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Attack Compaction
continued from page 8

to insects and diseases and less growth after fertilization.

Roots Of Compaction

Soil compaction results in increased soil density and strength and decreased pore space. With less pore space, soil oxygen levels are lowered. Plant-available water is reduced, as is infiltration and percolation. Runoff is increased. Compacted soils have higher summer temperatures and increased water use.

Most compaction from normal use occurs in the top 1 to 3 inches of the soil surface. The degree of soil compaction that occurs depends on soil texture, soil moisture when used, and, obviously, the amount of weight applied. Soils with high silt and clay contents compact easier than dry soils. Heavy-weight college football players cause more compaction than the lighter-weight youth league soccer players. Cleated shoes increase compaction more than flat shoes because the full weight of the player is distributed on the reduced surface area of the cleats.

Soil compaction caused by equipment will extend deeper into the soil. Heavy equipment used during construction can develop subsurface compaction, as can repeated cultivation to the same depth to relieve surface compaction. This subsurface compaction, similar to the "hardpan" condition typical of agricultural soils, can form a barrier preventing adequate water, air, and nutrient movement.

Getting Specific

To cope with the compaction challenge, turf managers must identify the problem, choose from the method or methods for correcting it, decide on correct timing and frequency of cultivation, and evaluate the results.

Identifying the problem requires accurate evaluation of surface and subsurface conditions using a soil probe or shovel. Make sure the soil is moist, then the note the soil resistance to a soil probe and at what depth in the soil profile the resistance occurs. The greater the resistance, the greater the compaction. Pull out a core or section of the soil. Examine the soil texture and soil color, and identify the depth at which texture and color variations appear. Note root development and rooting patterns. Compare results from several locations throughout the field. Compaction generally will be greatest in high-use areas.

The most common problem on sports fields is the presence of fine-textured soils or soils with significant proportions of silt and/or clay. The finer the soil particle size, the more closely the particles can be forced together or compacted. Layering within the soil profile is another problem. A difference in particle size between layers of 10 percent or greater causes water to thoroughly saturate across the finer layer before passing into the coarser soil layer.

Cultivation methods that cause minimal surface damage can be scheduled into the few "off days" during active play periods, when core cultivation will be too disruptive.

Once the problem is determined, choose the most effective method or methods to correct it. Cultivation may be only part of the solution. Extensive problems could require improved drainage or soil modification. Better traffic and irrigation control may be necessary. Often, a combination of these practices is needed.

Although any tool used to penetrate the soil will cause some compaction, it should relieve more compaction than it causes. Varying cultivation methods, using different types of equipment to different depths, should minimize any compaction from cultivation.

Deep cultivation to relieve subsurface compaction will affect soil conditions through the entire depth cultivated. Overall field water-holding capacity will be increased; infiltration, percolation and drainage will be improved; and deeper rooting will occur. Normal shallow cultivation followed within two weeks with deep cultivation will provide both surface and subsurface improvements and increase the effectiveness of the deep cultivation.

Compare the options available in surface and subsurface cultivation to turf needs.

Consider how much damage will occur and how that damage will affect play. Though hollow tines or spoons cause less compaction around and below the tines than solid tines, they bring soil to the surface. Active turf growth is necessary to reduce recovery time following the cultivation methods that cause severe surface damage. The greater the damage, the less frequently the practice can be used.

Monitor how long the cultivation effects last. When cultivation methods provide long-lasting benefits, a greater degree of turf damage can be tolerated.

Generally, spacing between shallow aeration holes should be 2 to 3 inches. This often means at least three passes in different directions with most aerators is needed.

At what depth in the soil profile does the compaction occur? To be effective, the cultivation method must extend far enough into the soil to act on the problem.

Vibrating or lifting actions such as that produced by the Verti-Drain, Aera-Vator, Shatter-Core, Aerway, and the Yeager-Twose Turf Conditioner loosen the soil.

Other Pivotal Considerations

It's essential that enough moisture be present in the soil to allow satisfactory penetration during cultivation. Very dry soils resist penetration and limit the effectiveness of the procedure. Cultivation methods that cause loosening work best when soil moisture is slightly less than field capacity. This generally means one day after normal irrigation or rainfall. If the soil is too moist, it won't move properly and no loosening (vibration) will occur. Soil moisture should be closer to field capacity for practices that penetrate with minimal loosening, such as vertically operated tines.

Topdressing extends the effectiveness of cultivation. Generally, the longer cultivation holes remain open to the soil surface, the longer-lasting the effect. The benefits of air and water movement are significantly reduced by sealing the holes, even at the soil surface alone. If topdressing does not take place, more frequent cultivation will be need to overcome surface sealing.

Ideally, cultivation timing and frequency would be determined by the needs of the turf. In the "real world," such practices must be scheduled around field use. But choosing cultivation methods in relation to such other factors as soil moisture, turf rooting patterns, existing turf conditions, and pest or other stress problems will maximize the positive effects. For regularly used fields, three cultivations per year (spring, summer, and fall) are probably a minimum. Scheduling in three to seven days for cultivation during mid-season can be very beneficial, particularly later in the season.

Procedures should be matched to the time needed for recovery. Cultivation methods that cause minimal surface damage can be scheduled into the few "off days" during active play periods, when core cultivation will be too disruptive.

Cultivation methods also should be coordinated with turf growth cycles. Actively growing turf recovers more quickly. Unless winter desiccation is a common problem, time one core cultivation of heavily used field just prior to the onset of winter to take advantage of the significant root growth that occurs at lower temperatures.

The benefits of cultivation may be difficult to evaluate in part because multiple procedures are often needed to produce a significant response. Such benefits as improved infiltration and percolation, looser and more penetrable soil, fewer wet and dry areas, deeper rooting, greater turf vigor, and reduced turf stress may also be hard to measure.

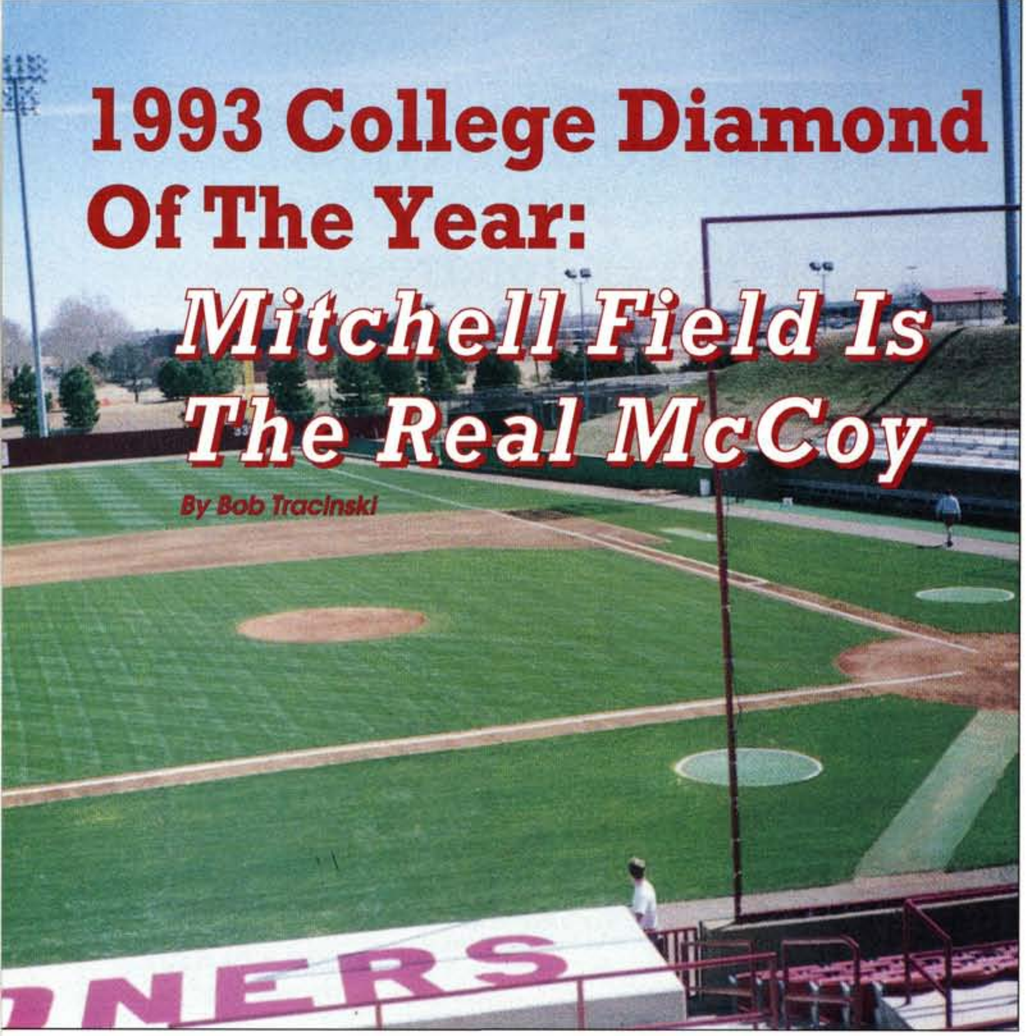
Keep records of the cultivation program throughout the year, and from year to year. Monitor the timing of each method; the play schedule and turf and weather conditions when the procedure occurred and during the follow-up period. Changes in weather patterns or field use from year to year will require adjustments in the cultivation program. Successful sports turf managers understand the constantly changing relationships between grass plants and the soil, and they learn to be flexible. ❑

Editor's Note: As extension turfgrass specialist for the University of Georgia, Dr. Gil Landry provides leadership in the development of statewide programs in turfgrass management. He is immediate past president of the national Sports Turf Managers Association, and has contributed several articles to sportsTURF.

1993 College Diamond Of The Year:

Mitchell Field Is The Real McCoy

By Bob Tracinski



Above: L. Dale Mitchell Field, home of the Oklahoma Sooners baseball team.

Below: Baseball field superintendent Monte McCoy (right) with Sooners head baseball coach Larry Cochell.

What makes a true winner? Is it talent and hard work, a tremendous work ethic and a drive for perfection? Or is it something less obvious, like a simple fear of failure? Perhaps it's all of these things, and *more*.

"Attention to detail is what separates a really good field from a great one," enthuses Monte McCoy, baseball field superintendent at the University of Oklahoma's L. Dale Mitchell Field, the 1993 Beam Clay College Baseball Diamond of the Year. "There's no aspect of the maintenance program that doesn't benefit from tending to the details.

"Field care is basically a lot of hard work," he continues. "You have to know what you want to achieve and have the dedication to keep working toward your goals. There's never a dead period. There's always more that we want to do than we can find time to do. We can see the results of our work and take pride in keeping the facility at the top level, nationwide."

The drive, reflected in the words of McCoy, is a long-standing Oklahoma "Sooner" tradition. It can be found from the school's administration, to its coaching staff, players, and maintenance crew.

Like McCoy, head baseball coach Larry Cochell is a "stickler for details." Under his direction, says McCoy, the grounds crew has become an incredibly detail-oriented group. The entire coaching staff, he adds, including hitting coach Pat Harrison and pitching coach Vernon Ruhle, understand the impact of a superior field on play, and they offer the crew hints, such as developing a major league mound. In turn, they depend on McCoy and his team to keep the diamond in top shape.

"This is the second year for my staff, student assistants Will Herren and Matt Lunnon," says McCoy. "They're dedicated guys, ready and able to put out what's needed to get the job done right. They'll both graduate this year and I'll miss them. The supervisor from the football athletic maintenance division, Don Hatcher, and his staff are also a great help. They've shared their equipment with us and that benefit will be even more important, since the football field is in the process of switching to natural turf. They also see to it that we get help with some of the time-consuming facility upkeep projects like painting the outfield railings and fences."

Yet another "plus" the program realizes comes from consulting agronomist

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Diamond of the Year

continued from page 14

Don Eckroat of Eckroat Seed, based in Oklahoma City.

Always In The Game

McCoy didn't start out in baseball with field maintenance in mind. Baseball, he says, was "the family game," and he played for two years at El Reno Junior College and "walked on" as an Oklahoma University player in the fall of 1989. At that time, his brother Gary, now head coach at Eastern Oklahoma Junior College, was an assistant coach at O.U.

When McCoy was cut from the team the next year, he couldn't stand being away from the game. His brother Gary helped him land a part-time position as student assistance coach, which also included hands-on experience working on the field. Field care, he says, became a passion and he read everything he could find on the subject. He also became active in the Oklahoma Sports Turf Managers Association, and traveled to observe other fields and pick up tips from fellow sports turf managers. In the fall of 1991, he was named baseball field superintendent at O.U.

Though an NCAA ruling that took effect in January of 1993 meant he could no longer coach at the university, McCoy remains active in the coaching arena. His American Legion Team in Norman, OK, placed third in last year's American Legion Baseball World Series in Roseburg, OR. This summer, he'll be head coach of a collegiate summer league team in the Red River College League at Oklahoma City.

Although McCoy will graduate from the university this May with a degree in health science, he intends to stay on as field superintendent.

"I try to keep learning, no matter which side of the field I'm on," he says. "Viewing the field as both a player and coach makes me even more aware of the importance of details as a field superintendent. The little things *do* matter."

On The Field

L. Dale Mitchell Field was completed and dedicated in 1981. Lights were installed in the summer of 1988. Named for former Sooner and major leaguer, L. Dale Mitchell, the $1,270,000 facility was financed by a combination of private donations and athletic department funds. The field is located just south of the University of Oklahoma, Norman campus.

McCoy and his crew pay particular attention to the diamond's skinned areas.

The field is used 10 months of the year, hosting nearly 80 games and the Sooner All-Star Baseball Camps, along with six weeks of fall practice. The university team practice begins in January and play extends through May and "as far as we can go into the College World Series," says McCoy. The Oklahoma High School State Championships and the NAIA District Nine Playoffs move in the first two weeks of May; the Sooner State Games are held the last weekend of June; an American Legion Tournament takes place July 4; the Oklahoma All-State Games are held the last week of July; and various other American Legion games and tournaments are worked into the schedule. Some O.U. players come in for workouts in August, and the field needs to be back in top shape for full-fledged practices in September.

A new infield and foul ground were installed in the summer of 1991, raising the grade of the field and eliminating the low spot "bird baths." Native black top soil was used to create the two-percent grade requested by the coaches. This improved drainage immediately, and it has continued to improve with the addition of washed masonry sand as the infield topdressing material.

During the first week of October, when most students head out for the O.U.-Texas game, the common bermudagrass turf is overseeded with 1,200 pounds of a perennial ryegrass blend of Boardwalk and Elegance. If necessary, the outfield is dethatched prior to overseeding. The seeding rate is 15 pounds per 1,000 square feet in the outfield, a little heavier in the infield. The staff overseeds the outfield in three different directions with a tractor-pulled drill seeder. The infield is covered in four different directions with a walk-behind dethatcher-drill seeder to ensure proper coverage. Following overseeding, the field is topdressed with screened and sterilized masonry sand. A pregerminated seed/quick-drying calcined clay mixture is kept on-hand during the spring playing season to fix any divots or problem areas.

After overseeding, the field is saturated to a 1-inch depth. Following saturation, the seed is kept moist, but not saturated, until the seedlings sprout. The staff then starts irrigating more deeply and less frequently as needed to encourage deeper rooting.

The field is equipped with an 11-station Toro 8000 automatic sprinkler system, which averages four heads per station. The foul ground area uses spider heads to limit "overshooting." The system can be set automatically or handled manually. McCoy can "tie into" the main landscape department via computer to set up his irrigation program when he's off-site.

L. Dale Mitchell Field is fertilized at a 1- to 1 1/2-pound rate with 20-5-10 water soluble, quick-release fertilizer as needed from March to September. Generally, timing is every four weeks during the season — four to six weeks as field activity slows. Starting in 1993, Nutralene, a slow-release fertilizer, was applied in June to help supplement the deficient nitrogen used. McCoy has found that the slow-release fertilizer generates an even, sustained grass growth, producing a steady color response without excessive clippings. They'll continue to use both quick-release water soluble and controlled-release fertilizers.

Soil tests are run three times a year, usually in September, January and May. Additional potash may be added in June, July and August, depending on soil test results.

A water-soluble, high-nitrogen fertilizer is used during the transition period to help cause stress to the perennial ryegrass. This, along with the rising temperatures, will help stimulate the bermudagrass. An 11-11-22 winterizer fertilizer is applied in November, along with lime or sulphur to adjust soil pH if soil test results indicate a need. Ferromec liquid iron supplement is applied prior to major events and two to three weeks after fertilization to provide aesthetic green-up without generating significant top growth.

The field is core aerated in April and June. Cores are dragged, broken, and redistributed with a drag mat pulled by a utility vehicle. For the last two years, the field has been aerated in July with an 8-inch tine spike aerifier. The aerator opens up the soil and fractures the hardpan that develops under the surface as a result of core aerifying. The deep aeration helps water and air reach the root zone, stimulates growth, relieves compaction, and improves percolation.

A preemergent herbicide is applied on or before March 15 to control grassy weeds. Broadleaf weeds and annual coarse grasses are spot-treated as necessary with the post-emergent herbicide Trimec Plus.

During the spring season, the ryegrass is mowed nearly every day, and double cut on game days. The outfield is maintained at a 1 1/2-inch height with a triplex reel rider mower. The infield is cut at 1 1/4-inch with a walk-behind reel mower. Mowing direction is rotated with each mowing from home to third, home to first, and home to second. This rotation keeps the grass growing vertically, combats tire compaction, and gives the field a striking "checkerboard" look.

In May, along with an extra kick of ammonium nitrate, the ryegrass is stressed by cutting back on irrigation and lowering the mowing height to 1 inch in the outfield, and 3/4 to 7/8 inch in the infield. The bermudagrass thrives on the lower mowing height, higher temperatures, and drier conditions. As the bermuda gains strength following the transition, the infield mowing height is moved up to 1 inch.

Every two weeks, the edges are recut between the turf and the skinned areas and between the turf and warning track to keep the bermudagrass looking good within dimensions. After each practice or game, the staff blows the accumulated soil and calcined clay from the edges with a hand-held blower to keep problem lips from forming. This eliminates the "wilt-over" effect on the ryegrass caused by broom treatment of the edges. Two or three times a week, the staff sprays off the edges with a high-pressure water hose.

In the fall of 1991, the existing clay-based skinned area was removed. The renovated skinned area consists of 70 percent topsoil, 20 percent sand, eight percent clay, and a two-percent combination of calcined clay and soil stabilizer. After practice ends in October, 30 to 40 tons of infield mixture is added to the low places on the skinned areas. This is worked into the existing soil, leveled, and then rolled with a 2 1/2-ton vibrating roller. Work begins again on the skinned area during Christmas break, gradually increasing to three times a week, then to every day.

During the season, the skinned areas are scarified and dragged daily. Scarification is done with 6-by-4-foot nail drag pulled behind a utility vehicle. The skinned area is groomed with a 3 1/2-inch-by-6-foot drag mat. Such high-traffic areas as the baselines and base areas are then rolled to ensure proper footing and groomed with a push broom. Once a week, the baselines, mound, and home plate area are sifted with a wire screen to eliminate clods.

The mound and home plate area are worked every day to maintain a smooth, firm, and well conditioned area. Holes in the landing areas are refilled with clay, wetted, and tamped to match the moisture and texture of the surrounding soil. Prior to the 1993 spring season, the staff resurfaced the landing areas of the pitcher's mound and batter's boxes with Beam Clay's pitcher's mound and home plate mixture. This has provided for less maintenance, extremely good footing, and a surface that all the players have preferred.

During the 1993 season, the park extended and lowered the dugouts, extended seating, and added 800 theater seats. On the horizon are 3,000 more seats, a new outfield fence, new locker rooms to serve the home team (allowing the current locker facilities to be used for umpires and visiting teams), new storage buildings, and a players' clubhouse.

"The administration is great to work with," says McCoy. "They understand our needs and try to assist us as much as possible. But as with all universities, there are budget constraints. We're looking forward to the merger of the Big 8 and Southwest Conference as a means to increase the interest and emphasis on the baseball program. Ideally, increased funds will be generated."

True to the Sooner spirit of competition, McCoy and his crew will continue and even improve upon the program and commitment that made L. Dale Mitchell Field the 1993 College Diamond of the Year. ❑

Editor's Note: Bob Tracinski is the manager of public relations for the John Deere Company in Raleight, NC, and public relations chairman for the Sports Turf Managers Association. The Beam Clay Baseball Diamond of the Year Awards are sponsored jointly by Beam Clay, the Sports Turf Managers Association, and sportsTURF Magazine in recognition of excellence and professionalism in maintaining outstanding, safe, and professional-quality diamonds. Winning diamonds are named in professional, college, and school/municipal/park categories.

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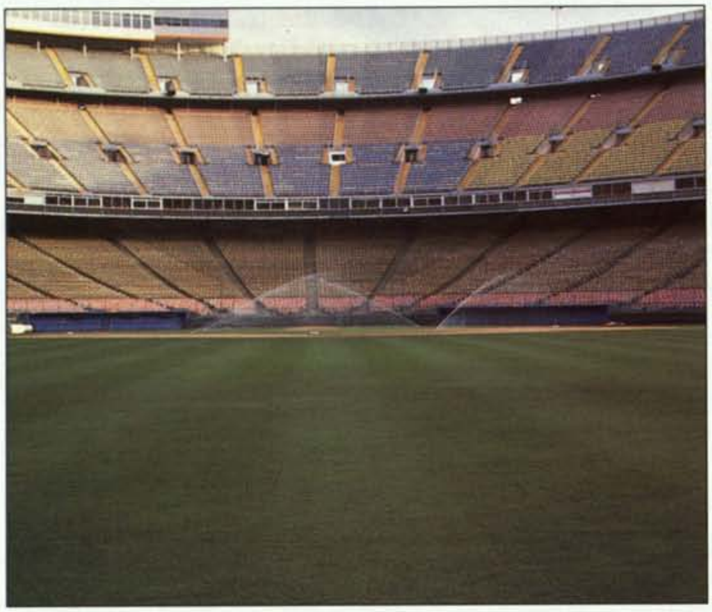
Preventing Insect Outbreaks From The Ground Up

By Mary Owen



Timing of irrigation can make a difference in disease potential and stress on turfgrass plants. Turf under disease pressure is less able to withstand insect injury. Photo of irrigation at Mile High Stadium, Denver, CO, courtesy Hunter Industries.

Compaction poses not only a physical problem, but also a physiological impediment to turfgrass growth, which weakens turf and makes it more susceptible to insect infestation. Photo courtesy: Ransomes America Corporation.

Insect invasion and infestation are unpleasant facts in turf management, especially in the management of athletic fields. A good defense will make the impact of infestation less severe.

Though attacks on turfgrass by insects can seldom be controlled by management techniques alone, some management strategies may manipulate the growth of turfgrass plants so that they become vigorous and hardy, and thus will be less likely to succumb to attack.

What does it take to mount a staunch defense against insect infestation? It takes the knowledge and skill of the athletic field manager working to develop turf with sturdy top growth and a healthy, extensive root system.

Develop A Knowledge Base

The first step in any defense against insect attack is the accumulation of data and development of a knowledge base. What insect pests are likely to attack the grasses growing on the fields? When are these pests likely to appear? When are they likely to do damage? When will they be most vulnerable to control? What is the past history of the fields relative to specific insect infestation, tolerance, or injury?

Assess the present condition of the turf. How dense is it? Has the growth rate been adequate or excessive? How deep and extensive is the root system? Is the turf healthy enough to withstand a low level of insect infestation?

Which turfgrasses are present? How will they withstand an insect attack? Fine-leaved fescues under chinch bug attack are more likely to lose leaf area more quickly than the more wide-bladed Kentucky bluegrasses, perennial ryegrasses, or tall fescues.

How intense is the upcoming schedule of use and play? Will the field be under heavy traffic stress at a time which coincides with a potential insect problem?

Once the situation has been assessed, proceed with the good management practices that make turfgrass plants strong and tough, both above and below ground.

Maintain A Vigorous Root System

Do all you can to stimulate root growth. A sturdy and extensive root system has the ability to pull a stressed turf through a mild infestation, especially of root-damaging insects such as white grubs.

Remember, roots have several functions:

- They absorb mineral nutrients, water, and oxygen.
- They provide anchorage and stability for the turf.
- They serve as a storage sink for carbohydrates, which the leaves and growing points can draw upon for growth and development.

Roots are consumers, not producers. They rely on the green parts of the plant to produce, through photosynthesis, the carbohydrates with which they are nourished, and with which they are able to do work. If top growth is overstimulated through heavy nitrogen fertilization and vigorous watering during periods unfavorable for root growth, the photosynthates will first go to the above-ground growth areas, not to the roots. Root growth will slow, root mass will degenerate, and the result will be green, lush above-ground growth with very little root system. This type of situation makes

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Preventing Insect Outbreaks
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the turf more vulnerable not only to insect damage at a low insect population level, but also to cold, heat, drought and wear injury.

High soil heat weakens roots. Maximum root growth for most cool season turfgrasses occurs in the range of 50 to 65 degrees F. The range for warm season grasses is approximately 75 to 80 degrees F. Above those temperatures, root growth slows dramatically. Roots become brown and spindly, and while many senesce and die, few will be replaced until soil temperatures cool. Spring and fall, when soil temperatures are cool, are optimum times for root growth.

Minimize stress from traffic and wear. Distribute traffic on a field, or from field to field, whenever possible to alleviate stress on grass plants, including the crown and the roots.

Correct compaction by core aeration. This provides the benefits of increased rooting, improved air and water penetration, and stimulation of microorganisms, which help decompose thatch.

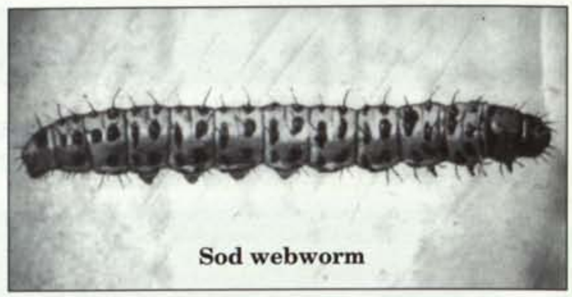
Compacted soil is a physically hostile place for root growth. When soil is compacted, the amount of soil solids per unit volume increases, the amount of water present remains the same and the amount of pore space — air space — is reduced. This limits oxygen uptake by the plant, as most oxygen is absorbed via the roots. When compacted soils are irrigated, the oxygen level in the soil can take up to 10 times as long to return to normal as in non-compacted soil.

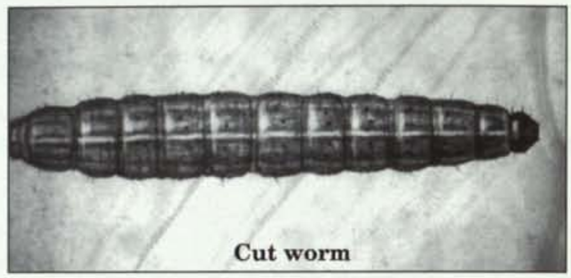
When soil oxygen levels are reduced, nitrogen, phosphorous, and potassium uptake are likewise reduced. Therefore, compaction poses not only a physical, but also a physiological impediment to turfgrass growth.

Keep Fertility Balanced

A properly nourished plant will be able to withstand a heavier infestation than a poorly nourished or overstimulated one. Provide for adequate fertility based on soil testing. Make applications at a rate and frequency to maintain quality and encourage recovery from stress, but not to push above-ground growth excessively. When fertilization after stress, especially during hot weather, is necessary, use a fertilizer containing a high percent of water insoluble nitrogen, so that the nutrient will be slowly available to the plant.


Chinch bug


Sod webworm


Cut worm

Pay particular attention to balanced pH and to potassium nutrition. Potassium not only encourages rooting, but also increases drought, cold, heat, and wear tolerance.

Irrigate With Care

Water properly and judiciously. Improper watering, whether inadequate or excessive, can restrict root growth and development.

Timing of irrigation can make a difference in disease potential and stress on turfgrass plants. Fungal diseases are intensified by extended periods of leaf wetness. Irrigation should be timed so as not to extend leaf wetness. Except in periods of very hot, humid weather, water in the late evening or very early (pre-dawn) morning. If turf is under disease pressure, then it will be less able to withstand insect injury.

Turf experiencing a grub problem of low- to medium-intensity can be pulled through in some cases by watering and low levels of fertilization. If roots are encouraged, and the root system is replacing roots at a rapid pace, then the level of grub population will have less adverse impact.

Manage Thatch

While a small amount of thatch provides resiliency to a turf surface, too much will impede rooting. Besides restricting water and pesticide movement, thatch provides a hiding place for insects such as chinch bugs or sod webworm. Though thatch itself will not cause an insect outbreak, it provides them with a competitive advantage.

Mow Precisely

Mow at the highest height possible for the grass present and the intended use. Raising the mowing height and decreasing the frequency of cut will reduce stress on the plant, conserve carbohydrates, and minimize damage to roots. Do not mow, or mow as little as possible, when turf is under heat stress.

Overseeding Helps

If leaf-damaging insects have been a problem, overseed with an endophytic cultivar of a turfgrass suitable to the site. There several cultivars of perennial ryegrasses, tall fescues, and fine fescues which contain these beneficial fungi. Endophytes impart resistance to leaf-feeding insects such as billbug, chinch bug, sod webworm, and aphid.

Vigilance Pays

Establish a regular scouting program to watch for potential problems. Key in on areas that have historically had problems. Begin to look for soil-inhabiting and crown- and leaf-damaging insects before their expected appearance. If the weather "throws a curve," you'll be ready. Weather extremes can affect pest emergence, egg laying and hatch, larval and nymphal development, as well as feeding behavior. Keep records of weather data, pest occurrence, and other observations.

Train a crew member or two who are on the fields regularly in simple scouting techniques. Build time for scouting into your weekly routine. Learn to recognize damage early, before turf is damaged beyond repair.

Determine the threshold of damage the