recalls. "But I knew it would work. Coach George Seifert (of the 49ers) said the field that day was the best he'd seen it all year."

**Lowdown on Long Sod**

Installing sod in ultra-long lengths isn't necessarily a "new" technique, but it is gaining popularity, particularly in situations with tight deadlines. The Cleveland Browns used a Cygnet Turf installation system — employing rolls 45 to 90 feet long — to resod its five practice fields in Berea, OH. At Joe Robbie Stadium in Miami, FL, turf manager Allen Siegwardt "went long" to install the new baseball diamond for the Florida Marlins.

Long-roll sod installation begins at the sod farm, where the sod is mechanically harvested by a special machine in long rolls. Where the average 4-by-4-foot square of sod would likely be cut 1/2- to 3/4-inch thick, long rolls of sod can be as much as 2 inches thick.

The specific thickness of sod cut long for a given situation depends on the installation objectives (stability, installation speed, etc.), the soil in which the sod was grown and the conditions of the installation site. Sod grown in a clay soil, for example, may be cut thinner than sod grown in a sandy soil.

Once harvested and transported to the site, the sod is laid by a specially designed machine. The device simply rolls the sod onto the field. Since the long rolls of sod are extremely heavy, laying them accurately *the first time* is crucial. When laying sod in long rolls, Toma actually overlaps the rows from 6 inches to 1 foot, and then returns to cut it accurately.

**Remember the Basics**

Whether the lengths of sod you install are 4 or 40 feet, the fundamentals of sod installation do not change. Failure to prepare and amend the soil, lay the sod in a timely matter, keep the sod moist during installation, and so on, practically invites future problems. Here's a few of the basics to keep in mind in *any* sod installation:

• Selection: Several types of sod may grow in a given area. Choosing the right one requires a basic knowledge of what's available — and what works — as well as a review of the physical characteristics (sun, shade, wind, soil profile, etc.) of the installation site itself. A soil test prior to selection, so that you can match the sod you choose to something grown on the farm in a similar soil, is a good idea. Sod farms, existing sports turf facilities in your area and the National Turfgrass Evaluation Program can be excellent sources of information.

• Soil Preparation: You could probably keep sod alive on concrete if you watered and fertilized it correctly. However, it's safe to say it wouldn't root. A soil test will indicate what the soil needs in terms of nutrients and amendments. Soil preparation also includes rotary tilling to a depth of 6 inches when applicable, breaking up large clods, rolling, and removing debris.

• Installation: Sod is a living plant under stress — the stress of having its roots recently severed. Allowing it to sit on a palette in the hot sun any longer than it has to is a serious mistake. Be ready to go when the sod arrives. On particularly hot or windy days, be prepared to cover the unlaid sod with moist burlap or sprinkle it with water.

Begin installing sod along the longest straight line, such as a fence. Butt and push the edges against each other tightly without stretching and avoid overlaps

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## The Long and the Short of Sod Installation

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or gaps. Joints should be staggered in each row in a brick-like pattern. Edges and corners should be knife-trimmed. Avoid leaving small strips on the outer edge, as they will not retain moisture.

To avoid creating indentations or air pockets, don't repeatedly walk or kneel on the sod as you're installing it. Rolling the entire area after sodding is complete will improve sod-to-soil contact and remove any air pockets.

• Irrigation: Immediately after sod installation, apply an inch of water. The turf should be kept moist until the sod is firmly rooted. That means irrigating daily, perhaps several times a day, depending on the weather. Hot, dry, windy conditions will necessitate more irrigation. Also, keep in mind that turf near structures will dry out faster than turf in other areas. Once the turf is rooted, reduce irrigation frequency while increasing irrigation duration. This will encourage deep rooting.

Installed in long or short lengths, sodding is quickest way to get any field ready for play. It is also the most expensive. Attention to detail today helps keeps athletic fields growing into the future. ❑

*Editor's note: Additional sod information can be obtained through the American Sod Producers Association in Rolling Meadows, IL at (708) 705-9898. The address for the National Turfgrass Evaluation Program is: NTEP, Agricultural Research Center West, Building 001, Room 333, Beltsville, MD 20705.*

## DATE SET FOR SEMINAR ON ATHLETIC-FIELD CARE

The Penn State Cooperative Extension department will hold a seminar on proper athletic-field care June 25 at McConnellsburg High School in McConnellsburg, PA.

The intent of the seminar is to teach high school maintenance staffs, youth leagues and community recreation volunteers how to grow and maintain high-quality turf for their playing fields. Various speakers will discuss the components of good turf development: grass selection, design and construction, soil drainage techniques and customized maintenance programs. The $5 advanced registration fee includes a box lunch.

For more information, call (717) 485-4111.

## RAIN BIRD NAMES GOLF SALESMAN OF THE YEAR

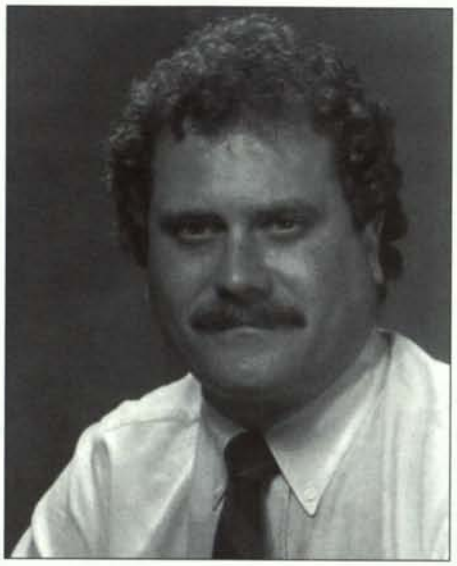
Mark Pena of Wolf Creek Company Inc., in Trotwood, OH, was named 1992 Golf Salesman of the Year by the Golf Divison of Rain Bird Sales Inc. at its awards banquet during the GCSAA Annual Conference and Trade Show in Anaheim, CA.

Pena has more than six years experience in the golf irrigation industry. At Wolf Creek, Pena is responsible for golf sales and marketing for the state of Ohio; he is also involved with irrigation design. Prior to joining Wolf Creek, Pena worked for the Jacobson company.

## NOR-AM AWARDS SCHOLARSHIP

NOR-AM Chemical Company has awarded a scholarship to Cale A. Bigelow, a turf management student at Virginia Polytechnic Institute. NOR-AM scholarships are based on a student's scholastic ability, personal integrity and professed interest in turfgrass management.

## PETE GIAUQUE JOINS SUNBELT SEEDS



Pete Giauque, an experienced veteran in turfgrass management, has joined Sunbelt Seeds Inc. as an agronomist and sales representative. His primary responsibility will be golf course, landscape and lawn care seed sales throughout the Southeast.

Giauque has held positions in the research, development and technical support departments at Chemlawn and has experience in golf course management. He has also held sales positions at nursery, plant materials and sod-producing organizations.

## TWO SUCCESSFUL SPRAY TECHNICIAN SEMINARS PROMPT THIRD

Two Georgia Golf Course Superintendent Association (GGCSA) spray technician seminars May 15 at the Standard Club in Duluth and the Doublegate Country Club in Albany, which hosted nearly 200 association members and golf course employees, have drawn overwhelming requests for a third.

Speakers included members of the University of Georgia faculty, Georgia golf course superintendents, and employees from Turf Care Products, Toro, Spraying Systems, ICI/Zeneca and DowElanco.

The third seminar will be held June 28 at The Landings in Savannah, GA. For more information, contact Karen White, GGCSA executive director, at (706) 769-4076.

# *Turfgrass Renovation:* Measures for Success

**Verticutters should be set so their blades penetrate completely through the thatch layer and at least 1/4-inch into the underlying soil. Blade-spacing depends on the species of turfgrass involved.**
**Photo courtesy: Ransomes America Corporation.**

*By John Wildmon*

In common usage, the term "renovation" is applied to everything from remodeling athletic facilities to restoring old homes. By definition, renovation means "to reinvigorate, refresh, or revive." Turfgrass renovation is a process of improving the turfgrass by measures extraordinary to normal maintenance procedures but short of removing the existing grass and replanting. However, before beginning turf renovation it's important to determine what caused the existing grass to decline and if enough of the desirable species remains to make renovation practical.

Any number of maladies can afflict turfgrasses to the point of needing renovation. In the case of home lawns, for example, the most common problem is improper mowing. Homeowners typically mow too low and too infrequently and fail to sharpen their mower blades on a regular basis. Other home lawn problems that lead to renovation include improper irrigation, mistakes with fertilizers and pesticides, and buried construction scrap.

With professionally installed and managed turf, the problems tend to be more complex. Turfgrass can deteriorate due to excessive thatch, tree root invasion, inadequate light, pest invasion, excessive traffic, adverse soil properties (high soluble salts, low pH, etc.) or adverse soil properties such as compaction and layering. Often a combination of the problems previously mentioned is involved. Whatever caused the turfgrass to decline must be determined and corrected or the renovation will probably fail for the same reason.

## Find the Source of Trouble

Discerning the cause of turfgrass problems is tricky and can be done in light of past history of the turf, as well as current observations. A soil probe is very useful in evaluating rooting depth and soil physical conditions. Correct diagnosis and subsequent soil amendments may also require a soil test. The soil probe can be used to pull soil plugs for visual observations as well as subsequent lab analysis. Plugs should be pulled at random from the entire area. Spots that are not

indicative of the general condition of the soil should be avoided. For example, it would not be appropriate to pull samples near road beds or in localized wet spots. Plugs should be pulled to a depth of about 6 inches and the top and bottom 1 inch removed.

Fifteen to 25 plugs are usually sufficient. The plugs should be spread out and allowed to air dry, screened using a piece of fiberglass house screen, and thoroughly mixed prior to submitting them for lab analysis. Phosphorus and potassium fertility and pH should be adjusted based on lab recommendations.

Determining a renovation's feasibility requires a thorough assessment of the site. Virtually any turfgrass can be renovated. However, renovation is not always the best choice. If the turfgrass is too thin or severe physical or chemical problems exist in the soil, complete removal and replanting may be more cost-effective and give better results. As a rule of thumb, renovation should not be attempted unless about 60 percent of the area is covered by the desirable species. However, with vigorous, stoloniferous and rhizomatous species such as bermudagrass or creeping bentgrass, successful renovation is possible with stands that are somewhat thinner. It is also possible to renovate thinner stands with seeded turfgrass varieties by reseeding as part of the renovation process. Soil problems that may limit successful renovation include: severe layering, exceedingly poor drainage, excessive soluble salts, or buildup of toxic chemicals in the surface layer.

### Tools for Correction

Once it has been determined that renovation is practical and existing problems have been determined and corrected, the renovation process can begin. Note that some problems, such as excessive thatch, will be corrected in the renovation process and may require prior attention. Of course, renovation should always be done during the growing season and should not be attempted during periods of severe turfgrass stress.

It will be necessary to eradicate existing weeds prior to beginning actual renovation. This can be accomplished either by spot-spraying with a non-selective herbicide or a broadcast application of selective herbicide. In either case, an herbicide should be selected which either has soil activity or translocates via the phloem (i.e., systemic herbicide) to facilitate destroying underground parts of perennial weeds. Some situations may require more than one application of herbicide. Thus, herbicide treatments will typically need to begin one to three weeks prior to renovation.

The exact method of weed control will depend on the species of weeds present, the extent of the weed problem and the herbicides selected, and should be decided on a case-by-case basis. Help in selecting the appropriate herbicides is generally available through state cooperative extension services.

The first step in renovation is assembling the appropriate equipment. This arsenal should include:

- Pickup or stake-body truck with high sides for hauling debris.
- Heavy-duty vertical mower for thatch removal.
- Heavy-duty rotary mower for scalping.
- Brush-type sweep for removing debris.
- Turf vacuum (optional) for removing finer debris and mat.

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## Turfgrass Renovation

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- Hollow tine aerifier (optional) for core cultivation.
- Steel drag mat or broom-type drag for working in topdressing and seed.
- Leaf rakes, brooms and pitchforks for clean-up.
- Disc seeder (optional) if reseeding is planned.
- Two- to 3-inch plugging tool (optional) for transplanting plugs from healthy areas.
- Irrigation marking flags or stakes to mark obstructions.

### Process Sequence

Begin by marking all obstructions, such as hose bibs, sprinklers, electrical outlets and valve boxes, with the marking flags. This will help prevent site damage as well as damage to the renovation equipment. The turfgrass should then be scalped. This accomplished by mowing at a height 30 to 50 percent lower than the current height of cut.

Ideally a mower with baskets or a bagging attachment should be used to facilitate catching clippings. Scalping is followed by heavy verticutting. The verticutter should be set so the blades penetrate completely through the thatch layer and at least 1/4-inch into the underlying soil. Blade spacing depends on the species of turfgrass involved. In general, longer internodes require wider blade spacings. Recommendations for verticutter blade spacings for various turfgrass species are as follows:

**As a rule of thumb, renovation should not be attempted unless about 60 percent of the area is covered by the desirable species.**

- One to 3 inches — Bermudagrass, creeping bentgrass, zoysiagrass, red fescue, bahiagrass, centipedegrass.
- Two to 3 inches — Kentucky bluegrass, St. Augustinegrass, carpetgrass.
- Three inches — Tall fescue.

After verticutting, surface debris should be removed using the sweeper. In heavily thatched turfgrasses, it may be necessary to verticut a second time. Debris should be removed prior to the second verticutting to prevent clogging and drag on the equipment.

The second verticutting should be oriented at a right angle to the direction of the first verticutting. Debris should be removed again using the sweeper after the second verticutting. Follow the sweeper with a turfgrass vacuum to remove fine mat if possible. On bunch grasses, or grasses that have stolons only, take care not to remove too much of the verdure. Enough vegetative material must remain to facilitate the recovery of the turf. Grasses with underground rhizomes can be scalped and verticut much more vigorously and still recover in a reasonable period of time. Be prepared, and prepare the customer for brown "unthrifty" turf immediately after the renovation.

Coring (aerification) is an optional next step. This step should definitely be included if a compaction or surface-layering problems exist. If severe thatch problems exists, the cores should be

removed. If most of the cores consist of desirable topsoil, they should be allowed to dry, broken up and scattered over the surface using a steel drag mat. If the cores resist breaking up with a drag mat, they can be scattered with the verticutter reset to skim the surface of the turf.

Lime and fertilizer should be applied prior to topdressing or dragging in aerifier cores. This helps get the lime and phosphorous down into the soil profile. Rates should be based on soil test results. If soil test results are not available, apply 2 pounds of phosphorus and 1 pound of nitrogen and potassium per 1,000 square feet. Approximately one-half of the nitrogen and potassium should be from a slow-release source, such as a sulfur or resin-coated product. Determine if the soil is acidic using pH paper or a homeowner-type pH kit. Apply dolomite lime to acidic sites at 50 pounds per 1,000 square feet for sand soils or 100 pounds per 1,000 square feet for finer texture soils such as loams or clays.

Topdressing is an essential next step. It smooths the surface, helps digest remaining thatch and stimulates new growth. Approximately 0.75 cubic yards of topdressing should be applied per 1,000 square feet. This will provide a layer approximately 1/4-inch thick. If aerifier cores are removed, an additional 2 to 3 cubic yards of topdressing per 1,000 square feet, depending on tine size and spacing, will be required to fill the aerifier holes.

Topdressing material should be sterile to prevent introduction of weeds and other pests and pathogens. It should be similar in texture to the existing soil to prevent layering problems and screened to remove foreign matter such as stones.

Topdressing should also be allowed to dry after application and then dragged or broomed into the surface. If cores are not removed, topdressing and cores can be dragged simultaneously. If additional seed is required, it may be applied immediately after topdressing and dragged or broomed in with the material. Alternatively, seed can be planted at this time without using a disk seeder.

Any large areas that are very thin, completely bare or devoid of desirable turfgrass, will require replanting. This should be accomplished by stripping these areas and following normal establishment procedures. Potentially, these areas can be plugged from areas that have healthy stands.

**Aftercare**

When necessary replanting is complete, the entire area should be treated like a new planting. Many renovations fail due to improper post-renovation care. Newly renovated turf is weakened, open and prone to becoming hydrophobic. Light, frequent irrigation, 0.1 inches applied two or three times a day, will be necessary on dry, hot days. Irrigation frequency can be gradually decreased to normal as the turfgrass becomes re-established. An application of 0.5 pounds of water-soluble nitrogen per 1,000 square feet, approximately two weeks after renovation, will also help speed the recovery process. Judicious monitoring for insects of diseases will also be necessary because of the conditions created by high-fertility and frequent irrigation.

Renovation works! Properly planned and executed, it's a cost-effective alternative to replanting when possible. The keys are careful evaluation and taking the process one step at a time. ❑

*Editor's note: John Wildmon is an instructor at Lake City Community College in Lake City, FL.*

# Water Feature Quality:
# Using All the Tools

**Top: Aquashade dye for early-season plant-growth control is applied by pouring it in along the shoreline. Photo courtesy: Applied Biochemists Inc.**

**Bottom: Two 2-1/2-horsepower, high-volume, flow-fountain vertical aerators in action in a park lake. Photo courtesy: Aqua-Master.**

A body in motion tends to stay in motion. A body at rest, tends to stay at rest." That's one of the cornerstones of thermodynamics, a branch of physics dealing with the conversion of energy. Yet when it comes to biological aspects of lakes and ponds, pivotal features in many parks and golf courses, that's not entirely correct. Left unattended, flat, peaceful water features will move considerably in terms of biological growth. Neglected, a soothing body of water, once a source of public enjoyment, can become an odious eyesore, full of algae and other weeds.

Like turf, lakes and ponds have balanced ecosystems. And, like turf, problems begin when that balance is upset. Fortunately, there are a number of tools that can be used to correct these problems. Getting them in place before a problem occurs is crucial, as is understanding how they begin in the first place.

**Constant Battle**

Consider the daily life cycle of the average park lake. In the early morning hours before sunrise, water oxygen levels are critically low. Aquatic plants stop photosynthesis after sunset and won't begin the process again until sunrise. In a balanced pond, there is sufficient oxygen to support aquatic life, such as various species of fish and plants.

Thermal stratification in lakes and ponds in the summer is common, especially if the body of water is shallow. The aerobic (epiliminion) layer of water at the surface of the feature is warmest and contains the most oxygen. Such conditions are ripe for algal blooms. Algal blooms, in turn, block sunlight from penetrating the lake or pond surface, which kills beneficial aquatic plants. These plants contribute to oxygen levels in the water.

At the bottom of the water feature is an anaerobic or hypoliminion layer of water. This cold layer has little oxygen. Dead fish and plants fall to the pond floor to decompose and further deplete the oxygen in the water. In addition, the resulting organic matter is filled with toxic gases, such as methane and hydrogen sulfide that rise to surface and produce that "rotten egg" smell.

Nutrients released from the pond floor also rise to the surface, triggering blooms of blue-green algae. The thick algae is not just unpleasant to look at — it can cause major clogging problems if the body of water in question is an irrigation source.

Ponds and lakes that are oxygen-deficient for extended periods and rich in plant and nutrient materials are defined as "eutrophic." Bringing a eutrophic body of water back to health can be accomplished through means such as aquatic herbicides, mechanical harvesters, plant-eating fish, dyes and mechanical aerators. Often, especially in cases where a pond or lake has been "let go," it may require a combination of these tools to get the job done.

**Aeration Systems**

Driven by wind, waves and rain, aeration of ponds and lakes occurs naturally to a certain degree. Wind whipping oxygen into the water surface sends this aerated water downward. As the aerated water moves down, it forces the deep layers of oxygen-deficient water to the surface where it is replenished.

Mechanical aeration systems give nature a hand. Types of mechanical aeration systems include: vertical, horizontal and diffused air injection.

• Vertical Aerators — As their name implies, vertical aerators throw water into the air "vertically." Although all fountains provide some water aeration, only vertical aerators provide significant aeration. They employ a pump to pull water from lower levels and send it shooting into the air. The water absorbs oxygen as it sprays into the air and creates wave action as it splashes back to the lake or pond surface. This oxygenates the water even further.

Sizes of vertical aerators vary widely and can create a number of water displays. Height and width of the water displays hinges on the size of the pump and the motor. How many aerators a given body of water requires depends on the size, shape and depth of the body of water in question. Aerator manufacturers will gladly offer assistance in this area.

A number of vertical aerator manufacturers make lighting kits for their prod-

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## Water Feature Quality

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ucts, which add a dimension of evening brilliance. Many units also have timers, which means they can be set to start and stop at predesignated times.

• Horizontal Aerators — Horizontal aerators circulate water *below* the lake or pond surface. They usually float on the surface and remain in one location or circulate a specific area.

These units employ a submerged propeller to send aerated water to lower levels. This oxygenated stream of water helps break up stratification by sending oxygenated water to the bottom and low-oxygen water to the surface. This keeps nutrients in suspension and oxygen-rich water throughout the water feature. Aerobic bacteria and algae thrive in these conditions. They feed on nutrients and, in the process, help prevent algae blooms.

The angle of the propeller and the size of the motor determine how deeply the unit circulates the water. As a general rule, the larger the motor, the more water the propeller will move. These units are sometimes available with camouflage covers, which enable them to blend into their surroundings and discourage vandalism.

As with vertical aerators, the pond and lake size, shape and depth will determine how many aerators are necessary to provide adequate aeration.

• Diffused Air Injection — Diffused air systems use tubes, placed at the lake or pond floor, through which air is pumped by an on-shore compressor. Emitters along the tubing break up the air stream into different bubble sizes. The larger the bubbles, the more surface disturbance will occur.

As the bubbles from the emitters rise to the surface they oxygenate the water. The rising air also helps circulate the water and decreases stratification.

For uniform aeration, the length and spacing of the tubing and size of the compressor must be specifically designed for the pond in question. The operation cost of these systems depends on the size and depth of the body of water. The deeper it is, the more power it will take to send air upward.

Ozonation is a variation on diffused air injection. Instead of simply injecting air though underground tubing, the system adds ozone. Ozone gas is a powerful oxidant. Its $0_3$ configuration readily breaks down into $0_2$, which we know as oxygen and oxygen radical, which easily bonds with other ions. This means ozone can oxidize many organic and inorganic components.

### Best Defense

Regardless of the type of aeration system you select, the key is to get it in place before the water quality becomes a problem. The restorative powers of these systems is impressive; however, restoration takes time.

Knowledgeable distributors can help you select a system — often they'll come on-site to examine your water feature. If not, make sure you know the feature's surface area, depth and rough shape so they have a few specifics on which to base their recommendations. (A diagram of the pond or lake will help.) And, of course, you must determine what will fit within your budget.

In water quality in lakes and ponds, your best defense is a strong offense. Paying attention to it now could make it the least of your worries later. ❑