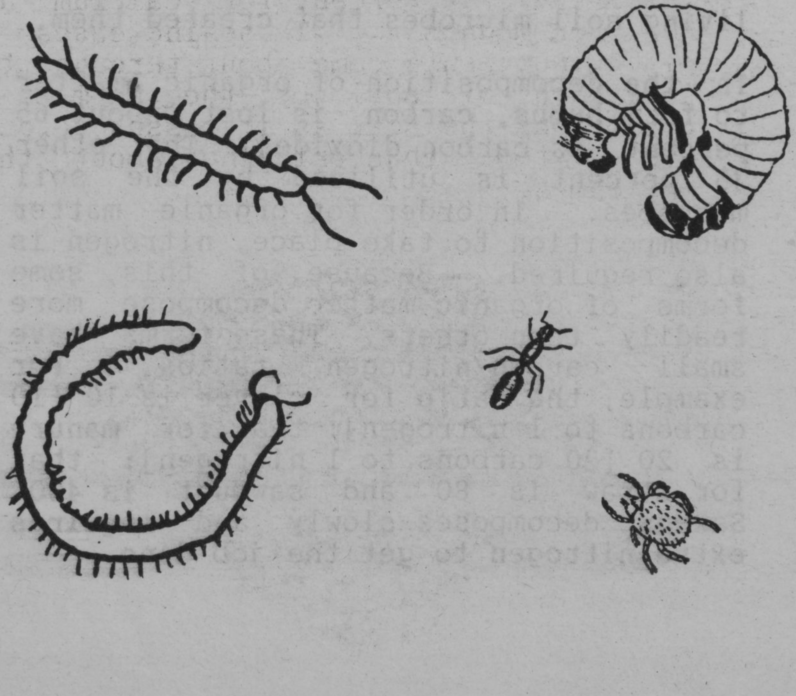
  Mites feed on decaying organic matter. They are from 0.1 to 1 millimeter in size and can easily feed inside of dead plant roots. They burrow actively and help keep soils aerated.

- Myriapods are active feeders on decaying plant remains. Some feed on living plant parts when soil organic matter is low. Some injest soil particles and in so doing, condition the soil in the process. The gut of many of these organisms is favorable for the humification of plant residues. Small woodlice are often more active in soils too dry for earthworms.

- Springtails are wingless insects that are from 0.5 to 2 millimeters long. They feed on decaying organic matter.

- Beetle larvae are much larger and have a greater impact on the soil as burrowers. Also, they often feed on living grass roots.

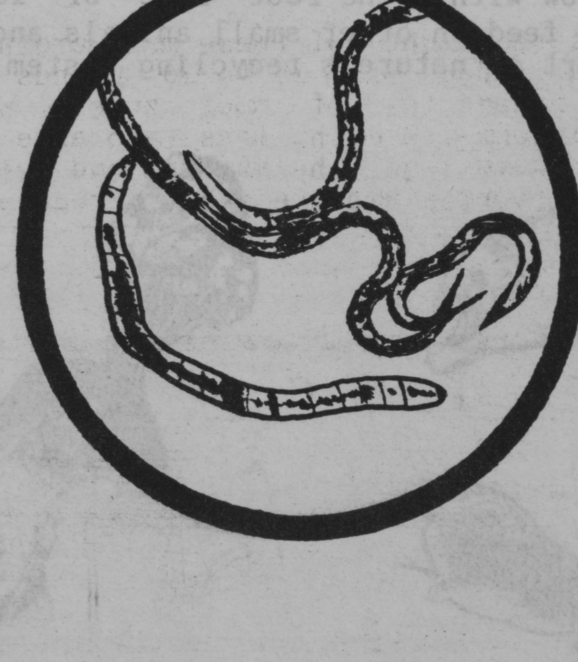
- Fly larvae live on decaying organic matter for the most part. Ants and termites are soil movers primarily, although some termites do ingest soil and mix it with organic matter.



Nematodes

- Nematodes or eelworms are non-segmented worms with cylindrical or spindle-shaped bodies. Most are from 0.5 to 1.5 millimeter long and 40 to 50 times as long as they are broad. There are generally 3 types; i.e., those that live on decaying organic matter, those that feed on small soil inhabiting animals and those that feed on plant roots. They are represented in the following classes:

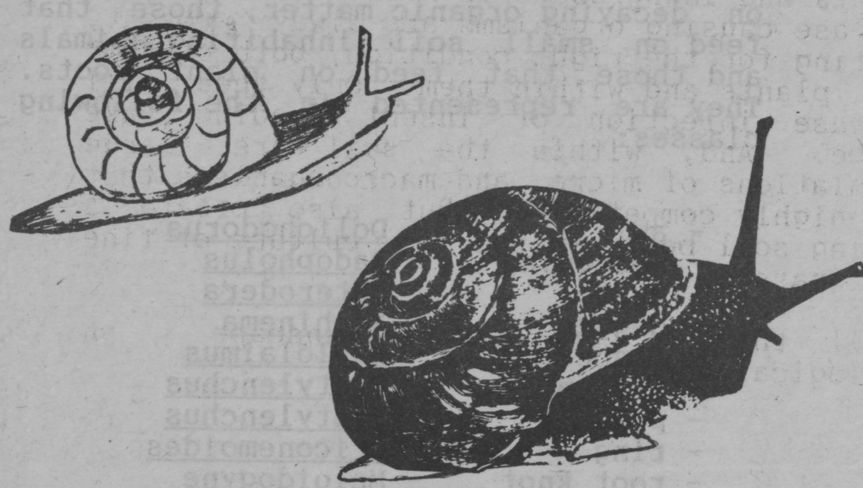
  - awl - Dolichodorus
  - burrowing - Radopholus
  - cyst - Heterodera
  - dagger - Xiphinema
  - lance - Hoplolaimus
  - lesion - Pratylenchus
  - pin - Pratylenchus
  - ring - Criconemoides
  - root knot - Meloidogyne
  - sheath - Hemicycliophoro
  - spiral - Helicotylenchus
  - sting - Belonolaimus
  - stubby root - Trichodorus
  - stunt - Tylenchorhynchus



The Living Soil continued

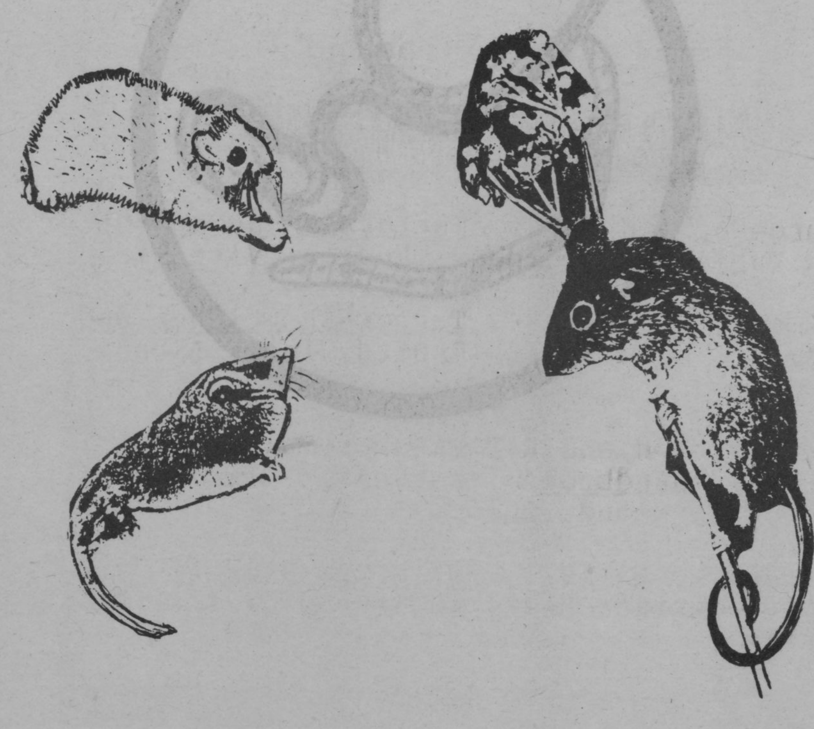
Gasteropods

- Slugs [Limacidae family] and snails [Gastropoda class] are the two soil representatives of the Gasteropods. Most are surface feeders that live in damp places, often provided by shady, moist lawns. They are typically scavengers that can render plant tissue more usable for smaller animals.



Soil-inhabiting Mammals

- Moles [Scapanus spp] and rodents [Rodentia order], including mice [Muridae family], voles [Microtus spp], gophers [Thomomys spp], and ground squirrels [Spermophilus spp] live and burrow within the root zone of lawns. They feed on other small animals and are a part of nature's recycling system.



Benefits of Soil Organisms

- Microbiological processes convert organic matter in the soil into humus. This is an ongoing reaction of great importance to turfgrasses. Humus is colloidal in nature and helps to form and stabilize soil aggregates that are so essential in encouraging deep and extensive root growth. Humus also contributes to the exchange complex of the soil that holds and releases nutrients for plant growth.

- As organic matter is decomposed, there are many intermediate products and by-products, such as cellulose, hemicellulose, starches, sugars, oils and fats. There may also be proteins, amino acids, amides and lignin, as well as residues that are not decomposed. These are attacked by varying populations of microorganisms. They utilize what they can and leave carbon dioxide, water and some alcohols and organic acids. Proteins, amino acids and amides become part of the microbial cell substance. Unutilized ammonia may be released and converted to nitrate for use by turfgrasses.

- Lignins become the humus nucleus and are associated with fats, waxes, hemicelluloses and proteins to form unique compounds. These have a negative charge and contain 10 times more carbon than nitrogen. This gives the compounds, which are non-living, about the same carbon/nitrogen ratio as the living soil microbes that created them.

- In the decomposition of organic matter to form humus, carbon is lost [about 65 percent as carbon dioxide]. The other 35 percent is utilized by the soil microbes. In order for organic matter decomposition to take place, nitrogen is also required. Because of this, some forms of organic matter decompose more readily than others. These forms have small carbon/nitrogen ratios. For example, the ratio for clover is 10 [10 carbons to 1 nitrogen]; that for manure is 20 [20 carbons to 1 nitrogen]; that for straw is 80 and sawdust is 400. Sawdust decomposes slowly and requires extra nitrogen to get the job done.

The Living Soil continued

- If we identify 100 pounds of organic matter that is 40 percent carbon, that means there are 40 pounds of carbon available. Of this 35 percent, or 14 pounds, of carbon will be utilized by the microbes. For microorganisms with a carbon/nitrogen ratio of 10, the decomposition of this organic matter will require 1.4 pounds of nitrogen. [$10/1=14/x$ $x=1.4$]. Should this amount of nitrogen not be available, a supplemental application must be made. Generally organic matter with a carbon/nitrogen ratio less than 30 has adequate nitrogen for microbial decomposition without an additional supply. Organic matter with a carbon/nitrogen ratio more than 30 has inadequate nitrogen for microbial breakdown. In this instance, the material may remain undecomposed or it may be decomposed at the expense of soil nitrogen reserves required for turfgrass growth or it may decompose in the presence of excess soil nitrogen thus making this excess nitrogen tied up and unavailable in the bodies of the microorganisms.

- These decomposition processes are not highly efficient. Only about 20 percent of the energy of decomposition is used by the microbes. The remaining 80 percent of the energy is lost as heat. This is generally not noted in soil but is evident in heat generated in the interior of compost piles.

- Besides the decomposition of organic matter to form humus, microbes [mostly bacteria] are involved in other processes some of which involve nitrogen. For example:

  * ammonia is formed and released in the soil by ammonification reactions;

  * ammonia in the soil is converted to nitrites and nitrites are converted to nitrates by nitrification reactions;

  * under anaerobic soil conditions, nitrates are converted to nitrites and these reduced to nitrogen gas by denitrification processes; and

  * atmospheric nitrogen may be fixed in the soil, both in association with plants like legumes [symbiotic] or without plants [non-symbiotic], by nitrogen fixing bacteria. An acre of legumes can fix from 100 to 150 pounds of nitrogen a year in this way.

The Whole Picture

Now, instead of viewing lawns and sports turf as simply some form of green plant cover over the ground, these areas become dynamic, ever changing populations of plants and animals living within and above the soil. There are lawngrasses competing with other lawngrasses. Competition between weedy plants and lawngrasses is keen. Insects and disease causing organisms are always present, waiting for the right condition, both outside the plants and within them. Only then will disease infection or insect feeding take place. And, within the soil are large populations of micro- and macroorganisms that are highly competitive, but also create a living soil best suited to culture of fine turfgrasses.

All this is part of the lawnscape - an ecological wonder.

For Further Reading

- Turgeon, A J. 1985. Turfgrass Management. Reston Publishing Company, Reston, Virginia.

- Emmons, R D. 1984. Turfgrass Science and Management. Delmar Publishers, Inc., Albany, New York.

- Daniel, W H and R P Freeborg. 1979. Turf Manager's Handbook. Harvest Publishing Company, Cleveland, Ohio.

- Beard, J B. 1973. Turfgrass Science and Culture. Prentice-Hall, Englewood Cliffs, New Jersey.

XERISCAPE... UPDATE

By Ed Davis
R & D Sod
Okeechobee FL

The recent Xeriscape Conference held in Ft Lauderdale enabled me to see a problem facing the South Florida Water Management District and the citizens they serve. The problem is that too many people use too much water. One of the ways to help solve this problem is a concept called Xeriscape.

During the meeting I met people who were very skeptical of the new concept. Others described Xeriscape as a marketing tool. Still others were fanatical about Xeriscape and native plants. Most referred to lawns as "lushy-gushy". All expressed concerns about the urban environment and the lack of green in the cities. The SFWMD and Bruce Adams in particular, seemed to be in the middle ground at this meeting. Whether you agree with the Xeriscape concept or its goals, the SFWMD is committed to Xeriscape. They will continue to use Xeriscape for solving the problem of too much water usage in the landscape.

As I was listening to one speaker tell of the volume of water used by each person in South Florida, I remembered when my grandmother scolded me for wasting water. How this came about was that I poured out the wash water on the ground instead of saving it for slopping the hogs. All waste water, whether dish or bath water, was for the hogs. If we had extra waste water, as on wash day, we put it on the azaleas next to the front steps. We haven't changed, we are still throwing out the wash water.

The turf industry supports the wise use of water in the landscape. We also continue to support the need for practical turf areas. The term "Practical Turf Area" is a replacement for the negative term of "limited turf" found in early Xeriscape promotional material. It should be clear to the turf industry by now that the terms "Limited Plant Areas" or Limited Hard Surface Areas" do not appear in the current literature.

An example of a non-practical turf area would be the narrow strip of turf, found along the side of a parking lot, road or building. Islands of turf in the parking areas is also a non-practical use of turf. These areas consume large amounts of water and labor. The mounds that are so popular in the landscape design today are also an example of non-practical turf usage. These mounds require extra water, are difficult to mow and hamper the water cleansing ability of turfgrass. Turfgrass does not grow in dense shade and this is also a non-practical area.

Practical turf areas should include an area large enough to accept the rainfall runoff from parking lots, roads and other non-pervious surfaces. This one area itself should be basic to all landscape designs. Play, social and sports areas are a few other practical turf areas. Another important practical turf area is an open area around buildings. Open turf areas reduce hiding places for criminals. This practical turf area is extremely important to South Florida's senior citizens. It is interesting to read how Florida's pioneers cleaned all shrubs from around their homestead to guard against Indians and fire.

There must be a balance of practical turf areas, plant areas and impervious surfaces in the landscape. Xeriscape, if it accomplishes nothing else, will focus attention on this balance.

The turf industry needs to adjust to the changing values of its customers. Xeriscape will mean less sod, less lawn area to mow, less lawn chemicals and less lawn equipment sold. Xeriscape does not mean less opportunity or less economic reward. We may perceive Xeriscape as the enemy or as a blessing. The zeal that I saw at this conference for Xeriscape will have an effect on the turf industry. We need to join and learn as much about Xeriscape as we can.

Reprinted from Florida Turf Digest
Vol 5 No 11
November 1988 p 7

THRESHING THE JOURNALS

BERMUDAGRASS, ZOYSIAGRASS, CENTIPEDEGRASS

INFLUENCE OF PLANT GROWTH REGULATORS ON TRANSITION OF BERMUDAGRASS PUTTING GREEN OVERSEEDED WITH PERENNIAL RYEGRASS

A R Mazur
Journal Am Soc for Horticultural Science
Volume 113 Number 3
Pages 367-373
1988

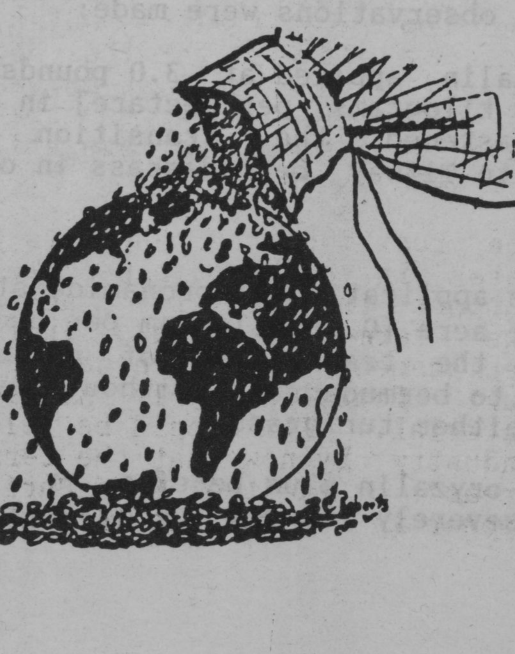
Hybrid bermudagrass greens in the southern United States are normally overseeded with ryegrass in the fall to provide green color, uniform surfaces and wear resistance during the period of winter dormancy. The greens are overseeded with ryegrass several weeks prior to the first frost in the fall. The period of transition from cool-season back to warm-season turf in the spring is particularly troublesome. A substantial reduction in turf quality occurs when the ryegrasses decline before the emergence of sufficient bermudagrass to maintain adequate density and color. The common practice in areas of the country where bermudagrass is grown has been to hold ryegrasses as long as possible, which is often late spring or early summer. Delayed emergence of bermudagrass in the spring because of competition from ryegrasses has been observed. Several cultural practices are known to encourage or retard bermudagrass emergence. Water and fertilizer extend the competitiveness of the overseeded grasses. Vertical mowing and aeration increase bermudagrass emergences.

Research at Clemson University has been conducted on putting green turf to determine the influence of plant growth regulators:

pronamide
ethephon
mefluidide
maleic hydrazide

on the transition from overseeded Yorktown II perennial ryegrass to Tifgreen bermudagrass in the spring. The following results have been reported.

- All plant growth regulator treatments were effective in increasing bermudagrass coverage over untreated grass; however, all reduced turf quality to some degree, with the exception of ethephon.
- High plant growth regulator rates generally had lower turfgrass quality than the low rates.
- The March and early April application had the greatest bermudagrass coverage.
- Early March treatments generally had lower turfgrass quality than later applications.
- Pronamide at 0.25 pound per acre [0.28 kilogram per hectare] applied as a single treatment had higher initial bermudagrass coverage than when applied as a split application, but split applications maintained higher turfgrass quality than the single application.
- The split application of mefluidide at 0.50 pound per acre [0.56 kilogram per hectare] provided greater bermudagrass coverage than the single application when applied on March 6 or April 3; however, the split application resulted in lower quality than obtained from a single application made on March 6.
- Pronamide at 0.25 pound per acre [0.28 kilogram per hectare] and higher rates reduced growth and corresponding mowing requirements.



INFLUENCE OF HERBICIDES ON BERMUDAGRASS GREENS OVERSEEDED WITH PERENNIAL RYEGRASS

B J Johnson
Journal Am Soc for Horticultural Science
Volume 113 Number 5
Pages 662-666
1988

Bermudagrass greens throughout the southern United States are usually overseeded in the fall with cool-season grasses to maintain a dense green turf during the winter while bermudagrass is dormant. Initiation of bermudagrass growth in early spring is delayed because of competition, especially from newly developed, aggressive and more heat-tolerant perennial ryegrasses. During spring and early summer, when both grasses are actively growing, the transition from ryegrass to bermudagrass is slow.

Spring management practices may hasten or delay transition of cool-season grass to bermudagrass. The spring transition period may be hastened by reducing mowing height, vertical mowing and coring, delayed fertilization and reduced soil moisture. The success of management programs to hasten transition depends on weather conditions and timing of the cultivation treatments. Because results from management practices vary, the application of an herbicide that would gradually reduce the cool-season grass and permit normal bermudagrass growth during the transition period would be desirable.

Experiments were initiated at the University of Georgia to determine the effects of spring-applied herbicides on injury and quality of the overseeded grass and influence of herbicides on transition to bermudagrass. The following observations were made:

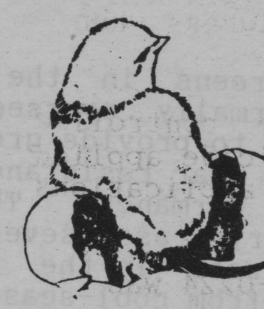
- Pendimethalin applied at 3.0 pounds per acre [3.3 kilograms per hectare] in early March hastened the transition from ryegrass to Tifway bermudagrass in one of 2 years.

- A single application of pronamide at 0.25 pound per acre [0.28 kilogram per hectare] hastened the transition of overseeded ryegrass to bermudagrass without severely injuring either turfgrass.

- Oryzalin, oryzalin plus benefin, or paraquat severely reduced the quality of ryegrass.

- Oxadiazon at 3.0 pound per acre [3.3 kilogram per hectare], oxadiazon plus benefin, glyphosate, metribuzin, or MSMA did not affect transition from overseeded ryegrass to bermudagrass when compared with nontreated turfgrass.

- This study illustrates the potential for some herbicides to enhance the transition from perennial ryegrass to bermudagrass.



GLYPHOSATE AND SC-0224 FOR BERMUDAGRASS CULTIVAR CONTROL

B J Johnson
Weed Technology
Volume 2 Number 1
Pages 20-23
1988

A poor stand, weeds, mixed grass species or a change in turfgrass species occasionally necessitates control of an existing turfgrass species before replanting a different grass. This is true whether the turfgrass will be used for home lawn, sports, commercial landscape, sod production or other high maintenance turf. To insure a pure stand of the newly planted grass, perennial turfgrasses and weeds must be controlled completely. Bermudagrass control with glyphosate usually is incomplete and regrowth occurs.

A small percentage of mixed turfgrasses may be acceptable in a home lawn when common bermudagrass is not controlled completely and the newly planted grass is Tifway or Tifdwarf bermudagrass. These hybrids are more competitive than common bermudagrass and can reduce the common bermudagrass gradually. While a mixture of bermudagrasses would be acceptable in home lawns because leaf texture and color are similar, a small percentage of common bermudagrass would be unacceptable when mixed with other turfgrass species, such as zoysiagrass or centipedegrass. Leaf texture and color of either centipedegrass or zoysiagrass are incompatible with common bermudagrass, resulting in poor quality turf. Incomplete control of bermudagrass would be unacceptable in commercial sod production when the site is replanted with a different bermudagrass cultivar or turfgrass species.

Experiments at The University of Georgia have been conducted to improve the consistency of bermudagrass control with glyphosate. The following results are worthy of note.

- Both glyphosate [N-(pharphonomethyl) glycine] and SC-0224 [trimethylsulfonium carboxymethylaminoethylphosphonate] applied in three applications [May, June and August] controlled Tifway, Tifgreen and Tifdwarf and Ormond bermudagrass when evaluated the next June.

- None of the cultivars were controlled effectively with either herbicide applied in May or in May and June applications regardless of rate.

- Control with glyphosate and SC-0224 was similar.

INFLUENCE OF NITROGEN ON THE RESPONSE OF TIFWAY BERMUDAGRASS TO FLURPRIMIDOL

B J Johnson
Weed Technology
Volume 2 Number 1
Pages 53 - 58
1988

Mowing turfgrass regularly is important to maintain a good, high-quality turf. However, mowing is time consuming and is a major cost in a turf management operational budget. Applying a plant growth regulator to suppress vegetative growth and to reduce the number of required mowings is preferable.

Research at The University of Georgia has involved Tifway bermudagrass treated with flurprimidol. The following results were obtained.

- Vegetative growth of Tifway bermudagrass treated with flurprimidol at 0.18 pound per acre [0.2 kilogram per hectare] and repeated at 3-week intervals for a total rate of 0.72 pound per acre [0.8 kilogram per hectare] was suppressed for 6 weeks compared to growth of nontreated grass.

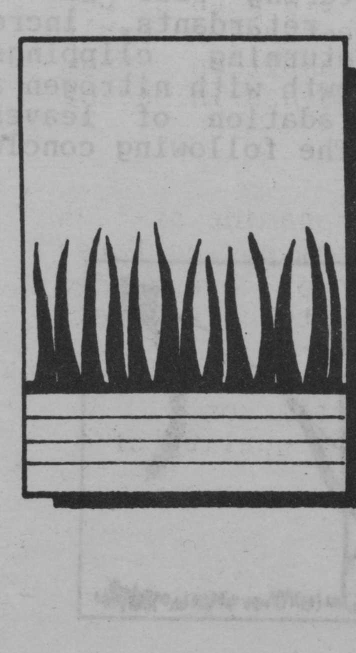
- A single application of flurprimidol at 0.72 pound per acre [0.8 kilogram per hectare] in late May suppressed growth for 4 weeks.

- When this single application was delayed until mid-July, bermudagrass growth was suppressed for only two weeks.

- Applications of nitrogen at 22 and 44 pounds per acre [25 and 50 kilograms per hectare] did not influence flurprimidol's suppression of bermudagrass growth.

- Turf quality in some instances was lowered when treated with 44 pounds per acre [50 kilograms per hectare] of nitrogen or the turfgrass required a longer recovery period than when treated with 22 pounds per acre [25 kilograms per hectare] of nitrogen following flurprimidol treatment.

- Although single or multiple applications of flurprimidol each totaling 0.72 pound per acre [0.8 kilogram per hectare], injured bermudagrass in some instances, the injury was not severe and the turfgrass fully recovered.



THRESHING THE JOURNALS continued

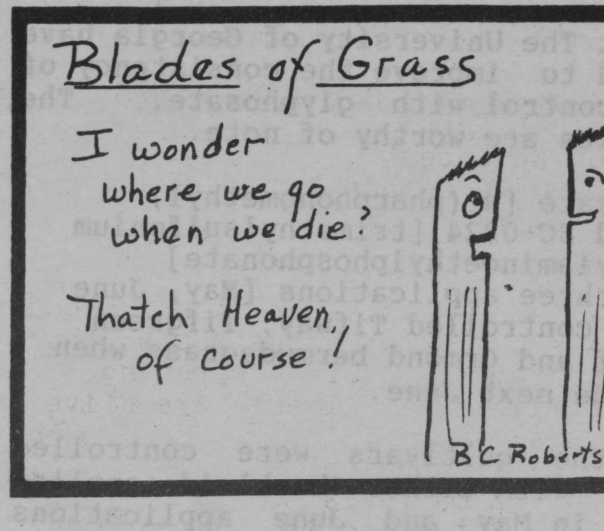
EFFECTS OF CLIPPING DISPOSAL, NITROGEN AND GROWTH RETARDANTS AND THATCH AND TILLER DENSITY IN ZOYSIAGRASS

D Z Soper, J H Dunn, D D Minner and
D A Sleper
Crop Science
Volume 28 Number 2
Pages 325-328
1988

Thatch is an accumulation of living, decomposed and partially decomposed plant tissues at the soil surface which can alter normal growth of turfgrass. Specific effects include an increase in turf sponginess, difficulty in wetting soil and increased pest incidence along with a decrease in pesticide efficacy. As roots and crowns of plants develop in a thatch layer, turf becomes increasingly susceptible to stress from low and high temperatures and desiccation. Meyer zoysiagrass is a popular turfgrass in the transition zone and in the southern United States for use on lawns and golf course tees and fairways. One of the problems associated with the use of zoysiagrass, however, is its tendency to form thatch.

Mechanical methods used to reduce thatch accumulation include topdressing, vertical mowing and core cultivation. Considering the cost of frequent use of these management procedures, thatch may be the most important cultural condition restricting the use of zoysiagrass.

Research at The University of Missouri was based on the premise that information regarding the relative resistance of specific tissues to decomposition and the quantity of tissue produced is important in selecting cultural practices to control thatch. Thus, thatch development in Meyer zoysiagrass was investigated by altering leaf and stolon growth using growth retardants, increasing leaf litter by returning clippings and increasing plant growth with nitrogen and by comparing the degradation of leaves and stolons in vitro. The following conclusions were drawn.



- Returned clippings increased thatch by only 3.4 percent and decreased tiller density by 12 percent when nitrogen was applied at a rate of 2 pounds per 1000 square feet [98.0 kilograms per hectare] per year.

- Nitrogen applied at the rate of 2 pounds per 1000 square feet [98.0 kilograms per hectare] per year increased thatch and tiller density.

- Growth retardants mefluidide and flurprimidol did not affect thatch.

- Degradation of leaves [64 percent] by cellulase solution exceeded that of stolons [60 percent].

- The reduction in tiller density associated with returned clippings may be due to shading from clippings in the turf canopy resulting in leaf etiolation and reduced tiller bud development.

- Leaf clippings contributed slightly to thatch accumulation, most likely due to their physical accumulation rather than indirect effects of nitrogen recycling.

- Both stolons, and to a lesser degree, leaves appear to contribute to thatch accumulation in Meyer zoysiagrass.

- Decreased use of nitrogen in the culture of Meyer zoysiagrass, within limits required for acceptable appearance might help reduce thatch accumulation.

- Removal of clippings is not recommended for thatch control considering their small contribution to thatch cover and due to the benefit of recycled nutrients.

IDENTIFICATION AND QUANTIFICATION OF ABSCISIC ACID IN ZOYSIAGRASS SEEDS AND ITS INHIBITORY EFFECT ON GERMINATION

D Y Yeam, N B Mandava, P H Terry, J J Murray and H L Portz
Crop Science
Volume 28 Number 2
Pages 317 - 321
1988

Zoysiagrass is a persistent, drought tolerant and slow growing turfgrass that reduces the requirements of watering, mowing and fertilizing. There are five species of zoysia:

- Z japonica
- Z matrella
- Z tenuifolia
- Z sinica
- Z macrostachya.

Zoysia japonica, however, is the major turfgrass in its native region in Korea and Japan.

The intact seed of zoysiagrass does not germinate but mechanical hulling and pretreatment with sulfuric acid result in increased speed and percentage germination. Light is also required for zoysiagrass seed germination. A low or alternating temperature treatment can be substituted for the light requirement.

Abscisic acid, a well-known seed dormancy inducing substance, has been identified in the dormant seeds of many temperate perennial weeds or grasses and in other plants. Low temperature treatment has reduced the levels of abscisic acid and resulted in an increase in germination and normal seedling growth. The role of abscisic acid in seed dormancy, however, is not clear. There may be high levels of abscisic acid without dormancy, little relationship between abscisic acid levels and entry into primary dormancy, differences in tissue sensitivity to abscisic acid, free vs bound abscisic acid and variability in levels of cis, trans vs trans-trans isomers.

Zoysiagrass seed dormancy can be broken by red light or low temperature treatment. After either a light or low temperature treatment, the seed content of a gibberellic acid-like substance increased and the content of an abscisic acid-like substance decreased. At present, there is great interest in determining the nature of zoysiagrass seed dormancy. The identification of the major dormancy factors would increase the potential for development of seed treatments to break dormancy and thus allow the establishment of zoysiagrass from seed. Seed establishment would be less expensive and much quicker than presently required vegetative establishment methods.

Research has been conducted to confirm and quantify the presence of abscisic acid in zoysiagrass seed, and to determine if external application of abscisic acid inhibits germination of zoysiagrass seeds. The following notations were made from these studies.

- The quantity of the abscisic acid cis, trans isomer found was 3.44 milligrams per kilogram of seed. This is the highest level of abscisic acid reported for any seed.

- There was no abscisic acid trans-trans isomer found in zoysiagrass seed.

- The high level of abscisic acid may be the reason that dormancy is so difficult to break in zoysiagrass seed.

- Abscisic acid applied to nondormant [potassium hydroxide and light treated] seed inhibited germination. Germination after 21 days was reduced 69 percent and 95 percent by small but increasing amounts of abscisic acid respectively [0.4 and 40.0 uM].

- The promotive effects of light on germination were reversed by abscisic acid applications. A positive relationship was found between abscisic acid concentration and the duration of light required for germination.

CENTIPEDEGRASS RESPONSE TO FOLIAR APPLICATION OF IRON AND NITROGEN

R N Carrow, B J Johnson and G W Landry, Jr
Agronomy Journal
Volume 80 Number 5
Pages 746-750
1988

Common centipedegrass is a popular lawngrass in the Coastal Plains areas of the warm, humid part of the United States. It has a lighter green color than most grasses and easily exhibits iron deficiency symptoms.

Shoot density can be maintained on centipedegrass with annual applications of 1 to 2 pounds of nitrogen per 1000 square feet [48 to 96 kilograms of nitrogen per hectare] but often without acceptable green color. This is a problem for lawn care operators, since increasing the nitrogen level can lead to centipedegrass decline. One approach is foliar applications of iron in conjunction with nitrogen.

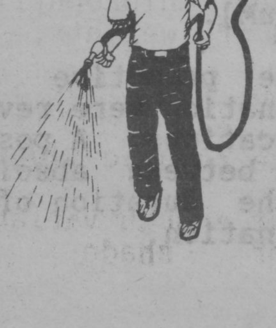
Information regarding iron effects on centipedegrass when applied in foliar applications would be very beneficial to the liquid lawn care industry.

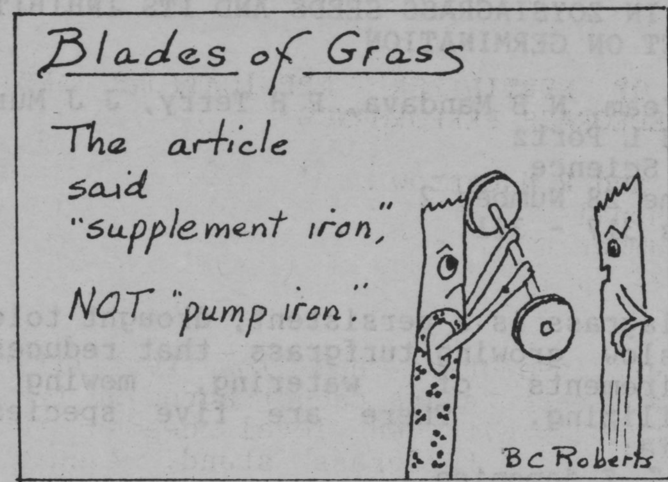
Research at the University of Georgia has been conducted to determine the influence of iron carrier on turfgrass quality and color and to determine the effects of iron and nitrogen applied alone and in combination and their different rates of application on phytotoxicity and the quality and color of centipedegrass. The following results should be noted.

- Minor differences occurred with respect to phytotoxicity but not visual quality or color from ferrous sulfate, ferrous ammonium sulfate and Sequestrene 330 chelate.

- When visual quality and color ratings were made at 2 weeks or more after application, the highest iron and nitrogen rates always provided the best response.

- However, initial phytotoxicity [within 1 to 6 days after treatment] from iron and nitrogen dictated the use of much lower rates.





- If applied on a moderately warm day, 70 degrees to 92 degrees Fahrenheit [21 to 33 degrees Centigrade], the maximum acceptable iron rate was 1.8 pounds per acre [2.0 kilograms per hectare] in combination with 0 or 8 3/4 pounds of nitrogen per acre [0 or 9.8 kilograms nitrogen per hectare].

- Centipedegrass could receive up to 35 pounds of nitrogen per acre [39 kilograms nitrogen per hectare] without any iron before nitrogen burn was objectionable.

- On a very hot day, 82 to 100 degrees Fahrenheit [28 to 37.5 degrees Centigrade] only 0.65 pounds of iron per acre [0.73 kilograms iron per hectare] could be applied with 11 pounds of nitrogen per acre [12.2 kilograms of nitrogen per hectare] without objectionable phytotoxicity.

- The maximum nitrogen rate that could be applied alone under these conditions was 22 pounds per acre [24.2 kilograms per hectare] before nitrogen induced phytotoxicity occurred.

- The 1.8 pounds of iron per acre [2.0 kilograms iron per hectare] rate provided positive visual quality and color responses for up to 35 days after treatment, while the 0.65 pounds of iron per acre [0.73 kilograms iron per hectare] improved color for only 22 days after treatment.

- Results show that iron can improve centipedegrass color but that centipedegrass is very sensitive to phytotoxicity from iron. Addition of nitrogen further reduces centipedegrass tolerance to iron.

FREQUENCY OF FERTILIZER APPLICATIONS AND CENTIPEDEGRASS PERFORMANCE

B J Johnson and R N Carrow
Agronomy Journal
Volume 80 Number 6
Pages 925-929
1988

Although centipedegrass has low fertility requirements, researchers cannot agree on the critical annual nitrogen level needed to maintain a good turfgrass stand. Annual recommended rates of nitrogen range from 0.5 pounds per 1000 square feet to 4.0 pounds per 1000 square feet [from 25 to 200 kilograms per hectare]. Variation in rates can be attributed to quality of "centipede decline" if centipedegrass is overfertilized.

Centipede decline is a term used to describe centipedegrass that exhibits slow spring green-up or becomes chlorotic and suddenly dies after initial growth.

Research at the University of Georgia has been initiated to determine if reducing nitrogen rates and increasing the number of applications would improve the over all quality of centipedegrass compared with a single spring application and to determine the frequency of annual treatments needed to maintain a good dense stand when the lighter green color is acceptable.

Results have been reported as follows.

- The quality of centipedegrass treated with 1 pound of nitrogen per 1000 square feet [50 kilograms per hectare] in April and repeated at the same rate in July for a total rate of 2 pounds of nitrogen per 1000 square feet [100 kilograms per hectare] was equal to or better than that from a single application of 2 pounds of nitrogen per 1000 square feet [100 kilograms per hectare] in April.
- Centipedegrass quality from split applications [April plus July] was also equal to or better than that when a total of 2 pounds of nitrogen per 1000 square feet [100 kilograms per hectare] was split into three or four equal applications over the growing season.
- Centipedegrass decline measured by quality and stand density occurred in plots treated with 2 pounds of nitrogen per 1000 square feet [100 kilograms per hectare] in April after 3 or 4 years of consecutive applications.
- Decline was not evident when nitrogen was applied annually at 2 pounds per 1000 square feet [100 kilograms per hectare] in split applications.
- Where no nitrogen was applied, centipedegrass failed to provide sufficient growth to maintain an acceptable stand.
- Also, after two consecutive years without nitrogen, centipedegrass quality declined, which indicates that some nitrogen is necessary every year.
- It was concluded that centipedegrass decline is influenced by time of nitrogen application.

RESPONSE OF 32 BERMUDAGRASS CLONES TO REDUCED LIGHT INTENSITY

R E Gaussoin, A A Baltensperger and B N Coffey
HortScience
Volume 23 Number 1
Pages 178-179
1988

Of the warm-season turfgrasses, bermudagrass is one of the most widely adapted and economically important. An attribute that limits use of bermudagrass as turf in many situations is lack of shade tolerance. Studies have indicated differences among bermudagrass genotypes for shade tolerance, but these studies included only a limited number of morphological types. The evaluation of a large number of phenotypically diverse clones for response to reduced light intensity would allow identification of potentially shade-tolerant materials.

Research at New Mexico State University was conducted to evaluate the response of a diverse population of bermudagrass clones to reduced light intensity. The following ratings were noted.

- Bermudagrass clones responded to reduced light by exhibiting shorter leaves, shorter stem internodes, reduced green foliage, lower chlorophyll concentration and decreased dry weights.
- Boise, No Mow, R9-P1, NM 2-13 and NM3 have been identified as being moderately insensitive to reduced light intensity.
- Data suggest enough variability exists to select for shade tolerance in bermudagrass.

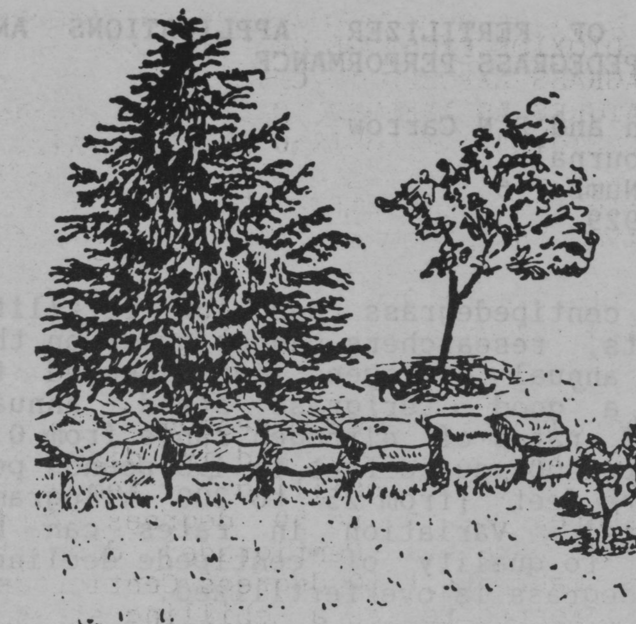
COLD HARDINESS OF MIDIRON AND TIFGREEN BERMUDAGRASS.

J A Anderson, M P Kenna and C M Taliaferro
HortScience
Volume 23 Number 4
Pages 748-750
1988

Bermudagrass cultivars currently used throughout the northern boundaries of adaptation periodically sustain winter damage. As a result, selection of new cultivars with superior cold hardiness is an important breeding objective. The classical approach to selection for cold hardiness has been to evaluate field plots in the spring following a severe winter. Although this procedure probably gives the best indication of field response to low temperature stress, it can be very time consuming.

Research conducted at Oklahoma State University determined whether the electrolyte leakage test could discern cold hardiness levels of bermudagrass crowns following exposure to freezing temperatures in a refrigerated bath. This method was compared with regrowth tests. The following observations were made.

- The two procedures were in close agreement.
- Midiron was found to be hardier than Tifgreen on all sampling dates.
- Greatest levels of freeze tolerance were at 12 degrees Fahrenheit [-11 degrees Centigrade] for Midiron and 20 degrees Fahrenheit [- 7 degrees Centigrade] for Tifgreen during December and January.
- Midiron was killed at 23 degrees Fahrenheit [- 5 degrees Centigrade] in early June while Tifgreen had lost all freeze tolerance by this date.



SALINITY EFFECTS ON THREE TURF BERMUDAGRASSES

L E Francois
HortScience
Volume 23 Number 4
Pages 706-708
1988

Bermudagrasses frequently are used for forage and turf in areas where soil salinity is a problem. Although all bermudagrasses that have been studied are considered to be salt tolerant, differences in salt tolerance among cultivars exist. Differences among cultivars are not unexpected, since germplasms frequently comes from very diverse origins.

Research at the U S Salinity Laboratory at Riverside, California has been conducted to determine the effect of soil salinity on Tifway II, Tifton 86 and Tifton 10 bermudagrass in the greenhouse. The following notations are of interest.

- Tifton 10 was found to be moderately tolerant to salinity.
- Tifway II and Tifton 86 rated tolerant to salinity.

THRESHING THE JOURNALS continued

CARBON DIOXIDE EXCHANGE OF TIFGREEN BERMUDAGRASS EXPOSED TO CHILLING TEMPERATURES AS INFLUENCED BY IRON AND N-[PHENYLMETHYL]-1 H PURIN-6-AMINE [B A]

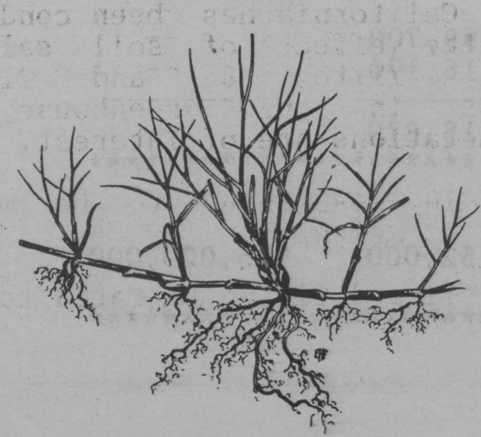
R H White and R E Schmidt
Journal American Society for Horticultural Science
Volume 113 Number 3
Pages 423 - 427
1988

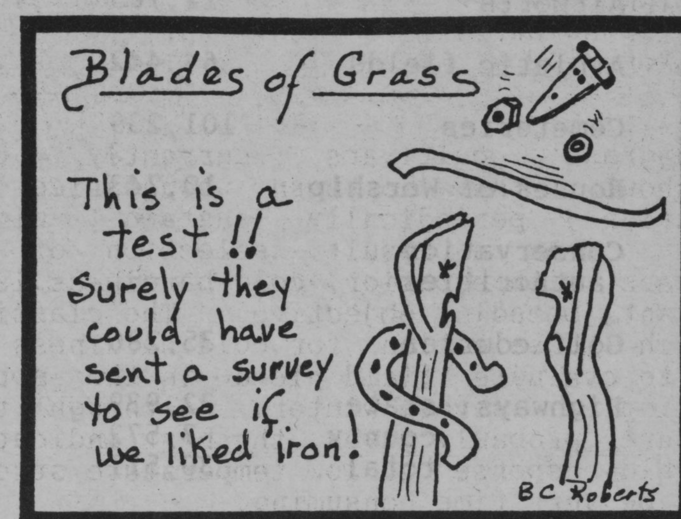
Bermudagrass, a warm-season perennial, produces little growth and is discolored by exposure to chilling temperatures. Temperatures of 50 to 59 degrees Fahrenheit [10 to 15 degrees Centigrade] down to 32 degrees Fahrenheit [0 degrees Centigrade] are often referred to as a chilling stress for grasses of tropical and subtropical origin. Prolonged chilling results in an alteration of plant physiological functions, a loss of green pigmentation and the plant eventually enters a state of dormancy. The slow growth rate is associated with decreased photosynthetic activity and carbohydrate metabolism at chilling temperatures.

Research at Virginia Tech University has evaluated management practices that may ameliorate the negative effects of cool fall and spring temperatures on bermudagrass performance. The purpose of this study was to determine the effects of chilling temperatures on Tifgreen bermudagrass net photosynthesis, respiration and leaf nonstructural carbohydrates as influenced by foliar iron and cytokinin applications. The following observations were made.

- Average photosynthesis and respiration rates were reduced 73 and 66 percent respectively by a 72-hour chilling period.

- Within 2 hours at 86 degrees Fahrenheit [30 degrees Centigrade] following chilling, respiration rates returned to prechill rates. However, photosynthesis rates returned to within only 50 percent of prechill rates during the same recovery period.





- The lack of full photosynthetic recovery was associated with a 288 percent increase in leaf total nonstructural carbohydrate.

- Iron increased photosynthesis rates prior to chilling. This iron effect was associated with increased photosynthetic activity per unit of chlorophyll and was evident before, during and after the chilling period.

- A cytokinin [BA] increased photosynthesis rates before chilling and within 20 hours at 86 degrees Fahrenheit [30 degrees Centigrade] following chilling. However, after chilling, photosynthesis rates for the BA treatment were similar to the control.

- Neither iron or BA significantly affected leaf total nonstructural carbohydrates or respiration rates.

- Iron and BA caused higher turf color scores during chilling.

- The chilling period used in these experiments was short, and therefore conclusions as to the effects of these materials on bermudagrass performance during natural chilling conditions in the field can not be made.

SURVEYS

LOCATION	MARYLAND 1986	NEW JERSEY 1983	NORTH CAROLINA 1986	ONTARIO 1983
		ACRES		
Airports	12,765	3,854	41,000	6,308
Athletic fields	64,442	--	6,060	--
Cemeteries	101,239	16,500	3,000	--
Houses of Worship	10,743	7,770	18,000	--
Conservation authorities	--	--	--	7,943
Golf courses	35,286	25,717	58,800	45,806
Highways: state	22,939	--	--	--
county	7,572	--	--	--
total	30,511	19,650	297,000	48,211
Industrial/ commercial	--	40,000	--	--
Institutions	5,827	8,135	43,800	--
Military	--	--	--	14,807
Municipalities	--	--	--	44,982
Public building grounds	4,233	--	--	--
Schools	38,826	23,200	34,100	--
Parks: county/city	34,663	42,750	--	1,334
federal	2,038	--	--	--
state	1,200	2,453	--	--
total	37,901	45,203	43,500	--
Residential	--	--	--	191,247
Home lawns	239,000	660,000	1,285,800	--
Multifamily dwelling	--	9,850	--	--
Mulifamily/commercial	--	--	144,000	--
Sod Producers	9,779	5,500	1,900	24,341
Waterways	3,546	--	--	--
Total	614,024	865,379	2,092,830	384,979
		ACRES		
Grounds management/ landscapers	15,975	--	99,700	--
Lawn care services	339,520	--	16,170	--
Total Acres by firms	355,495	--	115,870	--
Total maintenance costs	$662,098,070	452,447,833	733,762,000	275,000,000

References:

Economic Value of New Jersey Turfgrass Industry, A Summary Report
Dr Henry Indyk, Rutgers University, New Brunswick NJ 08903; 1985.

North Carolina Turfgrass Survey -1986
Dr Arthur Bruneau, NC State University, Raleigh NC 27695; 1986.

Maryland Turfgrass Survey - 1987
Dr Tom Turner, University of MD, College Park MD 20742; 1987.

Turfgrass Production & Maintenance Costs in Ontario -1983
Annette Anderson, Ontario Ministry Agriculture, Guelph Ont N1G 2W1.

Note: The Lawn Institute is appreciative of receiving documented statistics on turfgrass to help answer the many calls we receive for this type of information.

NATIONAL GARDENING ASSOCIATION

Burlington VT

"Retail sales of lawn and garden products totaled $17.491 billion, according to the 1987-1988 National Gardening Survey, an increase of 23 % or 3.2 billion more than the previous year when consumers spent a total of $14.206 billion. There was a significant increase in the average amount of money that consumers spent on a majority of lawn and garden activities and the average amount spent per household increased from $196 spent in 1986 to $251 spent in 1987.

"Trends are showing that American gardening households are becoming involved in more lawn and garden activities. In the past gardeners limited themselves to one or two forms of gardening. Today, the yard is like one more room of the home to many gardeners. The yard tends to reflect the personal style and taste of the gardener and involve many types of gardening activities from growing food to ornamentals, flowers, bulbs, lawn, herbs, trees and more."

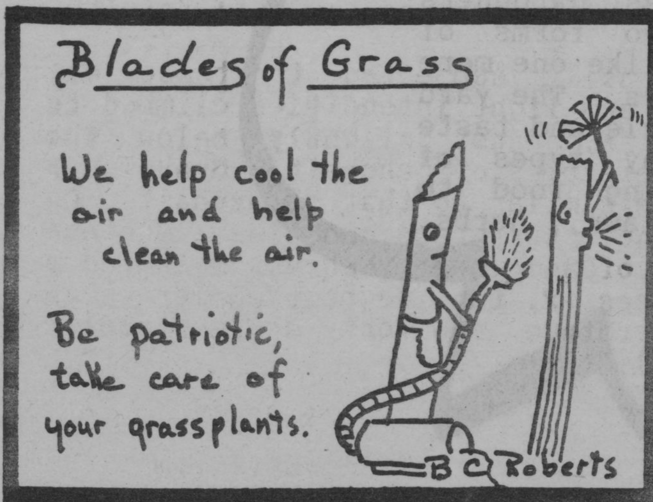
BENEFITS UPDATE

Since October, when "Lawn and Sports Turf Benefits" booklet was released, 7000 copies have been distributed. More information on benefits has been called to our attention and we hope that this will continue so that we can assemble as much referenced material as possible on this subject. Many have called for extra copies of the booklet to be used with other supporting materials in situations where policy makers need to become aware of turfgrass benefits before new restrictions are voted upon. The following information confirms and amplifies some of the sections of the booklet.

To Your Health !
The Lahey Clinic Health Letter
Burlington Massachusetts
Summer 1988

Concern about the tick-borne infection, Lyme Disease, is growing. This is prevalent in the New England area but cases have been reported in 30 states. It is spread by the bite of the Ixodes dammini tick, whose natural hosts are white footed mice and white-tailed deer. The most distinctive feature is the rash that forms around the bite.

Editor's note: Mown lawns are areas that are not desirable habitats for many small animal pests.



Science News
September 24,1988
Volume 134 Number 13 Page 203

Golf Course May Cool the Desert

"Scientists and urbanites are quite familiar with the 'heat island' effect which makes cities warmer than surrounding lawn-marbled suburbs. Now on the flip side, climate researchers think they have identified a desert locale where urban development has helped cool a city - what they term a 'cool island' effect.

"Since the early 1970s, Palm Springs, California, has cooled off several degrees relative to nearby towns such as Redlands, apparently because golf course construction has turned the town into a veritable oasis, report Robert Balling and Nina Lolk from Arizona State University in Tempe.

"Golf courses and other vegetated urban plots such as cemeteries and parks are known to keep city temperatures lower through evaporation. When radiation from the sun hits a street or building, most of the incoming energy is transformed into heat. However, if the rays strike an irrigated area, part of the energy evaporates water from plants and soil, leaving less energy to create heat, says Balling.

"Although many possible reasons could explain why Palm Springs is growing cooler than its neighbors, Balling says the most reasonable explanation is the growing area of turf within the city. At least two-thirds of the approximately 75 golf courses in town were constructed within the last 15 years, which is when the cooling trend began, he says.

"Microclimatic studies on golf courses in Phoenix have verified this effect on a small scale. 'When you walk out on a golf course, you can go from an environment that is 108 degrees F or 110 degrees F, and if you take air temperatures right over the golf course on a calm day, it's often as much as 8 or 9 degrees colder than surrounding areas that are not irrigated,' says Balling, who has spent several years studying how expanding desert cities such as Phoenix and Tucson are warming with respect to the surrounding deserts."

BENEFITS continued

U S Department of Agriculture
Agriculture Information Bulletin # 223
Soil Conservation Service

"A dense cover of grass protects the soil from the battering, splashing action of rain. The leaves break up the raindrops and allow more water to soak into the soil, thus preventing erosion, conserving moisture for plant growth, and restoring underground water supplies. The higher and denser the grass, the better it shades the soil and keeps it cool. This reduces loss of water by evaporation and enables grass to grow better in hot weather.

"For every pound of growth above ground, most grasses produce a pound or more of roots. Some of the better forage grasses send their roots down 10 to 15 feet. Some lawn grasses may penetrate as deep as 3 to 4 feet.

"Decaying grass roots, leaves and stems.... supply organic matter to the soil. This maintains its tilth and fertility, makes it more absorptive, and reduces erosion. To the extent that grass reduces the amount of water running off the land, it helps reduce floods.

"During the drought of the 1930's and again in the 1950's, wind erosion occurred largely on land that had little or no plant cover because of cultivation or too close grazing. Wind-tunnel studies have shown that a good growth of grass breaks the force of the wind before it can reach the ground and move the grains of soil."

Business Outlook
Landscape and Irrigation
Vol 12 Number 11:32-33

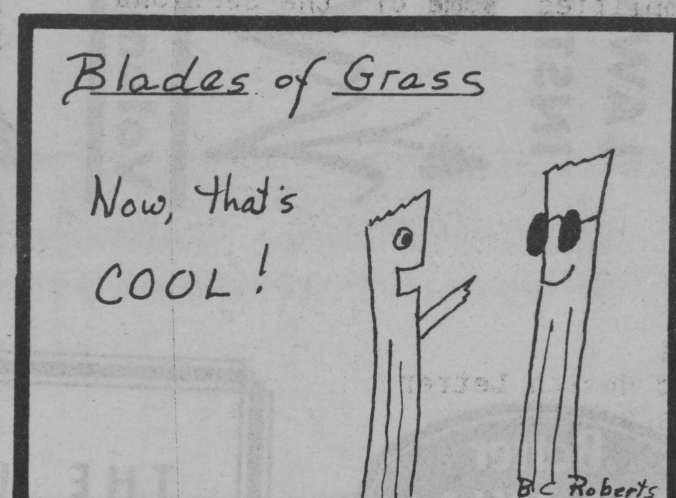
"Soft Alternative" Solves Erosion Problem

The city of Ft Collins,CO has reportedly been pleased with results of a nylon matting holding grass lining a stream drainage channel. The city wanted a "soft alternative" rather than a "hard alternative" like concrete to stem erosion because this helps "to maintain a natural look that is aesthetically pleasing."

'Love That Dirty Water'
Landscape Management
November 1988 Pages 52, 54.

There is a growing trend to use recycled or effluent water on golf courses, parks and residential landscapes as water supplies become more scarce. The water goes through several stages of pretreatment before being used.

James R Watson, PhD, notes that when treated recycled water is used, remaining impurities are filtered out by the turf. "Turf is a great filter. It permits water to percolate into the soil and back into the groundwater in a very 'pure form'."



High Temperatures are Gone But Not the Damage
Bob Morris
Southwest Lawn & Landscape
November 1988 Page 22

"We recently took an infrared thermometer [the gun-shaped heat sensor that measures surface temperatures when you aim it at an object] into the field when air temperatures were hovering around 105 degrees F. Aiming that thing at nearby surroundings produced some interesting results.

"Bare, dry soil subjected to these air temperatures and light intensities climbed to 145 degrees F, just slightly below the surface temperatures of asphalt. Gravel has a temperature similar to that of asphalt. On the other hand, turfgrass and leaf surface temperatures of some nearby shrubs measured a cool 95 degrees F, ten degrees cooler than the air temperature and forty degrees cooler than bare soil."

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Lawn Institute Harvests is published four times a year by The Better Lawn and Turf Institute. The headquarters office address is P O Box 108, Pleasant Hill, Tennessee 38578-0108. Phone: 615/277-3722. Inquiries concerning all aspects of this publication may be addressed to the headquarters office.

The Better Lawn and Turf Institute is incorporated as a nonprofit business league formed exclusively for educational and research purposes concerned with agronomic, horticultural and landscape concepts.

Lawn Institute Harvests is dedicated to improved communications among turfgrass seed and allied turf industries and other firms, businesses, organizations and individuals with lawngrass research and educational interest and concerns.

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Printer: Crossville Chronicle (Tennessee)