UNIVERSITY OF CALIFORNIA, RIVERSIDE TURFGRASS RESEARCH PROGRAM

Better Turf Thru Agronomics

UCRTRAC Newsletter, March 1997

UCR's New Putting Green Traffic Simulator Facilitates Fine-Tuning Research Results and Recommendations

The new apparatus provides uniform, reliable data on putting green wear and tear caused by metal cleats or alternate-spiked shoes under high, moderate, or low traffic conditions.

UCR's new putting green traffic simulator, affectionately known as the "blue beast," has its first off-station job at the Desert Horizons Country Club in Indian Wells.

The metal-cleated simulator, which mimics the punishment that golf shoes deliver to turf, yields uniform data for quantifying wear traffic patterns. The apparatus was unveiled at the UCR Turfgrass Research Advisory Committee semi-annual meeting in December 1996.

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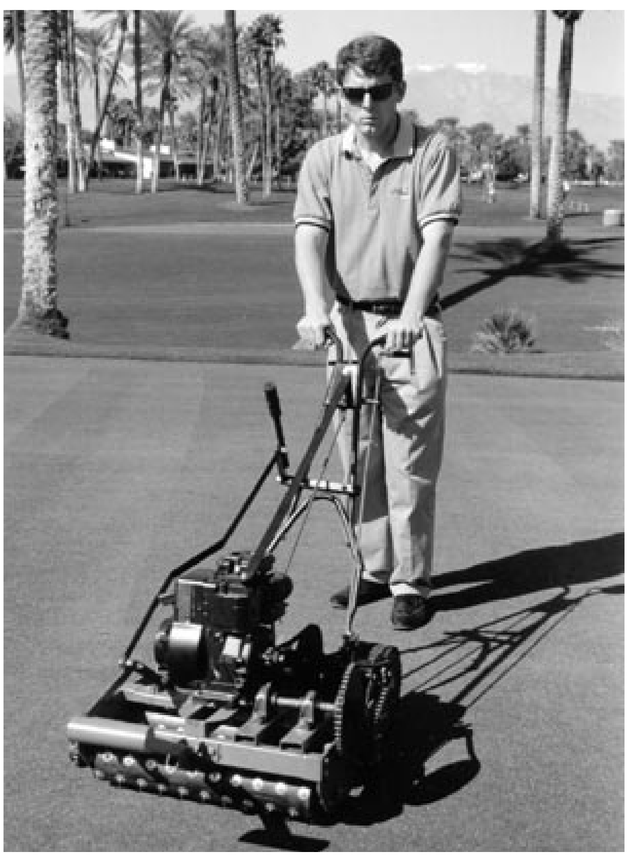

UCR's new putting green traffic simulator is being used by Jess Evans to apply uniform wear patterns on an overseeded bermudagrass putting green at Desert Horizons Country Club in Indian Wells.

New Simulator Mimics Metal Spikes or Alternate Spikes

The new putting green traffic simulator can yield uniform turf wear data for metal-spiked or alternate-spiked shoes, depending on the apparatus' configuration, said **Steve Cockerham**, UCR Superintendent of Agricultural Operations.

Alternate-spiked shoes, which have small plastic cleats for traction, rather than steel spikes, are gaining in popularity among golfers and golf courses.

"We designed the apparatus initially to mimic the destruction caused by metal-spiked shoes, but it can be modified easily to mimic alternate-spiked shoes," Cockerham said.

Larry Gilhuly, Western Region Director of the USGA's Green Section, recently computed the number of spike marks left behind in the turf after one month of 200 rounds of golf/day -- 61,776,000! Gilhuly calls golf spikes the "metallic mashers of monocots" in his recent article in the *USGA Green Section Record* (Sept./Oct. 1996 issue).

Seminal research a decade ago on golf shoes and their relative destructiveness to putting green turf by the UCR Turfgrass Research Program determined that spikeless shoes caused low turf damage in comparison to metal-spiked shoes. (See "Golf Shoe Study II" by UCR's Vic Gibeault and Vic Youngner, and the National Director of the USGA's Green Section, William Bengeyfield in the Sept./Oct. 1983 *USGA Green Section Record*.)

Nitrogen Transport and Fate: Key Factors in Fertilization Program

Understanding nitrogen fate is essential to developing an environment-friendly fertilization program that nourishes turf appearance and recuperative ability. Fate studies show that turf acts like a "sponge," soaking up applied nitrogen, said **Vic Gibeault**, Extension Environmental Horticulturist. Nitrogen (N) is the nutrient supplied most often and in the largest amount by turf managers.

Most N applied to turf usually stays in the 'turf system.' Fertilizer N applied to a dense, mature, and well-maintained turf sward is normally used rapidly by turf and its associated soil microbes. Analysis of N in turf clippings, verdure, thatch, and soil show that the 'system' is dynamic due to the high level of surface organic matter and microbes involved in N cycling associated with turf, he said.

Nitrate (NO_3^-)

- Many fertilizers deliver N as NO_3^-. Mineralization/nitrification of organic N yields NO_3^-.
- NO_3^- is not bound to soil or organic colloids. It moves with soil water to plant roots where absorption occurs. NO_3^- can be taken up by turf and other plant roots. NO_3^- causes concern because it can move off-site via runoff and leaching into surface or ground waters. However, in mature turf systems, which act like sponges, little risk of downward NO_3^- movement below the root zone (leaching) occurs. When immature turf grows on pure sand, leaching can occur.
- Low N rates or slow-release sources should be used on sand or very leachable soils.
- After fertilization, avoid runoff to protect surface water from contamination.
- Apply fertilizer when NO_3^- levels are expected to be low, when turf roots can use the nutrient.
- **Avoid overirrigation after fertilization.** In saturated soils, soil microbes reduce NO_3^- to nitrous oxide (N_2O) gas and elemental N (N_2) gas, which are both subject to volatilization losses.

Ammonium (NH_4^+)

- Turf and other plant roots can also absorb NH_4^+, but it is often bound to soil particle surfaces and cannot move as easily to roots as NO_3^-. Soil microbes can convert NH_4^+ to NO_3^-.
- **"Water-in" fertilizer immediately after application.** NH_4^+ is mineralized rapidly to gaseous ammonia (NH_3) and lost via volatilization, unless it dissolves quickly in water. Gaseous loss of N can be minimized to about 1% if fertilizer is watered-in.

SIMULATOR
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Since cleat traffic can affect the competitive relationship among turf species, the simulator is being employed to provide uniform, representative wear over the entire test plot for evaluating the effect of fall renovation practices on the spring transition back to bermudagrass from an overseeded perennial rye-*Poa trivialis* mixture at the Desert Horizons Country Club.

"The new putting green traffic simulator facilitates fine-tuning our cultural practice recommendations. Since the amount of play influences how much punishment cleats deliver to turf, accounting for the traffic variable is critical to making recommendations that fit real golf course needs," said **Robert Green**, UCR Turfgrass Research Agronomist.

Depending on the number of passes per week, the simulator can deliver low, moderate, or high traffic to mimic the playing conditions on any golf course. Most university putting green research does not have traffic on it, unless a practice putting green doubles as a research plot, Green said.

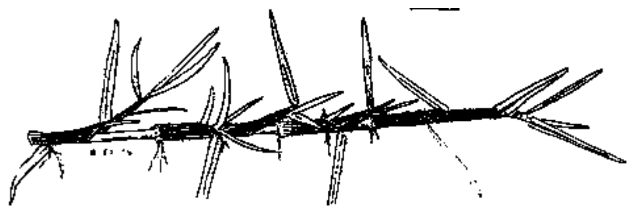
At Desert Horizons Country Club, **Lane Stave**, Superintendent, and his staff are applying the traffic treatments and determining the number of passes per week that resemble the metal-cleated golf traffic on their course. Stave and his staff recently named the simulator the "blue beast."

The simulator was designed by **Steve Cockerham**, Superintendent, UCR Agricultural Operations, and commissioned by Green. It was built using the frame of a walk-behind mower.

The Hi-Lo Desert Golf Course Superintendents Association is sponsoring Green's research at Desert Horizons Country Club.

Tall Fescue Is More Effective Than Perennial Ryegrass in Resisting Kikuyugrass Invasion

New tall fescue cultivars can slow or eliminate the penetration of kikuyugrass into established turf. They are more effective than perennial ryegrass in resisting kikuyugrass, as measured by cover, stolon spread, length, and biomass.



KIKUYUGRASS *Pennisetum clandestinum*
Drawing courtesy of Tom Yutani

Growing the new tall fescue cultivars next to stands of kikuyugrass should slow or eliminate the penetration of kikuyugrass into established turf swards, say UC Cooperative Extension Weed Specialists **Clyde Elmore** and **Dave Cudney** and UC Cooperative Extension Environmental Horticulturist **Vic Gibeault** in an upcoming issue of *Weed Technology*.

Parks, school grounds, and home landscapes, where fine turf is not needed and kikuyugrass is viewed as a weed, can take advantage of the results of the three recent UC studies, which document that tall fescue (*Festuca arundinacea*) is more effective than perennial ryegrass (*Lolium perenne*) in resisting kikuyugrass (*Pennisetum clandestinum*) invasion.

• Study 1: Kikuyugrass Suppression After Overseeding With Cool-Season Turf

Overseeding established kikuyugrass swards with tall fescue or perennial ryegrass reduced kikuyugrass cover. Doubling the overseeding rate from 10 to 20 lb/1000 ft^2 improved ryegrass establishment, but not that of tall fescue; however, one year after overseeding with tall fescue at a rate of 10 lb/1000 ft^2, it reduced kikuyugrass more effectively than perennial ryegrass when ryegrass was overseeded at (a) the same rate (10 lb/1000 ft^2) and (b) double the rate (20 lb/1000 ft^2).

• Study 2: Evaluation of Kikuyugrass Plug Establishment in Cool-Season Turf

Kikuyugrass plugs (10-cm) were planted into experimental plots of established perennial ryegrass (‘Derby’, ‘Manhattan II,’ ‘Gator,’ ‘Reppel’) and established tall fescue (‘Fawn,’ ‘Olympic,’ and ‘Falcon’). Irrigation was supplied with sprinklers at 75% ETo for perennial ryegrass. Fertilizer was applied monthly using a commercial 15-15-15 formulation for a total annual nitrogen (N) application of 6 lb N/1000 ft^2.

Fifteen months after the study was established, kikuyugrass growth and invasion were evaluated by counting stolons outside the 10-cm plug, measuring the length of each stolon (stolon spread), and drying and weighing shoot and root biomass.

"When all ryegrasses were compared to all tall fescue cultivars, the tall fescue cultivars were more effective in reducing the percentage of kikuyugrass cover, stolon spread, and biomass," Elmore, Gibeault, and Cudney wrote.

• Study 3: Resistance to Kikuyugrass Plug Establishment in Cool-Season Turf

Results in Study 3 were similar to Study 2. When kikuyugrass plugs were introduced into established tall fescue (‘Fawn,’ ‘Olympic,’ or ‘Bonsai’) or perennial ryegrass turf (‘Linn,’ ‘Manhattan II,’ or ‘Reppel’), tall fescue reduced the invasion of kikuyugrass stolons more effectively than perennial ryegrass. Tall fescue significantly reduced the number and length of kikuyugrass stolons and their biomass compared to perennial ryegrass.

“Stolons of kikuyugrass were able to penetrate the perennial ryegrass stand and were found under the perennial ryegrass and at greater lengths from the original plug than the stolons within the tall fescue cultivars. This may be due to the dense turf formed from the tall fescue; whereas, the perennial ryegrass cultivars produced a more open turf allowing stolon penetration,” concluded Elmore, Gibeault, and Cudney.

The newer turf-type tall fescue cultivars, ‘Bonsai,’ ‘Falcon,’ and ‘Olympic’ produced a dense, vigorous turf that suppressed kikuyugrass and were more effective than the older ‘Fawn’ cultivar.

Irrigation and fertilization treatments in Study 3 were identical to Study 2.

Buffalograss -- A Promising Drought-Resistant Turf for California

UC scientists are vegetatively propagating buffalograss, developing new cultivars, and testing their performance for use as low-input, low-maintenance, drought-resistant turf.

Buffalograss (*Buchloe dactyloides*), the oldest, warm-season native grass of the North American Great Plains, holds promise as a drought-resistant, low-input, low-maintenance turf for California, but several obstacles need to be overcome.

Extended winter dormancy causes loss of color, and a relatively open growth habit encourages weed invasion. Such inferior traits require improvement. But due to buffalograss' drought tolerance, low nutritional requirements, and short growth stature, its potential for use as a low-maintenance turf is drawing increasing attention.

UC researchers are participating in the National Turfgrass Evaluation Program (NTEP) studies to assess the performance of commercial and experimental buffalograsses. During the past century, buffalograss has been used primarily as forage, and, thus, is at the beginning stages of improvement for turf.

Sex expression is inconsistent in buffalograss, which makes breeding and selection challenging. Buffalograss is primarily dioecious, with separate male and female plants; however, monoecious plants (separate male and female flowers on one plant) do occur. On some monoecious plants, certain flowers are hermaphroditic (both male and female organs in one flower). Sex expression of individual plants often varies between years and locations, complicating the breeding process.

Breeding projects throughout the country are focusing on developing turf-type cultivars suitable for a range of climatic and use conditions. UC breeders are selecting vegetatively propagated varieties so that uniform cultivars can be made available to the public. Mowing encourages increased vegetative reproduction by male plants, in contrast to female plants, said **Lin Wu**, Professor, Department of Environmental Horticulture, UC Davis.

At UC, scientists found that cool temperatures, low light, and high nitrogen favors male sex expression in monoecious forms. Conversely, warm temperatures, high light, and low nitrogen favored female sex expression. Among natural buffalograss populations, the frequency of monoecious plants was negatively correlated with stand density.

Harvesting seeds from female plants or female flowers of monoecious plants is difficult because seedheads are borne near the ground and shatter. Burrs on seeds produced by female plants contain an oil that inhibits germination. Seeds produced by hermaphroditic flowers lack burr structures and dormancy and do not shatter.

UC Scientists Release Two Buffalograss Cultivars; Continue Performance Tests

'Highlight 25' and 'Highlight 15' released by UC rank among the best.

.Scientists at UC Davis and the Bay Area Research and Extension Center (BAREC) have vegetatively propagated buffalograsses and recently released two cultivars, 'Highlight 15' and 'Highlight 25'. Both are drought- and heat-resistant female clones mass selected for rapid growth, high density, and extended winter green color.

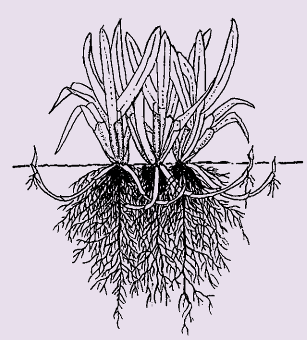
Stolons, sprigs, and plugs were used for asexual reproduction. Cultivars were field-tested at UC Davis and at BAREC in Santa Clara.

Both UC releases are distinguished by their fine texture, high turf density, rapid stolon spreading rate, competitive growth, short height, improved winter green color, short winter dormancy, spring turf quality, drought tolerance, low maintenance requirements, and improved turf performance, said **Ali Harivandi**, Extension Environmental Horticulture Advisor, San Francisco Bay Region.

The UC releases and 20 other buffalograss cultivars supplied by the National Turfgrass Evaluation Program are currently undergoing performance testing.

None have produced the deep green color of most turf-type tall fescues and Kentucky bluegrasses. All cultivars lost color during the winter and went dormant.

"If long winter dormancy is not an issue in a given situation, then several top performers, including the UC releases, could provide a low-input, low-maintenance, and moderate visual quality alternative to high maintenance, manicured lawns," Harivandi said.



Better Turf Thru Agronomics is prepared for the delegates and membership of UCRTRAC. The intent is to present summaries of turfgrass research results and topical information of interest to the Southern California turfgrass industries. The newsletter is edited by Vic Gibeault and Deborah Silva and designed by Brad Rowe, UCR Publications.