Journal Of ENVIRONMENTAL TURFGRASS

Scientifically based and objective information to help educate the public to the environmental benefits of turfgrass

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Additional information, technical background details, resources and expert interviews will be provided media representatives upon request.

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A SCIENTIFIC VIEWPOINT: Dr. Thomas L. Watschke

Turfgrasses Can Safely Clean Our Water Supplies

Finding 1: Water running off or passing through a well managed lawn is not likely to be of significantly lower quality than the tap water available in many cities.

Finding 2: Most chemicals applied to turfgrass are trapped within the thatch and rootzone areas of the plant and do not contaminate water supplies.

Finding 3: Lawns established with turfgrass sod are up to 15 times more effective in controlling runoff than seed-established lawns, even after three years.

Fears of adding to our pollution woes from homeowner or commercial lawncare are greatly unfounded and over-stated based on the results of a three-year study of water quality impact conducted at The Pennsylvania State University. In fact, the results show that well managed turf areas have very little runoff and virtually no potential for chemical contamination. Applications of these findings to land-use, city planners and environmental interests are very promising.

Funded in large measure by the U.S. Geological Survey, this study was initiated in 1986 to examine the water quality impact of pesticides and nutrients used in the urban landscape. A total of 9 test plots, with slopes ranging from 9 to 14 percent were prepared for the study. Water runoff and leachate trapping and measuring devices were installed on each plot, followed by the installation of identical irrigation systems and soil preparation. A sophisticated array of scientific instruments and specialized computer apparatus were connected to monitoring devices to measure and record what was taking place on each test plot.

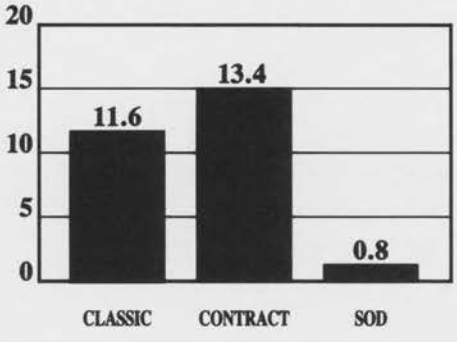
Three of the plots were seeded with a mixture of Kentucky bluegrass/perennial ryegrass/fine fescue, while three others were seeded with a "contractor" mix of annual rye, common Kentucky bluegrass and creeping red fescue. The final three test plots were covered with three-year-old turfgrass sod grown from a blend of 100 percent certified Kentucky bluegrasses.

The plots were mowed weekly at a height of two inches and given four annual treatments of pesticides and fertilizers in accordance with label recommendations. After establishment, irrigation was applied only when the need to collect runoff was scheduled (two days after the chemicals had been applied).

Runoff Results

To examine the potential effects of turf on water quality as a function of runoff, Penn State researchers used a carefully controlled irrigation system to uniformly apply known amounts of water to the test areas. After failing to obtain even the slightest amount of runoff from the sodded area with irrigation applications equal to a 3-inch per hour rain, the system was revamped to create a 6-inch per hour output in order to be able to collect runoff from sodded slopes for chemical analysis. According to rainfall probability data, a six-inch per hour storm in central Pennsylvania is not likely to ever occur.

CHART I: RUNOFF, % total applied



Comparison of runoff volumes from three turfgrass cover types/establishment methods.

The sodded test plots proved to be 15-times more effective than either of the seeded plots at controlling runoff. Only 0.8% of all of the water applied was collected as runoff from the sodded areas while 13.4% ran off the "contractor" grade seeded area and 11.6% ran off the classic seed area. The 15-fold better runoff control advantage for the sodded slopes has significant environmental implications because there would also be less likelihood that the water would contain significant amounts of sediment, chemicals or other potential pollutants.

Leachate collection devices were also used to capture water percolating through the soil to determine its chemical composition.

Clean Runoff Discovered

When analyzing the runoff and leachate at one part per billion (equal to one teaspoon of sugar in 1.3 million gallons of coffee), researchers found almost no detectable amounts of the eight pesticides and nutrients that had been applied to the turf. In fact, in a vast majority of the tests, the chemicals were not even detected or were below the federal drinking water standard (see Chart II).

While there are no federal drinking water standards for many of the chemicals (indicated above by N/A), the runoff and leachate samples generally contained less potassium than the irrigation water that was used. This seems to further illustrate the grass plant's capacity to trap and hold many of the chemicals that a sound turf management scheme would require. It is also important to remember that the water samples analyzed were virtually collected in a situation analagous to "curb-side". In a "real-life" situation, considerable runoff water from other sources would already be in the street which would result in significant dilution of already low concentrations of chemicals.

Potential Application of Findings

When combined with the other known

CHART II:

Nutrient Pesticide	Federal Drinking Water Limit	Number of Sample Dates	Number of Dates Not Detectable	Number of Dates Below Drinking Water Limit
Nitrate-N	10 ppm	29	2	28
2, 4-D	100 ppb	24	10	20
Dicamba	210 ppb	24	8	23
Phosphate-P	N/A	29	9	N/A
Potassium	N/A	29	1	N/A
Pendimethalin	N/A	24	24	N/A
2, 4-DP	N/A	24	12	N/A
Chlorpyifos	N/A	24	24	N/A

attributes of turfgrass such as conversion of carbon dioxide to oxygen, cooling effects, entrapment of particulate pollution and reduction of noise and glare, turf's water filtering capacities make it a very good candidate for additional environment improvement projects.

Directing urban runoff waters across turf and possibly into grass covered basins could provide not only a water cleansing effect, but also assist in:

a. flood control and thereby a related reduction of waste water treatment facility requirements;

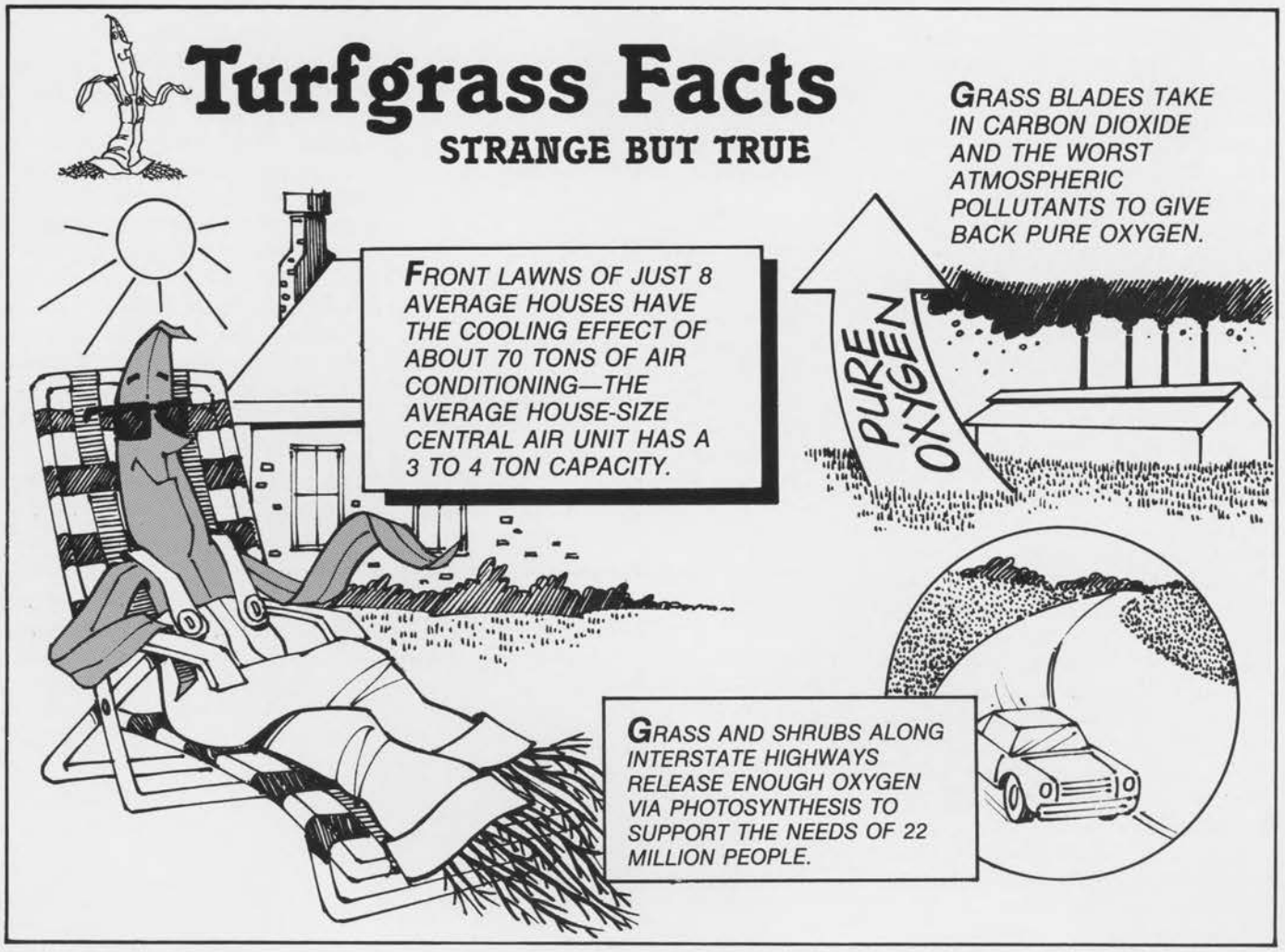
b. pollution control from parking lot and/or animal feedlot runoff waters; and

c. reduction of siltation and topsoil losses at construction sites, farm fields and highway rights-of-way.

While additional research is required to determine the surface areas of turfgrass needed to best serve its purposes on various soil types, grades and natural runoff amounts, considerable progress is being made in recognizing the many unique capabilities of the seemingly simple grass plant.

What has been right under our feet for many years is beginning to be recognized for the contributions it can make to improving our environment. Just as it is man who is creating environmental problems, it will be up to man to better understand and properly use the tools of environment improvement we have available to us, particularly turfgrasses.

Editor's Note: Dr. Thomas L. Watschke is a Professor of Turfgrass Science at The Pennsylvania State University, University Park, Pennsylvania. He is the Director of the Landscape Management Research Center, where he coordinates the research activities of faculty from five departments in the College of Agriculture. He is a past-president of the Northeastern Weed Science Society and chairman-elect of the Turfgrass Division of the American Society of Agronomy. In addition to his teaching and research responsibilities at Penn State, he has written and spoken extensively on the subject of turfgrass and its role in the environment.

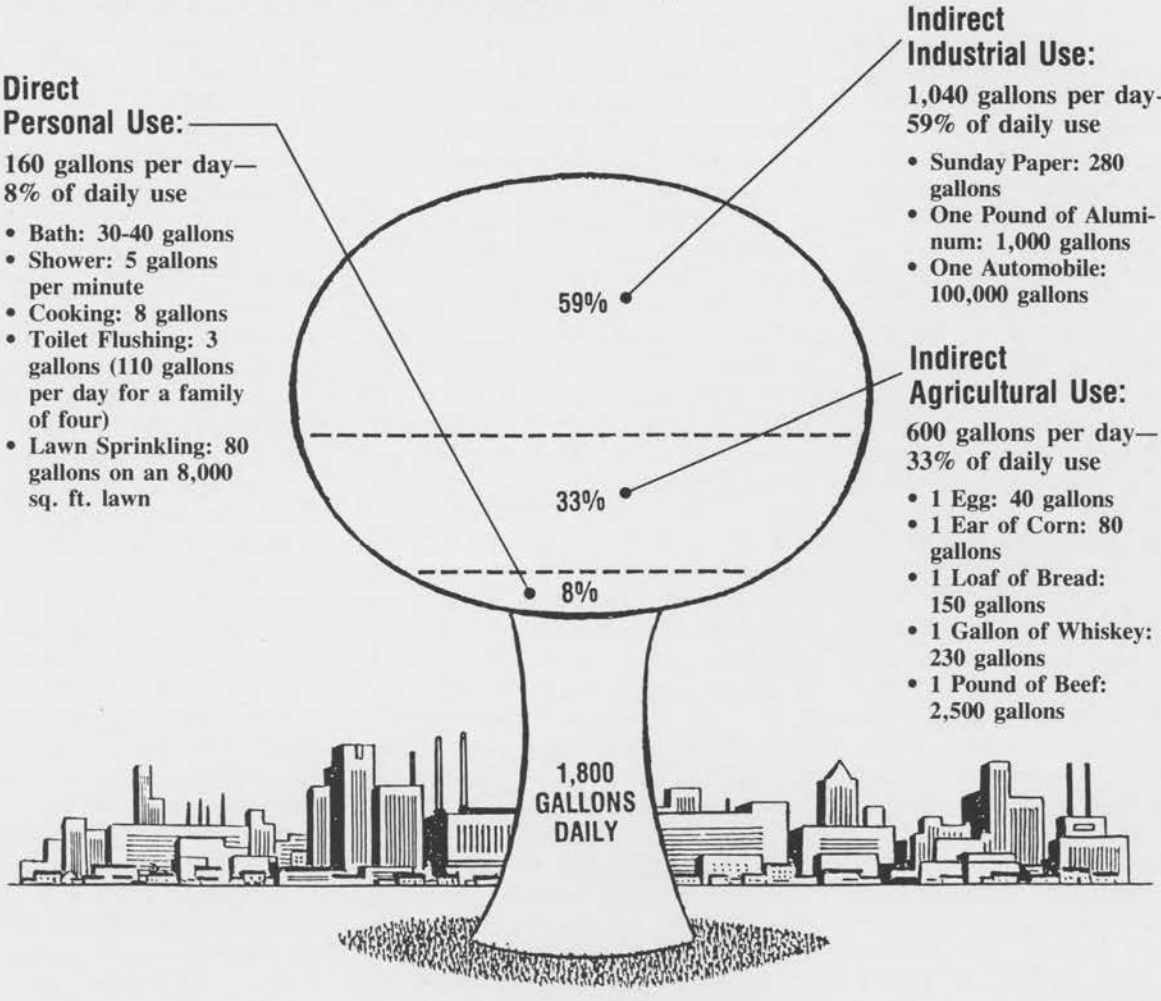


Outdoor Watering Bans: Symbolism or Good Sense?

While green lawns and flower gardens may be conspicuous consumers of water, one of our most precious natural resources, how effective are outdoor watering bans in helping to solve a very serious problem? As Kathleen K. Wiegner noted in "Forbes" magazine, "Bricks in toilet tanks or shutting off sprinklers hissing on summer lawns makes better symbolism than sense in dealing with water shortages."

According to G. Tyler Miller, Jr., in his publication, "Living in the Environment," the average American uses 1,800 gallons of water daily, some through direct personal use, the rest by indirect agricultural or industrial use.

Here's how we use much of those 1,800 gallons daily:



Symbolic acts seldom solve serious problems and more often than not, they serve only to redirect attention from another problem. For most areas, the problem is not green vs. brown lawns, it's more a matter of determining the value of water and planning sufficiently far in advance to ensure adequate supplies are present when they're needed.

Conservation is important, because water truly is one of our most precious natural resources. The concern is that we create effective conservation programs and not merely symbolic gestures that have little real meaning.

When you mow your grass—DON'T BAG IT!

By Dr. Bill Knoop, Extension Turfgrass Specialist, Texas Agricultural Extension Service, Dallas.

The United States is slowly, but surely running out of landfill space. One government agency reports that some large American cities have only a few years worth of space remaining and that, in fact, some entire states will be completely without any landfills in the 1990s. It has also been reported that more state-wide, outright bans on grass clippings from landfills are very likely.

There are a great variety of materials placed in landfills. Some of these materials are recyclable and some may not be, but there is certainly one fairly significant solid waste product that doesn't have to go in a landfill at all, and it is certainly recyclable—grass clippings. All across the U.S., north and south, during the growing season, in every city, ton after ton of grass clippings are deposited in the local landfill. Surveys have shown that in some higher income neighborhoods, as much as one half of the solid waste pickups during the summer are grass clippings. It was estimated that in one Texas city of about 18,000 homes, over 700 tons of grass clippings per week were set out for solid waste pickup. Not only do these clippings take up valuable landfill space, but it costs cities big money, thousands of dollars, for the pick up and transportation of the clippings to the landfill.

Turfgrass management has evolved with the golf course. The golf course has always represented the "state of the art." Most of us admire the rich green fairways and, perhaps, wish our own lawns could look so good. The basic turfgrass management principles that were used to develop the great golf courses around the world are exactly the same as those that should apply to the management of the home lawn. None of the text books or any of the research papers ever written about turfgrass maintenance suggest that the bagging of clippings is a necessary part of lawn care. The return of grass clippings to the lawn and eventually to the soil has always been considered to be a naturally accepted part of maintaining a lawn by the true turf experts.

Clippings Do Not Contribute To Thatch

Grass clippings are a valuable resource to the homeowner or others maintaining a turfgrass lawn. They usually contain over four percent nitrogen, about two percent potassium and around one-half percent phosphorus, as well as lesser amounts of the other essential plant nutrients. These

clippings, which are between 20 and 30 percent protein, are rapidly attacked by bacteria and fungi which cause their fast decomposition. They do not contribute to thatch. Thatch results from the abnormally fast growth of tissues high in lignin, such as roots, rhizomes, stolons and crowns. While the thatch issue has always been associated with the return of clippings to the lawn, clippings and thatch are simply not connected.

The bagging of grass clippings probably started back before 1950 with the first mowers with a catcher attachment. The evolution of the bagging device has now reached the point that non-bagging mowers are hard to sell and a true mulching mower is a very rare item in the marketplace. The public buys bagging mowers, and then apparently feels an obligation to use the device, gather the clippings in plastic bags to have them hauled to the landfill.

Most of us have grown up with the powered rotary mower and the odds are, it has a bagging attachment. We've learned how to maintain our lawns from our parents or perhaps from a neighbor. It almost seems that every neighborhood has at least one resident turfgrass "expert" who is more than willing to share advice. Very few home lawn managers practice good, solid turfgrass management principles or even know much about them. Many have turned over the management of their lawns to commercial concerns that may or may not be practicing good techniques.

Every city of any size has a solid waste pick up program. This function may be a fairly significant part of its budget. Solid waste pick up volumes are increasing and landfill space is decreasing. Obviously, this can't continue.

It's to the advantage of every city and every citizen to reduce the demands on its solid waste facilities and to extend the life of its landfill as long as possible, but how can this be accomplished? In the case of grass clippings, the homeowner must learn how to manage a lawn without using the mower's bagging attachment.

A "Don't Bag Grass" program is actually very simple, with three key elements.

Watering: During the driest period of summer, lawns usually require one inch of water every five to six days. Most hose sprinklers put out one-fourth to one-third inch of water per hour. If the water runs off the lawn before one inch is applied, turn off the sprinkler, let the water soak in for about an hour, then continue watering. The best time to water is early morning.

Mowing: For optimum results, mow every five to six days instead of once a week. As a rule of thumb, do not remove more than a third of the leaf surface at any one time. Grass clippings left on your lawn will not contribute to thatch, but will return valuable nutrients to the soil.

Fertilizing: The ratio of nutrients in the fertilizer, and the rate and frequency of application all affect how fast grass grows. Fertilize only so the lawn can grow at a reasonable rate and still have good color. For slow, even growth, use a fertilizer containing either sulfur-coated urea or ureaformaldehyde as a nitrogen source.

Specific recommendations and additional details for each grass variety can usually be obtained from the Extension Service agent in the area, members of a gardening club, or others who have professional training or knowledge of turf maintenance.

The results are real. A city-wide summer demonstration program was conducted in Fort Worth, Texas, with very positive reactions. Nearly 80 percent of the participants were very satisfied with the appearance of their lawn and 87 percent plan to continue not bagging grass clippings. Participant comments make it clear they approve of the approach and the results. One said, "My yard looks great, it's thick, healthy and has encouraged growth in bare spots without having to reseed. I may mow more often, but that is less taxing than mowing, catching the grass, emptying the catcher, carting the grass somewhere, etc., etc., in the Texas heat." Another participant noted, "I think it's the 'old way' revised and my lawn is healthier for it. Due to the landfill problems we are having, it's the best thing going!"

Grass clippings are of great benefit to the lawn and they aren't needed in landfills. We can all do our part to improve the environment by maintaining a healthy lawn and not bagging the grass clippings. It's easy, efficient, effective and inexpensive.

Remarkable People Say Remarkable Things About The Remarkable Grass Plant

Throughout history, man has most often trod across grassy fields or home lawns, with little care or thought to what was taking place right under his feet. Several remarkable people have made equally remarkable statements about what grass provides mankind.

"I believe a leaf of grass is no less than the journey-work of the stars."

Walt Whitman (1819-1892)

"Next in importance to the divine profusion of water, light and air—may be reckoned the universal beneficence of grass. Grass is the forgiveness of nature, her constant benediction."

Senator John J. Ingalls (1833-1900)

"Whoever could make ... two blades of grass grow where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together."

Johnathan Swift (1667-1745)

"Grass is what saves and holds the water that keeps life good and going ... It keeps the falling rain from flushing away. Blades of grass take water from the air and transpire it into the ground. That works the other way around too. Because grass blades help put water back into the air so that rain can fall again."

Theodore Roosevelt (1858-1919)

A SCIENTIFIC VIEWPOINT:

DR. J.B. BEARD

SCIENCE SHOWS TURF CAN SAVE WATER RESOURCES

Some published reports claim that turfgrasses are high water users, even exceeding the water use rate of trees and shrubs. The scientific facts are that turfgrass can actually conserve water. Partial evidence of the truth of this statement is provided by nature itself.

In the semiarid regions of the U.S. plains states, grasses are the dominant vegetation, whereas trees and shrubs are dominate in the higher rainfall areas east of the Mississippi River and west of the Cascade Mountains on the Pacific Coast. The point is, that there are many turfgrasses, both natural and naturalized, that are quite low water users.

In what surely must be a "worst-case water-shortage" scenario, studies at Texas A&M University showed that green, functional turfgrass can be retained throughout a 160 day period without using any additional water. Without either rainfall or supplemental irrigation, five different varieties of three warm-season turfgrasses (Bermudagrass, St. Augustinegrass, and Seashore Paspalum) displayed exceptional drought resistance qualities. Accentuating the severity of this drought stress test was the fact that the grasses were grown in three-foot deep sand, which offered almost no reserve water-holding capacity.

What this and other studies have shown is that it's man's decisions and methods concerning specific cultural practices that create a high water use rate in certain turfgrass species, not the plant itself.

Contrary to what some people and groups may propose, grass can indeed be a conservor of water and energy. Perhaps one of the least recognized functional benefits of turfgrasses is the ability to entrap and hold rainfall better than most surfaces, thereby reducing water loss by runoff and enhancing the potential for ground water recharge. In a related dimension, turfgrasses are one of the most cost-effective means of trapping and holding surface water that may be carrying eroded soil and organic chemicals, thereby reducing the amount of siltation and organic chemicals that enter sewers, streams, rivers and lakes.

Temperature Comparisons on a Selected Day in August

Type of Surface	Maximum Daily Temp. (°F) Surface Temperature	3" Above Surface	Nocturnal Min. Temp. Surface Temperature
Green, Irrigated Turf	88°	89°	76°
Synthetic Turf, Dry	158°	96°	84°
Brown, Dormant Turf	126°	95°	79°
Bare Soil, Dry	102°	91°	78°

J.B. Beard

Grass also offers a unique cooling capability that greatly enhances the comfort of people in highly populated urban areas. It accomplishes this at no cost of outside energy or the burning of carbon dioxide creating fossil fuels.

Studies now in their third year consistently demonstrate that actively growing turfgrass will reduce surface temperatures by 30-40° F in comparison to bare soil and by 50 to 70° F in comparison to synthetic turf surfaces. Cement, asphalt and stone surfaces also act as heat sinks with surfaces much hotter than turf.

As an added benefit, turf's growth process removes carbon dioxide from the atmosphere which has been identified as one of the potential factors that may cause global warming. By absorbing carbon dioxide and releasing clean oxygen, the grass plant is helping cool the earth, as well as our homes.

There are many other functional benefits of turfgrasses typically overlooked by the general public. These include:

1. Soil erosion control, which protects a vital national resource.
2. Dust stabilization.
3. Heat dissipation—temperature moderation.
4. Noise abatement.
5. Glare reduction.
6. Reduced runoff loss of precipitation.
7. Higher ground water recharge.
8. Increased degradation of organic chemicals.
9. Safety in vehicle operation and equipment longevity.
10. Facilitates security for key installations.
11. Reduced fire hazard.
12. Reduced problems with pests such as insects, snakes and rodents.

It should be noted that these functional benefits derived from turfgrasses are closely interrelated with water in a number of situations. Furthermore, even turfgrasses that are grey to tan in color due to summer drought stress still retain many of the important benefits listed.

Through education about proper turfgrass selection, irrigation equipment selection and use, man can also realize increased benefits from turfgrass.

That little grass plant most of us take for granted may help make this planet more liveable, especially if we learn to give it a chance to give us all of the benefits it is capable of.

Editor's Note: Dr. James B. Beard is a Professor of Turfgrass Physiology and Ecology in the Department of Soil & Crop Sciences at Texas A&M University, College Station. His research and teaching in Turfgrass Sciences include a broad array of topics including many mentioned in this article. Recognized as a leader by his peers, he has served as President of the Crop Science Society of America and the International Turfgrass Society, as well as being a recipient of numerous honorary positions and awards. Dr. Beard also is the author of six books on turfgrass and their cultures.

Lawns Can Heal The Environment's Wounds

Walking around barefooted on a hot, bright summer afternoon can be a real learning experience. An experiment in environmental enhancement, if you will.

First, as you step onto the sidewalk, your shoeless feet seem to almost sizzle, so you quickly jump onto the grass for the cooling, almost tickling effect you sense.

As you continue your journey, you pass into a concrete canyon created by high-rise offices and you notice not only the stillness of the air and its thick feeling, but the increased temperature and general lack of visual appeal. Without grass, trees, shrubs, flowers or other living plants, the area seems depressing, if not depressed.

Going farther, you venture onto the wide expanse of beach-front, but immediately squint, stumble and pull on your darkest sunglasses. The intense glare of sunlight reflecting off of the sand and water are more than your naked eyes want to tolerate. While putting on your sunglasses you also quickly dance from foot-to-foot before the heated sand sears your feet.

At last, you make it to the park. Surrounded by shade dappled sunlight, you sense the coolness around you; the serenity of the natural sounds and the general calm that overtakes you. Your eyes relax as you take off your sunglasses and your toes dig into the grass blades. You feel at home.

You've just experienced in nature what scientists are starting to quantify.

Grass and trees can directly and indirectly influence our environment. Even more encouraging, scientists are showing us that grass can actually serve to heal many of the environment's wounds mankind has so carelessly inflicted.

Cooling the World Around Us

Without getting into all of the scientific jargon, researchers at Texas A&M University have quantified the cooling effects of turfgrass, noting that turf will reduce surface temperatures by 30-40 degrees-F in comparison to bare soil and by 50 to 70 degrees over synthetic turf surfaces.

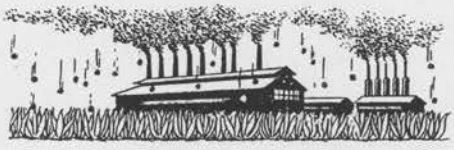
Other researchers have calculated that the front lawns of just eight average houses

provide the cooling effect of about 70 tons of air conditioning. The average home-size air conditioning unit has about a 3 to 4 ton capacity and requires the generation of electricity through the burning of fossil fuels or nuclear power that may contribute to air pollution. Grass achieves its cooling effect by using its own self-powered evapo-transpiration system.

Converting Poison to Oxygen

Many activities in our lives create poisonous gases such as carbon dioxide, ozone or methane. Grass, on the other hand, requires carbon dioxide to survive and as it takes this gas out of the atmosphere, it replaces it with oxygen.

Grass is such an efficient carbon dioxide—oxygen converter that an area just 50 feet by 50 feet generates enough oxygen to meet the needs of a family of four. In



addition to absorbing CO_2, grass is also taking in other gases poisonous to humans such as ozone, hydrogen fluoride and peroxyacetyl nitrate.

It is estimated that the grass and trees along the U.S. interstate highway system release enough oxygen to support 22 million people.

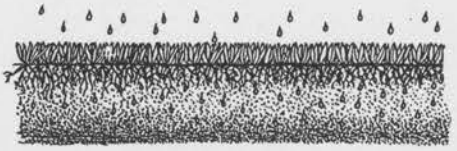
Cleansing the Water

Within a thick lawn, there are six turfgrass plants in each square inch, 850 plants in a square foot and about 8 million plants in an average lawn of 10,000 square feet. A single grass plant can have 387 miles of roots, which means that beneath that average lawn are a tangle of some 3 billion miles of roots!

With such an extensive and entertwined system, it's no wonder that grass is estimated to trap some 12 million tons of dust and dirt from the air annually. Just one acre of grass will absorb hundreds of pounds of fossil fuel created sulfur dioxide in a single year.

As rains fall or we water our lawns, the trapped pollutants are not washed into our drinking water systems, but rather moved into the thatch and surface soil levels where they are almost immediately acted upon by millions and millions of microbes who call this area home.

Healthy lawns absorb rainfall six times more effectively than a wheat field and four times better than a hay field. A sodded lawn will be 15 times more effective at controlling runoff than a seed-established lawn, even after several years of growth.



Studies at Penn State University, concerned about the water quality effects of man-applied fertilizers and pesticides, found that the runoff and lechate (run-through) water collected just two days after chemicals had been applied, were usually cleaner than what the government requires for drinking water.

Applying Environmental Bandages

Much has been made recently of the effect planting more trees can have toward improving the environment and while the theory is sound, the practical aspects aren't so certain.

Unfortunately, trees are usually slow-growing, taking 10, 15 or 20 years to reach maturity, with their environmental benefits increasing only with their maturity. Another potential difficulty with massive tree plantings concerns site selection. Misplaced trees could destroy structural foundations, sidewalks and sewers as their massive root systems expand with age. Another factor to consider is the maintenance of trees in many urban settings.

Wind, age and vandals can all cause tree damage that must be repaired to avoid the tree's death or harm to humans and their property. Caring for a nation's trees is no small task.

Grass, particularly if turfgrass sod is used, can have an immediate and lasting impact. It's growth cycle initiates itself immediately and with that comes all of the environmental correcting benefits cited above. Clean air, clean water, less glare and cooling can all begin practically overnight.

While grass should be cared for, minimal watering, feeding and pest control, as well as mowing can be lessened with the use of newly developed grass varieties that

have high tolerance to low maintenance practices. Should the grass become damaged or even die, its replacement does not create a major disruption to the area and can be accomplished by a single individual.

To further capitalize on the advantages of turfgrass, city planners, developers and owners of commercial and residential property can install turfgrass to achieve very real environmental advantages.

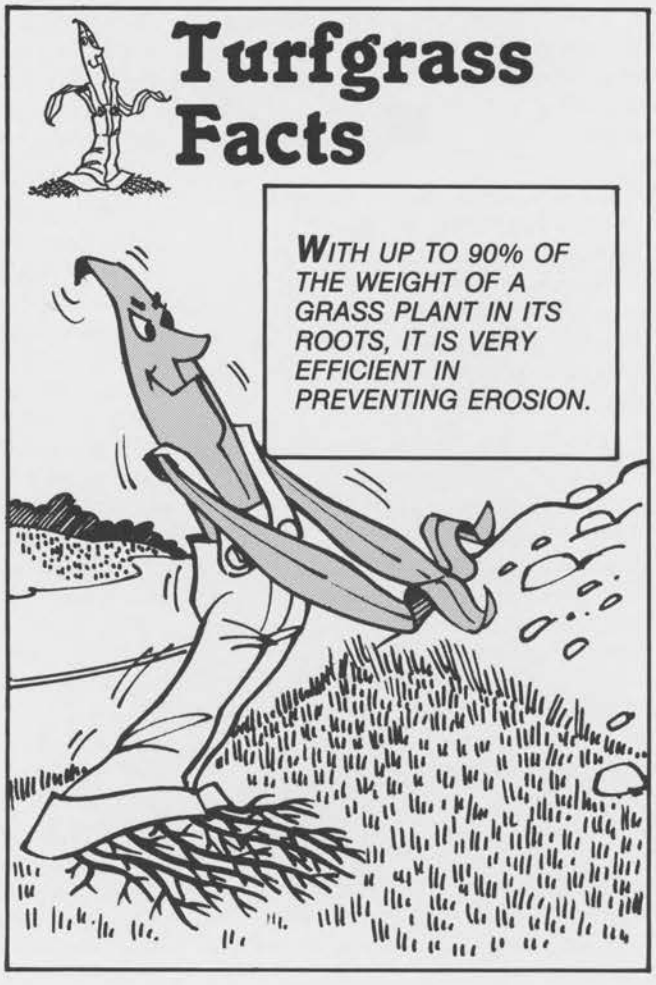
For example, turf areas beside parking lots can use runoff waters for irrigation and at the same time cleanse the water and recharge the groundwater system, rather than forcing the runoff into sewer systems already at their maximum capacities. The other benefits provided by turf would be a bonus.

One Person Makes A Difference

With only a minimal investment in time, energy and money, one person can make a positive contribution to the environment by creating and caring for a quality lawn area.

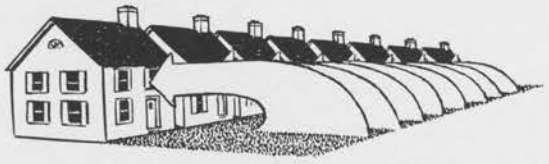
In addition to realizing a 10 to 15% increase in property values because of a well

maintained landscape, the homeowner will have lower summertime air conditioning bills and be contributing to an improved environment rather than contributing to its pollution.

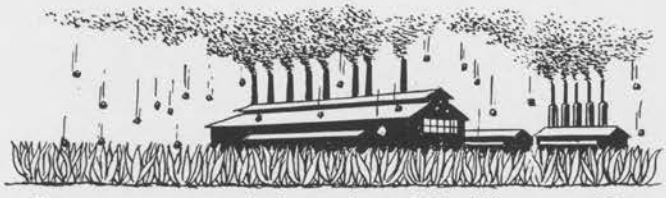


Here are 10 Great Things

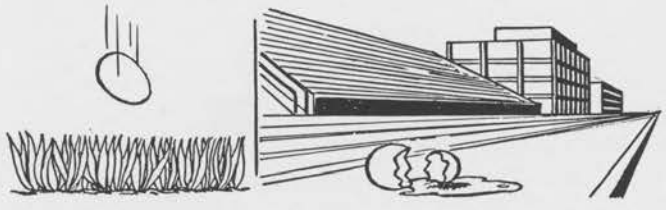
Johnathan Swift, in 1726 said, "Whoever could make two blades of grass grow where only one grew before, would deserve better of mankind, and do more essential service to his country than the whole race of politicians put together." Old Mr. Swift certainly knew what he was talking about. Here are just a few of the benefits turfgrass lawns provide humanity:



Front lawns of just eight average houses have the cooling effect of about 70 tons of air conditioning, while the average home-size central air unit has only a 3 to 4 ton capacity.

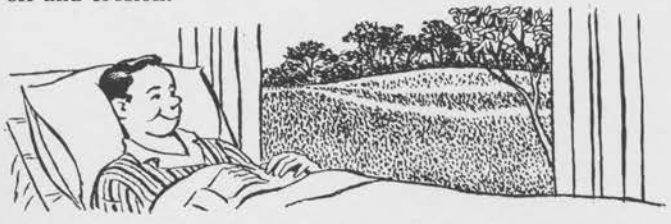


Turgrasses trap much of an estimated 12 million tons of dust and dirt released annually into the U.S. atmosphere.



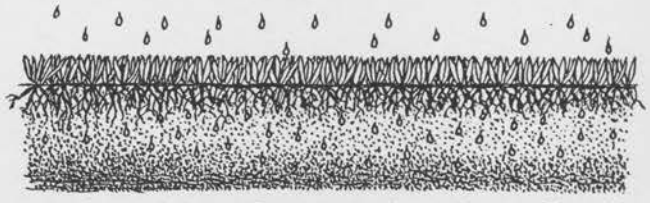
Playing fields covered with dense turf have proven safer, as demonstrated by a simple egg drop test. When a dozen raw eggs were dropped from a height of 11 feet onto a two-inch thick piece of dense turf, none broke; two thirds of them broke on thin turf from that height; and from just 18-inches up, all broke on an all-weather track!

Healthy, dense lawns absorb rainfall six times more effectively than a wheat field and four times better than a hay field. Sodded lawns can absorb 10 to 12 times more water than seeded lawns, even after two years of growth, thus preventing run-off and erosion.



Recovery rates among hospitalized patients are often quicker when their rooms view a landscaped area than patients with non-landscaped views. Where vegetation grows, child mortality, suicide and energy consumption are less than in places where there are no plants.

With up to 90% of the weight of a grass plant in its roots, it makes a very efficient erosion prevention device, also removing soil particles from silty water.



Turfgrasses help purify water entering underground aquifers by its root mass and soil microbes acting as a filter to capture and breakdown many types of pollutants.

A Gallup Survey reported 62% of all U.S. homeowners felt investment in lawns and landscaping was as good or better than other home improvements. The investment recovery rate is 100-200% for landscape improvement, compared to a deck or patio that will recover 40-70%. Proper and well maintained landscaping adds 15% to a home's value according to buyers.

Grass areas quickly affect people's moods by creating feelings of senerity, privacy, thoughtfulness or happiness and its yearly cycles of growth and color change lift human spirits and link urban inhabitants with their countryside heritage.

A turf area just 50-feet by 50-feet absorbs carbon dioxide, ozone, hydrogen fluoride and perosyacetyle nitrate and releases enough oxygen to meet the needs of a family of four. The grass and trees along the U.S. interstate highway system release enough oxygen to support 22 million people.

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10 WAYS TO SAVE WATER

When Establishing Lawns

Save water and money by following these 10 simple methods:

1. REDUCE STEEP SLOPES IN THE DESIGN ... Level surfaces allow water to penetrate while steeper slopes encourages wasteful water run-off.

2. TEST SOIL AND AMEND ... Create the best possible growing medium with organic materials, pH balance and nutrients.

3. INSTALL AN IRRIGATION SYSTEM ... water efficiency is greatly improved with a designed system over hoses and especially hand-held sprinklers.

4. SELECT DROUGHT TOLERANT VARIETIES ... Scientific grass breeding has developed many varieties of improved turfgrasses.

5. SOD RATHER THAN SEED ... Turfgrass sod requires 15 to 60 percent less water to establish a lawn than does seeding, depending on the area and conditions.

6. USE A SOIL PROBE ... Water only when a probe or screw driver is difficult to push into the ground or shows the soil is dry.

7. WATER IN THE EARLY MORNING OR EVENING ... Less wind drift and lower evaporation rates increase water efficiency use rates.

8. PREVENT RUN-OFF SITUATIONS ... Apply water for brief periods or at reduced rates to allow greater penetration of the soil before run-off occurs.

9. MATCH FERTILIZER TO PLANT REQUIREMENTS ... Extension agents or professional agronomists can recommend timing and amounts of fertilizer needed by each grass variety. This reduces waste and mowing needs as well as overly succulent, water-wasting growth.

10. MOW HIGHER THAN NORMAL WITH A SHARP BLADE ... Larger leaf surfaces hold plant liquids and shade the root zone. Dull mower blades will increase moisture loss from the plant.

10 WAYS TO SAVE WATER

On Established Lawns

Save water and money by following these 10 simple methods:

1. MOW AS INFREQUENTLY AS POSSIBLE ... Mowing puts the grass plant under additional stress and it will use more water.

2. MOW HIGHER THAN NORMAL ... Greater leaf surfaces hold plant liquids and shade the root zone. Never remove more than ⅓ of the leaf blade in one mowing. Longer blades usually mean deeper, more efficient roots.

3. WATER AND MOW IN THE EARLY EVENING OR MORNING ... Less wind and heat reduces stress on the plant and allows for greater penetration and less run-off or evaporation.

4. WATER FOR DEEP PENETRATION ... Interrupt watering when puddles or run-off occur, allow the water to penetrate into the soil before restarting. Light, infrequent sprinkling may actually do more harm than good.

5. SPOT WATER ... Drier areas near buildings and on slopes require more water than flat areas where water doesn't run-off.

6. AERIFY OR VERTICUT TURF ... Increased penetration of water and air will place the water where it can be used by the grass plant.

7. USE A SOIL PROBE ... Test soil moisture with a probe or screw driver. Water only when the soil is dry or the probe is difficult to push into the ground.

8. MATCH FERTILIZER TO PLANT REQUIREMENTS ... Extension agents or professional agronomists can recommend timing and amounts of fertilizer needed by each grass variety. This reduces waste and mowing needs as well as overly succulent, water-wasting growth.

9. INCREASE DISEASE AND INSECT CONTROL, WITH CARE ... Drought stressed turf is more susceptible to pest problems, but too much pesticide will increase stress in the plant.

10. ACCEPT A LESS THAN LUSH LAWN ... Grass will naturally go dormant during periods of drought, but will readily regenerate when water becomes available. Reduce traffic on these areas if possible.

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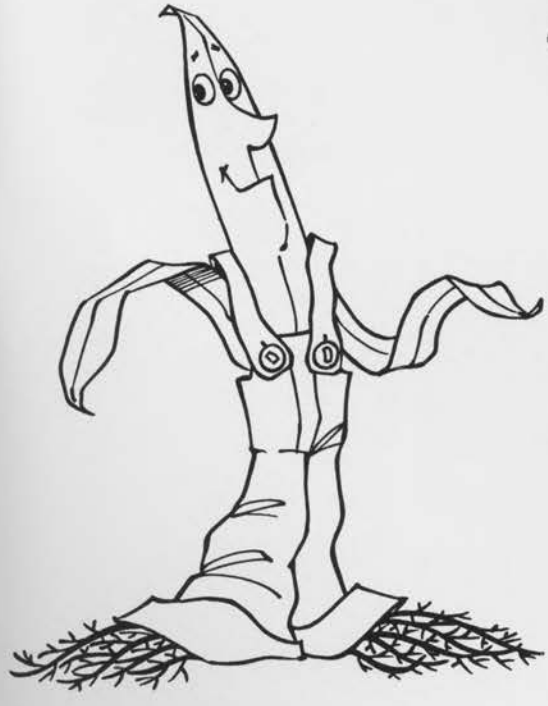
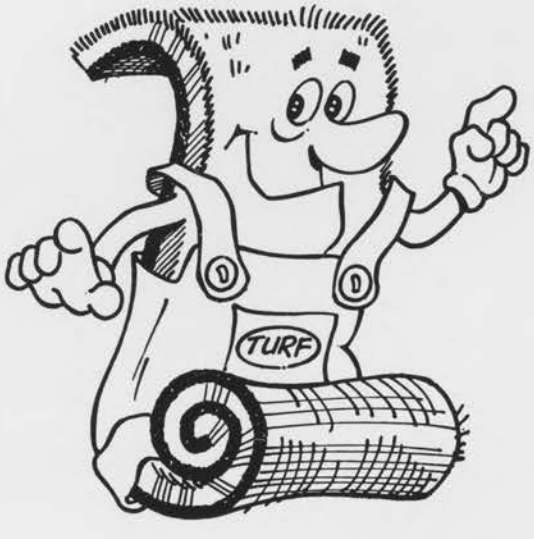
Article Illustrations and Clip Art





The following organizations endorse the environment educational efforts of the American Sod Producers Association,

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Irrigation Association
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Professional Grounds Management Society
The Lawn Institute

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