keep tees from becoming slippery.

10. Replace broken sprinkler head covers.

11. Protect pumphouses with fences and locks to keep children away.

12. Check brakes and locking devices for overnight storage of carts and equipment.

13. Remove all low hanging branches that could affect equipment operators and golf cart operators.

14. Use highly visible gates, not cables.

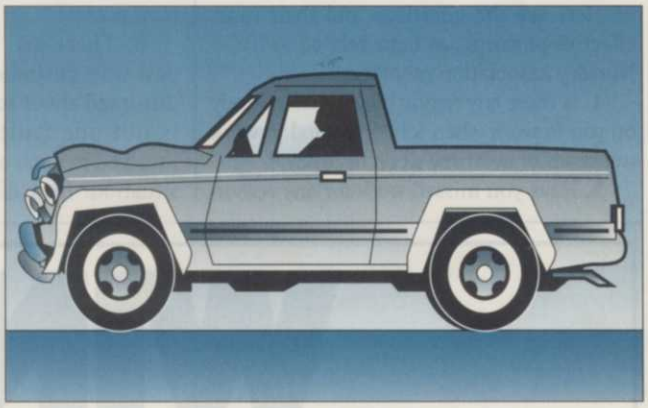
15. Remove rocks or cover from fairways and roughs that might ricochet a golf shot back to the golfer from across fairways.

16. Refrain from using railroad ties for sand trap facings.

17. Provide proper barriers in golf cart parking areas.

To minimize risk of injury to golfers, you should repair any eroded areas by grading, seeding or sodding.

Is your vehicle insurance a wreck?



Certain types of coverage are necessities—but that doesn't necessarily mean you should pay exorbitant premiums.

■ Basic vehicle liability coverages may be woefully inadequate to protect lawn maintenance operators in a serious mishap, according to Chester A. Pierce, benefits representative for the Lawn Maintenance Association in Florida.

Pierce's suggestions for making decisions on auto insurance, as listed in the organization's newsletter:

1) Set liability limits at a level high enough to protect your assets.

2) Carry uninsured motorist coverage at the same levels as your liability policy.

3) Buy personal injury protection which has no deductibles.

4) Consider higher deductible policies for collision coverage to keep premium payments down.

5) Carry comprehensive and collision coverage until the vehicle has little value.

Pierce also offers good preventive suggestions, including:

1) Use careful hiring practices, particularly with those you expect will drive.

2) Hold safety sessions with employees.

3) Explain to drivers that premiums are directly affected by driving practices.

4) Set a good example yourself to employees.

Pierce recommends thorough review of all policies. Questions about coverage should be fully explained by your agent.

Defusing those volatile clients

■ There are specific steps you can take when faced with a difficult customer, according to a recent Garden Centers of America newsletter.

Defusing difficult situations:

● **SMILE:** Give the customer a warm, sincere hello with a smile.

● **ANTICIPATE:** Head off customer complaints with a sincere, concerned comment. Take the offensive with kindness.

● **APOLOGIZE:** Take the blame for the customer's situation and empathize with them for their problem on behalf of your organization.

● **ACTION:** Solve the problems promptly.

Cooling irate customers:

● **LISTEN:** Let the customers know you are interested in their problems.

● **EMPATHIZE:** Put yourself in the customer's place. Use "warm fuzzies" that are genuine, specific, timely and sincere.

● **QUESTION:** Ask questions in a mature, non-threatening manner that requires the customer to think about answers.

● **REPEAT:** Tell customers your understanding of the problem, then suggest one or more alternatives to answer their concerns.

● **APOLOGIZE:** But don't issue any blame.

● **SOLVE:** Identify solutions to satisfy the customer's needs or find someone who can.

Hiring questions to ask & avoid

For legal and other reasons, it's important to ask the right questions during a job interview, and to avoid the wrong questions.

■ Legally, what *can* you ask and what *can't* you ask during a job interview?

Richard I. Lehr, general counsel to the Professional Lawn Care Association of America, lists 10 questions that provide solid, pertinent information about possible job candidates yet don't infringe on personal rights guaranteed by our legal system.

Here are the questions and their most effective phrasing, as Lehr related to Idaho Nursery Association members:

1. Is there any reason why we cannot rely on you to work when scheduled and to work weekends or overtime when necessary?

2. Have you missed work for any reason other than vacation or holidays during the past three years?

3. There are times when the schedule for providing our service will be hectic due to the weather and other circumstances beyond your control. There may be a lot of pressure involved. What kinds of circumstances have you been in where you have had pressure deadlines to meet? How did it turn out? What did you do to achieve that result?

Richard Lehr: ask hirees the right questions

4. We want customers to think that the services we provide are better than our competitors'. What do you think would provide this result?

5. There are times when each of us must deal with people we don't like. Tell me about such situations you have been involved in. What did you do? How did it turn out?

6. There are times when we have to deal with customers who are very mad or disturbed about something, even though it is not our fault. Have you ever been involved in such a situation? What was the situation? How did you deal with it? What was the result? Looking back on it now, should you have dealt with it differently, and if so, how?

7. Were you ever placed in a situation where you were asked to compromise your values, and if so how did you handle it? Do you have any regrets about that now?

8. Do you recall any situation at work or away from work where you believe that you were criticized unfairly? What was the situation? Why do you think it was unfair?

9. Are you most comfortable supervising others or being supervised? What were the attributes of the supervisor you most admired? What were the attributes of the supervisor you least admired?

10. What type of people have you most enjoyed working with? Describe those circumstances. Which individuals did you least enjoy working with, and why?

Remember, Lehr warns, that a relationship must exist between the answer to a question and the individual's ability to do the job. If not, the question may very well be illegal.

LANDSCAPE MANAGEMENT

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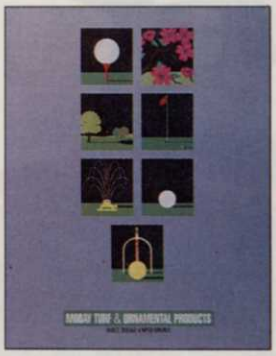

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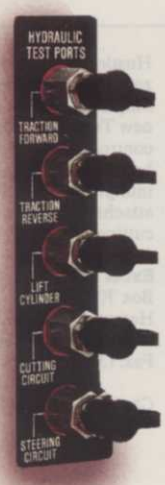
It Stopped Just To Have Its P

You're witnessing a rare sight. Toro's Reelmaster® 450-D actually standing still. A rare sight because the Reelmaster 450-D is so dependable that it goes and goes and goes. Giving you the high capacity mowing and precise even cutting you've been looking for.

Each cutting unit is connected to a universal joint, so it can float freely in any direction, following the contour of the turf for an even, uniform cut. Or can be locked in a fixed position.

The Reelmaster 450-D can be customized with these accessories: ROPS, Cab, 5- and 7-bladed reels, rollers and thatching reels.

The Toro 450-D gives you protection against hydraulic fluid leaks. Wherever possible, hoses have been replaced with strong steel lines and O-ring seals protect connections. A hydraulic warning system flashes an alarm when the fluid level drops. For easy servicing, test ports for the hydraulic system are right on the side of the machine.



The Toro Company, Commercial Marketing Services, 8111 Lyndale Ave. So., Minneapolis, MN 55420.

Long Enough
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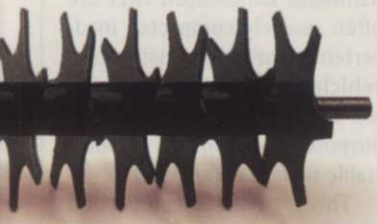
Toro's exclusive variable clip control allows you to calibrate reel speed and mowing speed to give you the highest quality of cut in varying course conditions. Combine that with faster mowing speeds, up to 7.5 mph and 12.5 mph transport speed, and you're going to witness an increase in productivity. All controls are in easy reach of the operator to provide greater comfort.

The 450-D is designed with its weight evenly distributed around a center-mount 50 hp engine for better balance. This means more uphill climbing ability than other machines and better traction.



Compared to tractor gang mowers, the Toro 450-D weighs less and is equipped with wide 31-inch tires that spread the weight for the lowest PSI, further minimizing turf marking.

For faster, easier mowing with more beautiful results, call your local Toro distributor for a demonstration of the Reelmaster 450-D or contact Toro at the address below. A machine built from the ground up with proven Toro design experience. And that translates into the kind of productivity no one can argue with.

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Water infiltration into soils

How much water is getting to your turf's roots? Water infiltration is a key to healthier turf.

by Don Taylor and C. Frank Williams

■ Water infiltration rate is the rate at which water enters the soil. It is critically important in managing turf.

The water infiltration rate determines how much water from a storm actually gets into the soil, and how much runs off the surface. It determines the rate at which irrigation water can be added, and the length of time irrigation can be continued before water starts to pond and run off.

Due to soil compaction, low water infiltration rates are common on golf greens, athletic fields and some lawns. In fact, most turf areas probably suffer from one or more of the following problems associated with low infiltration rates:

- lowered irrigation efficiency;
- excessive surface water puddling;
- poor playing conditions following rainfall; and
- turf damage from surface water ponding.

Many factors determine the water infiltration rate, including soil type, soil compaction and the presence of thatch or other layers at the surface.

Soil type—Water moves through the pores between soil particles. Generally, larger soil particles result in larger pores; thus, sandy soils with relatively large particles usually have higher infiltration rates than do finer-textured soils such as loams, silt loams and clay loams.

Several factors must be considered in applying this generalization to turf sites:

1) Compacted, sandy soils can have very low infiltration rates. We have measured rates below 0.1 inches/hour on golf greens modified to have 70 to 80 percent sand by weight.

2) Mixing small amounts of sand into fine-textured soil will usually not improve infiltration rates. Research has shown that sand contents must be very high—around 85 percent sand or higher—in soil mixtures to maintain high infiltration rates.

3) Finer-textured soils which are well-aggregated can have reasonably high infiltration rates if the soil structure or aggregation can be preserved. Aggregation of soils high in clay content is stronger and more easily preserved than soils high in silt content. However, soil structure near the surface of any type of soil will be destroyed if subjected to intensive vehicular or foot traffic.

The key is to preserve as much soil structure as possible, regardless of soil type. This can be done by:

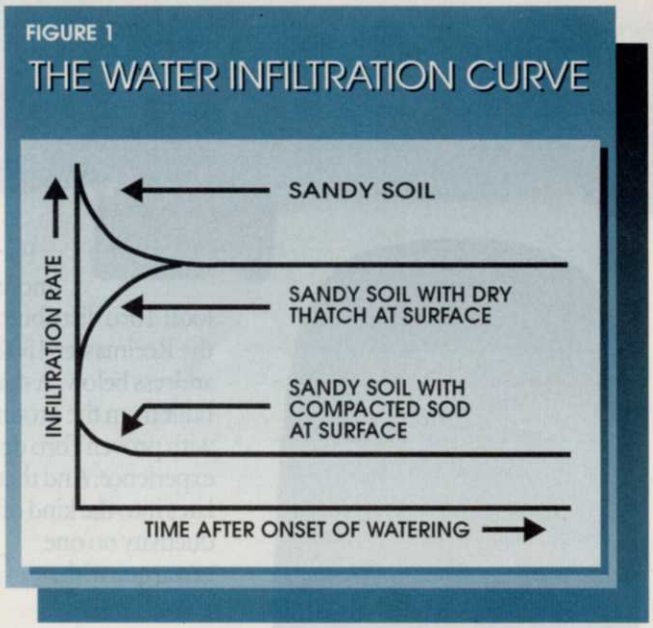
1) Keeping vehicular traffic to a minimum and preserving as much soil structure as possible before turf establishment.

2) Limiting unnecessary traffic on turf, especially when the soil is wet.

3) Maintaining conditions conducive to vigorous root growth, earthworm and micro-organism activity through proper watering, fertilization and aerification practices, and prudent pesticide use.

FIGURE 1

THE WATER INFILTRATION CURVE



Soil compaction—The majority of problems with low infiltration rates on turf areas probably result from soil that is compacted before turf establishment. Landscaped sites are often severely compacted inadvertently through construction vehicle traffic. Sometimes the soil is excessively compacted on purpose to establish a smooth, stable surface for sodding.

This type of soil compaction simply must be improved by deep plowing before establishing turf. After establishing turf, options for relieving soil compaction are severely limited.

Continued on page 28

ELSEWHERE

Fungicides for pythium control, page 29

Ant control in turfgrass, page 29

Preventing the leaching process, page 30

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Soil compaction following turf establishment can—and frequently does—occur on golf turf, athletic fields and other heavily used turf areas from concentrated foot traffic. The most common method of alleviating soil compaction on an established turf is through aerification.

Typical aerifiers only go to a limited depth (three to four inches, at most), and disturb a small percentage of the surface. A typical athletic field aerator with 3/4-inch tines taking cores on six-inch centers disturbs only 1.2 percent of the surface with a single pass. A typical golf green aerator with 1/2-inch tines taking cores on two-inch centers disturbs 4.9 percent of the surface. Thus, with most aerifiers, several passes over the turf when soil moisture conditions favor deep tine penetration are required.

The new deep-tine aerifiers can open holes to a depth of 12 inches or more. New water-injection machines can create openings in the soil using water drops under high pressure.

Thatch—The presence of thatch at the soil surface has interesting influences on water infiltration rates.

As long as the thatch layer is relatively un-decomposed, water can flow readily through it, if it is moist. If the thatch is dry, however, it becomes hydrophobic and repels water.

Fig. 1 shows the general response of infiltration rate as time progresses through a storm or irrigation cycle. In normal soils, infiltration rate starts high and decreases as the soil becomes increasingly wet. A dry thatch at the surface causes the initial infiltration rate to be low. Infiltration rate increases as the thatch moistens up.

Maintaining moist conditions in the thatch layer, either through syringing or by a short moistening irrigation prior to a storm or a regular watering, may improve water infiltration into the soil.

Other types of surface layers can severely impact water infiltration rate.

A layer of sod grown on fine soil or peat, once compacted, can severely limit water infiltration. The resulting infiltration curve is represented by the bottom curve in Fig. 1.

Wind-blown soil, particularly silt-sized particles, can plug the pores at the surface of a turf soil and reduce infiltration rates.

Algae growth can create a limiting layer at the soil surface.

Intensive aerification can help break up surface layers regardless of their source, and reduce their impact on water infiltration rates.

Rather than actually measuring infiltration rates (see accompanying article), it seems preferable for turf managers to evaluate the symptoms associated with low water infiltration rates.

One symptom is standing water on the soil surface. Perhaps the simplest method of determining if low infiltration rates are a problem for your turf conditions is to carefully inspect the area during normal irrigation cycles and during substantial storms. If any water collects at the surface during irrigation or if excessive amounts collect during storms typical of your area, then water infiltration rates are too low.

Other symptoms which may be useful in assessing water infiltration rates are evidences of soil compaction—such as hard soil or restricted root systems—shallow depths of soil wetting after irrigation, or distinct soil layering in the rootzone.

What can be done about low water infil-

RING SIZES SHOW DIFFERENT RESULTS

On one golf green where sand topdressing had resulted in several inches of sand over the original gravelly loam topsoil, infiltration rates measured with the small rings averaged 2.0 inches/hour, while the infiltration rate measured with the large rings averaged 0.6 inches/hour. Our opinion the water in the soil was flowing horizontally in the sand layer rather than vertically into the gravelly loam layer.

At one golf green, which had been constructed of 100 percent sand, and where we expected fairly uniform conditions, we measured rates varying from 2.6 to 7.9 inches/hour using the large rings.

—The authors

Measuring infiltration

■ Though many sophisticated methods are used to measure the water infiltration into soil, the only method suitable for routine use by turf managers is to drive a cylinder of two concentric cylinders into the soil. After maintaining a pond of water inside the cylinders for an hour or so, the infiltration rate can be determined by measuring how fast the ponded water in the inner ring drops.

If, for example, the water level drops by 0.2 inches in 15 minutes, the infiltration rate is 0.2 inches divided by 0.25 hours or 0.8 inches per hour.

Typical rings used in agriculture are one foot in diameter or larger. The double ring consists of an inner ring one foot in diameter and an outer ring 20 inches in diameter. Infiltration rings this large are cumbersome and require considerable quantities of water if the infiltration rate is high.

Smaller rings can easily be made. Rings made from a six-inch and an eight-inch turf repairer were used in an experiment to determine their usefulness in assessing water infiltration rates on turf areas. The results were not particularly encouraging and indicated two cautions with using ponded water in rings to measure infiltration rates:

1) Though small rings are easy to use, their results do not always agree with results from large rings. We found this to be particularly true where distinct layers were known to exist in the soil. Measurements from smaller rings are more affected by lateral or horizontal flow than larger rings, and the smaller the ring, the greater the over-estimation of vertical infiltration rate.

2) Infiltration rates into the soil can vary dramatically, even within a small area. Consequently, measurements at several locations on the turf site are essential. A single infiltration measurement to characterize a golf green, athletic field or other turf site may lead to gross errors. Even with several measurements, our opinion is that using water ponded in rings will do no better than give an estimate of infiltration conditions.

—Taylor, Williams

tration rates in turf areas? Most importantly, we need to change our perception about how the soil is treated prior to turf establishment. If everything possible were done to preserve soil structure and minimize soil compaction prior to turf establishment, most of our problems with low infiltration rates would not occur.

Where turf is already present and infiltration rates are low, aerification—and plenty of it—should be the first corrective measure. Once over is not enough; several passes are necessary. Often, adequate turf conditions can be maintained despite compacted soil and low infiltration rates with frequent and intensive aerification.

If regular aerification is insufficient, then more extensive treatments such as deep tine aerification or reconstruction may be required.

Fungicides for pythium on golf course fairways

■ In a test conducted at Penn State University, nine of 15 fungicides tested on pythium blight were providing excellent control eight days after application. By 16 days after application, eight, including three Banol/Subdue mixtures, were still providing control.

One fungicide application was made on July 16th. One day after application, the plots were inoculated with *Pythium aphanideratum*. They were again inoculated eight days after application.

The tests were conducted at the Valentine Turfgrass Research Center on perennial ryegrass maintained under golf course fairway conditions, which simulated high humidity.

The tests were conducted by P.L. Sanders and M.D. Soika, and reported in "The Keynoter," the publication of the Pennsylvania Turfgrass Council.

See adjacent chart for complete test results.

PYTHIUM BLIGHT CONTROL, POST-TREATMENT RESULTS

Treatment	Formulation	Rate/ 1000 sq ft	Pythium blight severity[1] 8 days post-treatment	Pythium blight severity[1] 16 days post-treatment
FCI 6444	50W	1.47 oz	8.2 a[2]	7.0 b[2]
RO 43-2664	24%E	0.32 fl oz	7.0 ab	9.2 a
FCI 6444	50W	2.9 oz	7.0 ab	8.3 ab
Check	N/A	N/A	6.3 ab	8.2 ab
RO 43-2664	24%E	0.65 fl oz	4.8 bc	9.0 a
RO 43-2664	24%E	1.3 fl oz	3.7 cd	8.7 ab
S 3116	G	6.9 lbs	3.3 cd	2.2 cd
Aliette	80W	4.0 oz		
+ Koban	30W	4.0 oz	1.8 de	3.2 cd
Aliette	80W	4.0 oz	1.2 de	3.0 cd
Subdue	2E	0.5 fl oz	0.7 e	2.8 cd
Subdue	2E	1.0 fl oz	0.7 e	3.3 c
Banol	6S	0.7 fl oz		
+ Subdue	2E	0.5 fl oz	0.7 e	1.5 cd
Banol	6S	1.3 fl oz		
+Subdue	2E	0.5 fl oz	0.7 e	1.3 d
Banol	6S	1.3 fl oz	0.5 e	3.3 c
Banol	6S	1.0 fl oz		
+Subdue	2E	0.5 fl oz	0.3 e	1.3 d
Aliette	80W	8.0 oz	0.0 e	3.0 cd

[1] 0-10 visual rating scale, where 0 = no blight present, 1 = 10% of plot blighted, and 10 = 100% of plot blighted; mean of three replications.

[2] Within columns, means followed by the same letter are not statistically different, using Waller-Duncan K-ration t test.

Source: P.L. Sanders & M.D. Soika, Penn State Univ.

ANT CONTROL RESULTS

Treatment	Rate (lb AI/acre)	Mean number of ant mounds per 144 ft² plot* 15 Aug	23 Aug	30 Aug	6 Sept	13 Sept	26 Sept
019537	2.5 lb/100 ft²	20.7 a	18.0 ab	6.8 bc	8.0 bc	8.5 ab	7.5 ab
Pageant DF	1.0	24.3 a	21.3 a	10.0 ab	19.7 a	18.0 a	13.2 a
XRM-5184	1.0	24.3 a	10.2 bc	4.7 bc	4.2 bc	8.5 ab	7.0 ab
Dursban ME 20	1.0	26.7 a	11.8 b	7.7 bc	6.8 bc	8.8 ab	6.2 ab
Triumph 4E	1.5 oz/1000ft²	24.2 a	4.7 c	3.3 c	1.7 c	2.7 b	3.7 b
Control	....	21.8 a	27.3 a	15.2 a	14.5 ab	19.5 a	8.7 ab

* Means within a column followed by the same letter are not significantly different (P=0.05; DMRT)

Source: Michigan State Univ.

Ant control in turfgrass

■ Triumph 4E was shown to be the best control for ant mounding in a test done by staffers of the Department of Entomology, Michigan State University, in 1990.

At three and four weeks after the August 15th treatment, Triumph 4E had significantly reduced ant mounding in comparison with the control. At one and two weeks after treatment, most insecticide products reduced mounding. None of the products tested was effective five weeks after application.

Preventing nitrate leaching

■ Nitrate losses on many fertilized grassy areas on many soil types are no greater than those on unfertilized areas, according to research from Cornell University.

"There are some cases, however," says Cornell's Dr. Norman W. Hummel Jr., "where the potential for nitrate leaching does exist."

Conditions that promote leaching, he says, are:

- sandy soils;
- too much water from irrigation or rainfall;
- applying more fertilizer than necessary; and
- using water soluble (quick release) fertilizers in the late fall.

Hummel, speaking at a Virginia Turfgrass Conference convention, noted three actions that turf managers can take to prevent nitrate leaching. They are:

1) Use slow-release fertilizers. "Research has shown that leaching of nitrates on even sandy soils can be prevented," Hummel says. "Most slow-release fertilizers release nitrogen at a rate similar to plant needs. Therefore, very little nitrogen is left to be leached out of the rootzone."

NITROGEN REQUIREMENTS PER 1,000 SQ. FT.

Pounds nitrogen**	Urea 46-0-0	10-5-5	16-8-8	25-3-3	20-3-7 20-5-10	SCU 36% N	Natural org. 6% N	Ureaform 38% N	IBDU 31% N
1/2	1	5	3	2	2 1/2	*	*	*	*
1	2	10	6 1/2	4	5	3	8 1/2	*	3
1 1/2	3	15	9 1/2	6	7 1/2	4	17	4	5
2	*	20	13	8	10	5 1/2	33 1/2	5 1/2	6 1/2
2 1/2	*	25	15 1/2	10	12 1/2	7	42	6 1/2	8
3	*	30	19	12	15	8	50	8	10

* Not recommended at these rates. ** Recommended *Source: Cornell University*

Hummel also suggests avoiding fertilizers that contain a large percentage of urea, ammonium nitrate, ammonium sulfate or ammoniated phosphates, especially if used in the late fall.

2) Don't over-fertilize. "Apply no more than one pound of actual nitrogen per 1000 sq. ft. at one time, unless a 100 percent slow-release material is used."

The table above lists fertilizer rates to deliver this nitrogen rate using different analysis fertilizers. Please, however, reduce these rates by 1/3 if clippings are returned after mowing. "Also, older lawns will require less nitrogen due to a build-up of soil organic nitrogen that occurs through time," Hummel notes.

3) Don't over-water. Apply only enough water to moisten the rootzone (about 3/4 of an inch of water on dry soil). "Too much water will drain through the profile, carrying nitrates with it," Hummel concludes.