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*Consult your operator's manual for safety instructions when mowing hills.

Drought-tolerant varieties

■ Select grasses according to the nature of the area to be covered, water availability and effect desired. For any of the lawn grasses to produce an aesthetically pleasing turf, supplemental water must be applied. Generally, grasses should be considered high water requirement plants, but drought tolerant turfgrasses are becoming increasingly available.

Here are National Turfgrass Evaluation Program (NTEP) ratings of various commercially-available varieties, grouped by cultivars. These are the highest ratings in each group of trials, with no statistical differences evident. Please note that most ratings are based on limited site evaluations. All are from NTEP 1992 progress reports.

BUFFALOGRASS (wilting)		Morning Star.....8.0	Merit.....4.0
315.....9.0		Navaho.....8.0	Opal.....4.0
609.....9.0		Quickstart.....8.0	Ram-1.....4.0
Bison.....9.0		Target.....8.0	
Buffalawn.....9.0		Topeka.....8.0	KENTUCKY BLUEGRASS
NE 84-378.....9.0		Prizm.....8.0	MEDIUM-HIGH MAINT.
Sharps Improved.....9.0			(dormancy)
BUFFALOGRASS (dormancy)		KENTUCKY BLUEGRASS MEDIUM-HIGH MAINT. (wilting)	Barzan.....5.0
609.....8.2		Eagleton.....8.7	Glade.....5.0
Texoka.....7.8		Barmax.....8.3	Ronde.....5.0
315.....7.2		Monopoly.....8.3	Indigo.....4.7
Plains.....7.2		Silvia.....8.3	Marquis.....4.7
Bison.....7.0		A-34.....8.0	Merit.....4.7
Sharps Improved.....7.0		Indigo.....8.0	Viva.....4.7
		Blacksburg.....7.7	KENTUCKY BLUEGRASS
PERENNIAL RYE (dormancy)		Challenger.....7.7	LOW MAINTENANCE
Nighthawk.....8.7		Classic.....7.7	(recovery)
Patriot II.....8.7		Freedom.....7.7	Monopoly.....6.3
Pebble Beach.....8.7		Nustar.....7.7	Banjo.....5.0
Sherwood.....8.7		Preakness.....7.7	Alene.....4.7
Affinity.....8.3		Suffolk.....7.7	S. Dakota Cert.....4.7
Envy.....8.3			Barzan.....4.7
Stallion Select.....8.3		KENTUCKY BLUEGRASS LOW MAINTENANCE (dormancy)	Kenblue.....4.3
Accolade.....8.0		Fortuna.....5.0	Nustar.....4.3
Achiever.....8.0		Voyager.....5.0	TALL FESCUE
Advent.....8.0		Merion.....4.7	(recovery)
Barrage.....8.0		Unique.....4.7	Hubbard 87.....6.3
Caliente.....8.0		Banjo.....4.3	Phoenix.....6.0
Brightstar.....8.0		Amazon.....4.0	Adventure.....5.7
Competitor.....8.0		Barzan.....4.0	Chieftain.....5.7
Cutter.....8.0		Bronco.....4.0	Guardian.....5.7
Gator.....8.0		Chelsea.....4.0	Jaguar II.....5.7
Goalie.....8.0		Destiny.....4.0	Monarch.....5.7
			Sundance.....5.7
			Willamette.....5.7
			Winchester.....5.7

Athletic field soil is a key to avoiding injuries

by Henry Indyk, Ph.D.

■ Consider athletic field soil conditions from two major perspectives: the best possible growth situation for the turf, and the basis for player safety.

For optimum turf growth, soil conditions must be suitable from both chemical and physical standpoints.

Chemical conditions include pH, nutrient status, level of salt concentration and contaminants.

Physical conditions include soil texture, infiltration and percolation, drainage, and susceptibility to compaction. From the standpoint of safety, add field grade and contour, evenness or levelness, existence of

depressions, and undesirable debris. **Modified topsoil root zone mix. A 10-inch layer is spread over the subgrade showing one of the drainage lines.**

depressions, and undesirable debris.

Assessing conditions—Know what's wrong before you take any action. Soil conditions must be assessed to analyze existing situations properly. This must be done by someone with knowledge and background in soils, someone who knows what to look

for and how to judge conditions accurately.

A great deal can be determined by visual observation during a site visit: physical conditions including soil texture, drainage, levelness, contour, grade, depressions, percentage of debris and existing turf condi-

continued on page 34





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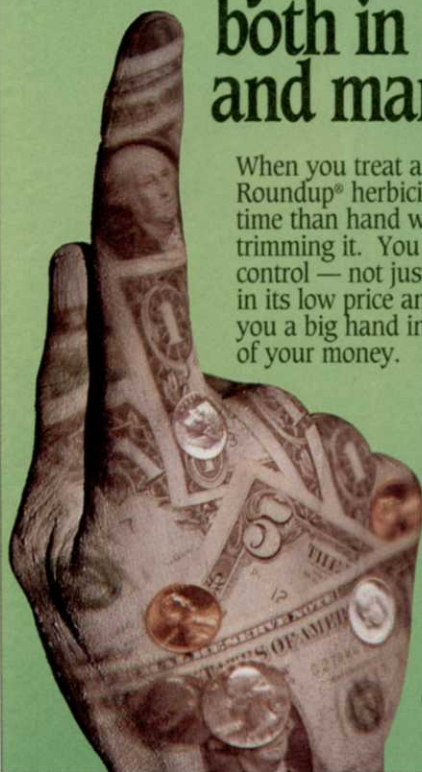


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ATHLETIC SOIL from page 32

tions (density, evenness and vigor). Even hardness can be determined to some degree, though for best accuracy a physical measurement of hardness can be taken with an impact machine.

The site visit includes soil sampling for a laboratory quantitative assessment of chemical and physical characteristics. Take soil samples according to field variability, pulling some samples from each area with variations. From 10 to 20 samples should be taken. Gather them with a soil sample tool to a depth of at least six inches.

Combine and thoroughly mix the collected samples in a clean container. By testing the samples together, rather than testing each sample individually, results will reveal a composite of the entire field.

Send air-dried samples to a qualified, reputable laboratory for chemical testing and physical analysis.

Chemical testing should include levels for soil acidity (pH) and the major nutrients of phosphorus and potassium, and calcium and magnesium. If the field is in an area where micronutrients are normally deficient, test for these also.

Physical analysis should include mechanical analysis for sand, silt and clay proportions. This will help predict the ability of the soil to infiltrate and percolate water, its drainage characteristics, water-holding capacity, and its compaction susceptibility. Information gained from this analysis can be fortified with other laboratory determinations, such as sand

fractionation, bulk density and percolation rate.

Visual assessment and lab test results combined provide useful information on the existing status of the field.

Corrective procedures—It's vital to know what the soil profile conditions should be for the growth and support of a dense, vigorous and healthy natural turf sports playing surface in order to determine what needs to be done to get there.

Corrections in the chemical area will be based on the results of the laboratory analysis and are generally issued in prescription form by the lab. For example, use v amount of x material to alter the y level by z amount.

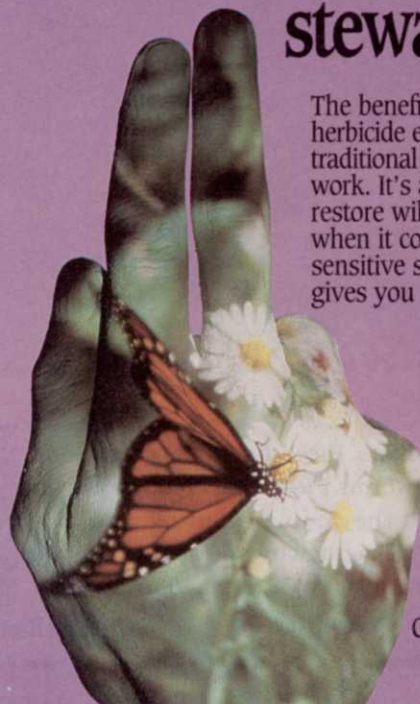
The proper pH levels for favorable turfgrass growth range between 6.0 and 7.0 with 6.5 being ideal. High pH—alkaline conditions—require acidifying; low pH—acidic conditions—must be neutralized. Sulphur compounds correct alkaline conditions; lime corrects acidity. The farther pH levels range from the ideal, the harder it will be to correct pH conditions for the proper establishment and maintenance of turfgrasses.

Lab prescriptions also spell out the amount and type of corrective materials to be applied according to specific nutrient deficiency levels.

In spite of pH and nutrient levels, high salts or other contaminants can affect turf growth. Contaminants may be due to misapplication of chemicals, or the result of leaks or spills. Excess salts may also come from contaminants. They may build up in coastal regions when areas are inundated with brackish water during flooding. In the Southwest, natural salt levels may be great enough that salt crusts appear on the soil surface.

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range (1.0 mm) down to the fine range (0.25 mm). Little—10 percent or less—of the sand should be in the range above very coarse or below very fine.

Depending on available sand sources, silica sand is preferred to calcareous sand, which normally carries a high pH.

Drainage problems—One can go through all the steps of rebuilding the soil, doing everything ideally, so that the soils are chemically and physically on target, grade the field, sod or seed, and have the field look beautiful until the first big rain. Then problems may appear: what happened with all of the expended energy and cost in rebuilding the soil?

Modification of the upper layer of soil, no matter how great the depth, is not the solution to a drainage problem unless the subsoil is such that it allows drainage, which is a rare solution. Essentially, what is above the subsoil, with good physical characteristics that allow percolation and infiltration, is then impeded by the subsoil barrier which causes water to back up.

An internal soil drainage system is needed to correct subsoil drainage problems, allowing the modified field media to function properly.

Rebuilding the soil requires "in depth" homework. Know what you have, where you want to go, and what you need to get there—and test every step of the way.

—Dr. Henry Indyk is turfgrass agronomist for Turfcon, the professional consultation branch of The Greenway Group, Horsham, Pa. He was extension specialist with Rutgers for 30 years. Indyk is secretary of the national Sports Turf

Salt concentration is measured easily with a conductivity test. Using water to leach out excess salts can be a long, time-consuming process. The water to be used also must be tested for salt levels. Gypsum can be used to accelerate the leaching process. In some cases where high salt levels exist, it may be necessary to replace existing soils. The new soils must be tested also, before changes are made.

Though a visual assessment gives a qualitative analysis of physical conditions (the sand:silt:clay ratio), it should always be backed up with a laboratory mechanical analysis to establish quantitative proportions. In addition to this mechanical analysis, a sieve analysis, also known as a sand fractionation analysis, should be conducted.

The sieve test separates and grades sand particles by specific sizes: very coarse, coarse, medium, fine and very fine. If the sand component is predominantly in the fine/very fine range, the small particles can fit together so closely that the sand functions more like silt and clay and their restriction on the rapid infiltration and percolation of water required for suitable athletic field soils.

Corrective procedures to improve filtration, percolation rates and compaction resistance require soil modification to change the physical make-up of the soils. To be effective, these modifications must incorporate the right amount of the right quality of sand. The critical factor is testing of the sand for particle size, pH, and salt index prior to use. There's no point bringing in sand that has problems of its own.

Stipulate sand fractions with 90 percent in the coarse

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GOLF 'SCAPING

Flowers add COLOR CLOUT

The best arrangements add excitement and reflect the mood and colors in the surrounding landscape.

by Steve & Suz Trusty

■ Flowers add something extra to high visibility areas on the golf course.

Traditionally, the most flower-intensive spot on a course has been the clubhouse entrance.

Thereafter, most of the course is trimmed in shades of green, with grasses and trees or native vegetation that form the backdrop for the rough areas.

Rob Sawyer is principal of Land Concern, Limited, Santa Ana, Calif., which concentrates on marketing and merchandising solutions for residential areas. According to Sawyer, colorful focal elements and visual relief from color add to

the golfers' day, and to the players' estimation of course maintenance.

Some planting tips:

- Plant most flowers in areas where golfers tend to spend most of their time. Such a time/space relationship gives you the chance to strengthen the message that the course is well-managed and aesthetically pleasing.

- The strongest focal points are around the tee box, about 200 yards out from the tee and around the green.

- Other flower bed locations could be key spots on the cart path, but not along the fairways and other areas golfers merely "pass by."

- In tournament or outing play, there is usually a staging area. By need, there's a great deal of hardscaping in this location to accommodate the cart lineup. However, attention to detail and some added beauty



The area surrounding the tee box is one of the strongest focal points on the entire golf course.



Combine annuals and ornamental grasses for an exotic and colorful impression.

will pay off if players spend an hour in that area as they wait for play to begin.

- Players may also spend 20-30 minutes at the food service area after the first nine, perhaps more than at the clubhouse.

- Finally, there's the cart drop-off area. Depending on the crowd, people may spend more time there than any other spot on the course. The last impression of the course shouldn't be of washed-down carts and battery chargers.

- Golfers come to the course seeking a break from the day's routine. They're enthusiastic, they want to get to the game.

Bright, intense colors arranged in structured, flowing patterns mirror and enhance that mood. As play winds down around the 17th and 18th holes, soft colors and less-structured, more carefree designs add to the sense of relaxation, making the round of golf a more satisfying experience.

Remember, flowers can clash with each other just like a poorly chosen wardrobe. Mariam Tate, owner of Mariam Tate Co.,

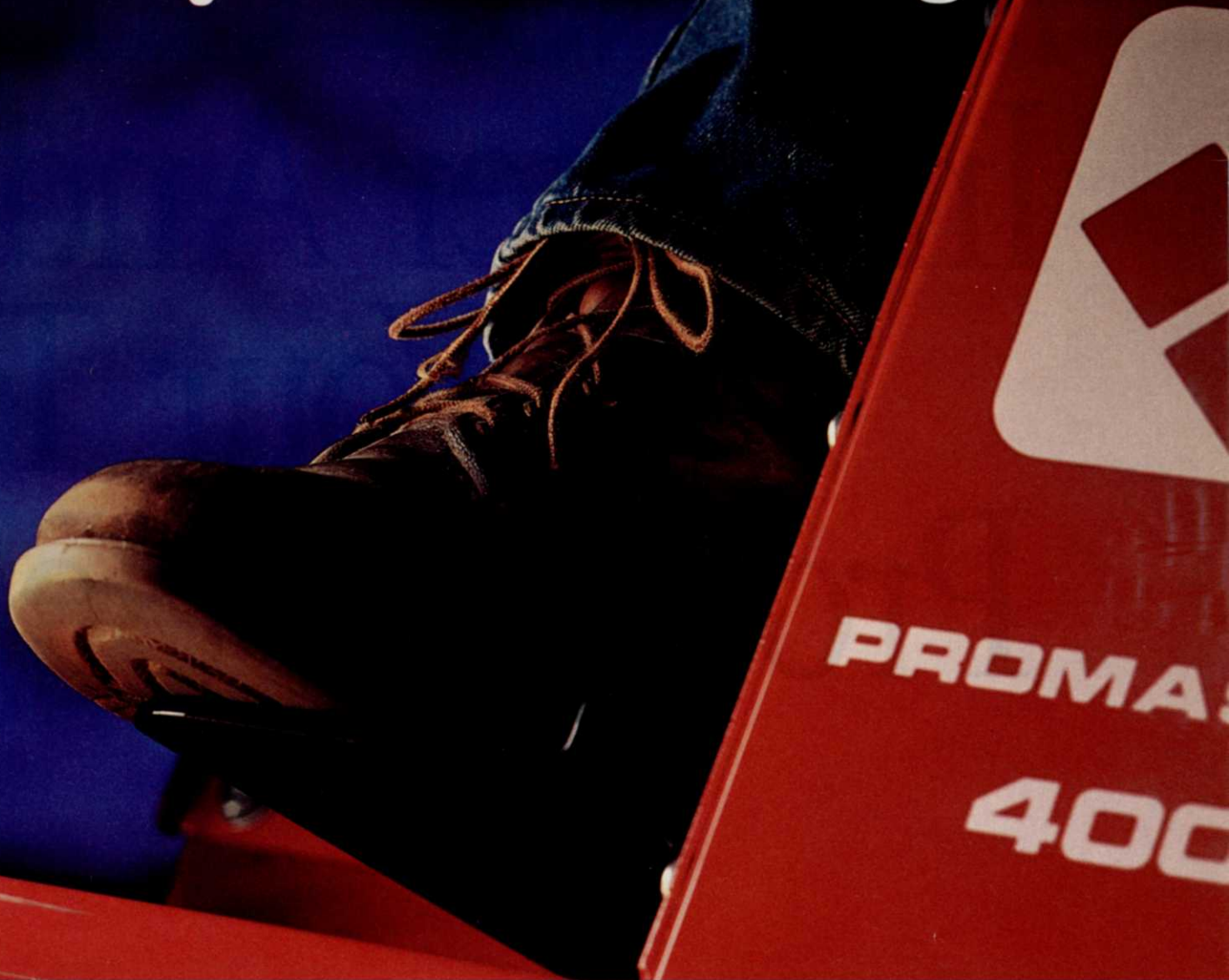
continued on page 40

ELSEWHERE

Exclusive survey confirms color use, page 40

Planting, culture of selected annuals, page 42

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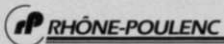
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COLOR from p.36

an architectural color consultant firm in Irvine, Calif., says some flowers are too bright, too stimulating for the surroundings.

Tate is also a member of The Color Marketing Group, an international, non-profit association of design and color professionals, located in Alexandria, Va. She suggests:

- Dusky purples, car-amels and reds will pick up the sunset, any nearby rock outcroppings and evening shadows of a mountain view.

- For coastal areas, consider copying the colors of the water, the sunrise, the beach sand and rocks.

- Courses in the Southwest may use

the desert as master palette. There, the colors are many: sunrise and sunset; bright blossoms; subtle, cool colors from the sand, native cactus and sage brush.

- Sawyer stresses seasonal color as well as annual hues. Seasonal color with perennials and flowering shrubs can generate favorable impressions with less maintenance.

- Don't forget green. Build on shades of green, layering hues of light and dark, or using variations in the blue-green or yellow-green palette. Use perennials with variegated leaves, and add tones of white, yellow, pink or red.

Annuals, of course, are high maintenance choices, and may need lots of water,

depending on the varieties chosen.

Plant annuals where care can be provided easily and economically. Borders of annuals around—or in—a portion of permanent beds may make for a good mix.

Try red and white petunias by the clubhouse, deep pink impatiens by the ninth hole turn. But change them the next year.

For a final lesson, play your course or a neighboring one. Where does the course look weak? What views and combinations are most striking? Take notes—photos if you can—and use them for guidance.

—The authors are freelance writers specializing in the horticultural field. They work out of their office in Council Bluffs, Iowa.

LM survey says flowers more popular than ever at nation's golf courses

One super-intendent LM talked to says he buys 200 to 300 flats each year at a cost of between \$6 and \$7 per flat.

■ It's no longer unusual to find flowers in and around the nation's golf courses. Virtually all the golf course superintendents—97.8 percent, actually—surveyed by LANDSCAPE MANAGEMENT magazine admit to having them on their courses.

Most—nine out of 10—use annual flowers in the clubhouse area, but annuals are becoming more popular at various other points on the course itself.

For instance, about 60 percent (of the 93 supers we surveyed at the GCSAA's last national conference) feature annuals around tees. Almost half use them between holes, and nearly one-fourth have them around greens.

Roland White of Bald Peak Country Club in Melvin Village, N.H., could have been one of the first superintendents to feature flowers on his course. He started planting them 19 years ago and now has "beds all around the course."

"Overall, there's less maintenance, once you've got the beds in shape," White reports. "We treat them every spring with Eptam

and find we have very few weeds."

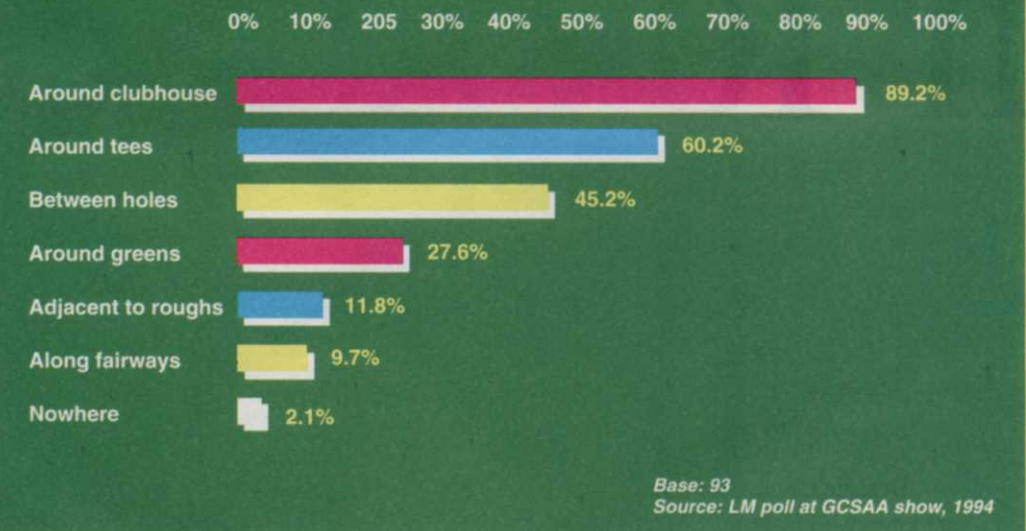
White hires two women to tend the flowers and flower beds around the clubhouse—one his wife—during the summer. They work 24 to 36 hours each.

"We put the flowers where they can be seen, in front of our stone walls, around boulders—but we don't have mass plantings," White says. "They go real well here in New Hampshire."

Among the more popular annuals are marigolds, impatiens, snapdragons, periwinkle and salvia. Each species is specific to the types and amounts of soil, fertility, light and water required.

There have been flowers on display at Franklin Hills Country Club, Franklin, Mich. since **Tom Lawrence** has been there—five years. This year, he's switching to more annuals after a season with more perennials.

PERCENT OF GOLF COURSES USING ANNUAL COLOR, BY LOCATION



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