

Better Turf Thru Agronomics



UCRTRAC Newsletter, December 2002

Turf Protects the Environment, Benefits Health

What do you do for a living? I grow grass.

“That’s the way a Cooperative Extension colleague used to introduce his vocation when he wanted to tell a mixed group about the benefits of turf. Turf researchers, educators, and green industry leaders do need to communicate the benefits of turf in the California landscape. Our clientele continue to make decisions that impact the industry and the citizens of our state. We have factual evidence to defend the claim that turf protects soil and water resources and improves the quality of urban and suburban life,” says **Vic Gibeault**, UCRTRAC delegate and Extension Environmental Horticulturist.

Too often, turf is thought of as an attractive lawn or golf course amenity that guzzles scarce water resources. It’s not a valid assessment. Turf reduces runoff and soil erosion, protects groundwater and surface water quality, is linked to decomposition of polluting organic chemicals, dissipates heat, gives cushioning against injuries, and reduces stress, benefiting human health, Gibeault said.

“Turf has a multifaceted story that we need to tell. The scientific research findings in the literature are compelling,” Gibeault said.

Please see *Turf Benefits*, page 3

<http://ucrturf.ucr.edu> — UCR Turfgrass Research Program Launches Meaty Website

The UCR Turfgrass Research Program has unveiled its new website: <http://ucrturf.ucr.edu> It’s loaded with meaty information strategically organized for turf professionals and the general public.

- **UCR TURF Home Page**
- **General Information**
- **Research Projects**
- **Reports and Technical Issues**
- **Research Conference/Field Day**
- **UCRTRAC**
- **Publications**
- **Turf Links**
- **Search**

“We have designed the UCR Turf website as a multi-linked, user-friendly communication vehicle that provides a clearinghouse of pertinent, accurate information for the turf industry, university researchers, government agencies, and the general public interested in turf issues, such as water conservation and quality,” said **Robert Green**, UCR Turfgrass Research Agronomist.

Research Projects

Five categories of ongoing and recently completed research projects are featured with thumbnails and more complete summaries of results:

- (1) Water Use Efficiency
- (2) New Turf Development and Establishment
- (3) Chemical and Fertilizer Environmental Impacts
- (4) Unbiased Product Testing
- (5) Sports Turf Management

Turf Links

Important legislation, memoranda, and statistics impacting the turf industries in Southern California are available on the UCR Turf website via its links. Water-related websites are featured. Multiple links to the websites of California state government agencies, turfgrass industry associations, and university research centers are offered.

Please see <http://ucrturf.ucr.edu>, page 2

Key Points: Turf Benefits Checklist

Soil and Water Resources

- Turf protects groundwater quality and improves recharge.
- Turf reduces surface water runoff and protects surface water quality.
- Turf reduces soil erosion and stabilizes polluting dust.
- The turf-soil ecosystem entraps and biodegrades polluting organic chemicals.
- Turf accelerates restoration of disturbed soils.
- Turf provides flood control.

Other Functional Benefits

- Turf saves energy in urban areas. Turf dissipates heat, reducing energy required to cool nearby homes and commercial buildings.
- Turf abates noise and reduces glare.
- Mowed turf decreases disease-carrying pests (mosquitoes, ticks) and snakes in the landscape.
- Mowed turf produces few, if any, flowers and allergy-linked pollens.
- Well-managed turf can reduce the fire hazard of homes and buildings near canyons, brush, and wooded areas.
- Well-maintained turf and landscaping increase property values.

Recreational Benefits

- Turf provides high-quality cushioning against impact injuries in amateur and professional sports.
- Turf is a low-cost, durable, smooth surface for play and relaxation during outdoor leisure activities.

Aesthetics & Health Benefits

- Well-maintained turf and natural scenery have positive therapeutic effects, as measured by heart rate and blood pressure.
- Green turf enhances landscape attractiveness.

Included are pertinent UC systemwide Agriculture and Natural Resources websites, UCR websites, and websites of other university-based turf research and education programs in the United States and Canada. Links are provided to websites of professional societies, associations, and organizations based in California, nationwide, and internationally and to other resources, such as CIMIS (California Irrigation Management and Information System).

Reports on Topical Issues. The website includes reports about TMDLs (total maximum daily loads) and Clean Water Act enforcement, turfgrass fertilization, and trends in the turfgrass industries. Many more reports will be added.

Publications. Links are offered to publications associated with the UCR Turfgrass Research Program, including *Better Turf Thru Agronomics*, *California Turfgrass Culture*, and *Proceedings of the UCR Turfgrass and Landscape Research Conference and Field Day* (1995-present).

UCRTRAC. The University of California, Riverside Turfgrass Research Advisory Committee (UCRTRAC), consisting of UCR and 10 turf industry partners (golf, sod, and general turf interests), was established in 1996 to form an industry-wide linkage between UCR and the turfgrass industries in Southern California. Links to the websites of each UCRTRAC member organization (Southern California Golf Association, California Golf Course Superintendents Association [GCSA], San Diego GCSA, Hi-Lo Desert GCSA, CGSA of Southern California, California Sod Producers Association, Southern California Section, Professional Golfers Association, Southern California Turfgrass Council, Southern California Turfgrass Foundation, UCR, and United States Golf Association) are offered in this section of the website.

The **UCRTRAC Annual Research Summary Reports** are on the website. A cumulative index of *Better Turf Thru Agronomics* newsletter articles from 1996 to the present, keyed to 11 areas of research and education needs identified by UCRTRAC delegates, facilitates searching for articles of interest.

UCR TURF Home Page. This section provides turfgrass management information for homeowners, including links to several UC websites, publications, and programs that offer lawn care information, such as the website of the California Master Gardener Program, a statewide volunteer program of UC Cooperative Extension whereby the UC extends research-based information in home horticulture and pest management, verified by UC experts, to Californians. The home page also offers links to educational programs, seminars, and workshops for those interested in obtaining turfgrass-related college degrees, certificates, and continuing education credits (CECs).

General Information. This section provides general information about the UCR Turfgrass Research Program, including facilities, research focus, and outreach activities.

Research Conference and Field Day. This annual event, sponsored by the UCR Turfgrass Research Program, is featured in this section of the website.

Search. A search of the entire UCR Turf website, powered by Google, is available.

UCR Staff Research Associate **Grant Klein** is the UCR Turf webmaster. The website is overseen by **Robert Green**, UCR Turfgrass Research Agronomist, and **Vic Gibeault**, UCR Cooperative Extension Environmental Horticulturist.

Turf Growth Response Under Restricted Light

When baseball is played on natural turf, leaves are sheared and stems are left intact, presenting a manageable recovery problem, but Bank One Ballpark in Phoenix, home of the Arizona Diamondbacks, introduced new, tough variables in the late 1990s: The turf had to grow, recuperate, and look attractive under the dome of a retractable roof, despite limited light, air conditioning, and punishment from cleats.

Designers planned the ballpark for the comfort of fans in the torrid south west, not to benefit the major league baseball playing surface, making an exciting sports turf research challenge, said **Steve Cockerham**, UCRTRAC delegate and Superintendent of UCR's Agricultural Operations.

Typically, each major league baseball game does not produce excessive traffic, but pre-game activities – batting and infield practice and workouts by the opposing teams— can put some stress on the turf, he said.

Researchable Questions.

Turf was known to have decreased density and softer stems under low irradiance, so Cockerham and his UCR Turf team expected to recommend modifying standard sports turf cultural practices to ensure optimal performance under intermittent days and hours of closed-roof shade (low light), unusual wind velocities (air conditioning), abrupt changes in temperature, and cleat traffic.

Cockerham designed experiments to determine the turf of choice. (See *Better Turf Thru Agronomics*, *Putting Turf in a Retractable-Roof Baseball Stadium for the First Time – A Novel Challenge*, Nov. '96.)

Once the best sports turf for the site was determined (the newly patented 'De Anza' zoysiagrass, a UCR release), the mowing height that would yield optimal performance had to be established. The best management practices (BMPs) for nitrogen (N) fertilization were unknown for these environmental conditions. Minimum light thresholds of turf species used for baseball were also unknown. Was it efficacious to supplement the restricted sunlight with artificial light? If so, with what type of light source? Three UCR Turf studies are summarized.

N and Mowing Height. Under limited light conditions, 'De Anza' zoysiagrass withstood scuffing injury

Please see *Low Light*, page 3



Soil Erosion Control and Dust Stabilization

Turf protects nonrenewable soil resources from water and wind erosion. Turf's high shoot density and root mass stabilize surface soil, preventing erosion. Mowed turfgrasses are estimated to have shoot densities ranging from 75 million to greater than 20 billion shoots per hectare. During storms, turf's high biomass matrix provides resistance to lateral surface water flow, which slows otherwise potentially erosive water velocities. Quality turfgrass stands modify the overland process of water flow so that runoff is insignificant in all but the most intense rainfall events.

Perennial turfgrasses offer one of the most cost-effective methods to control water and wind erosion of soil, reducing dust and mud problems around homes, schools, factories, and businesses.

Turf can function as vegetative filter strips that greatly reduce the sediment transported into surface streams and rivers, especially when positioned down slope from cropland, mines, and animal production facilities. The reduction in sediment movement not only protects soil resources, but it also reduces sediment-linked nonpoint surface water pollution in rivers, lakes, and streams.

Groundwater Recharge and Surface Water Quality

Turfgrasses preserve water quality primarily by their growth habit, which consists of a huge biomass of short, fine-textured stems and narrow leaves that trap and hold what would otherwise be runoff water. When soil is planted to turf, more water infiltrates and filters through the soil-turfgrass ecosystem, enhancing groundwater recharge, rather than increasing surface runoff.

Results of a research study in Maryland that compared surface water runoff losses from a perennial turf and a cultivated tobacco grown at the same site were noteworthy: During the tobacco-growing season (May – September), surface water runoff losses for the tobacco were 11 times greater than the runoff losses from the perennial turf ($6.7 \text{ mm ha}^{-1} 4 \text{ wk}^{-1}$ for tobacco vs. $0.6 \text{ mm ha}^{-1} 4 \text{ wk}^{-1}$ for turf). Surface runoff losses for total nitrogen (N) and phosphorus (P) also differed and followed the same pattern. Runoff from the tobacco plantings had 195 times more N and 240 times more P than runoff from the turf. For turf, surface runoff losses of N and P were 0.012 and $0.002 \text{ kg ha}^{-1} 4 \text{ wk}^{-1}$, respectively, vs. 2.34 and $0.48 \text{ kg ha}^{-1} 4 \text{ wk}^{-1}$ losses of N and P, respectively, for tobacco. (See end of article for references.)

Turfgrass ecosystems support abundant earthworm populations, which contribute to increased macropore space in soil, resulting in higher soil water infiltration rates, higher water-holding capacity, and improved soil structure. The reduction in runoff volume linked to turf can lead to a decrease in stormwater management expenses.

Organic Chemical Decomposition

The turf-soil ecosystem – turf leaves, crowns, stems, roots, thatch, soil, and soil microbes – supports large populations of microscopic “decomposers,” beneficial soil microflora (bacteria, actinomycetes, other fungi) and fauna, which are associated with turf and known to break down pesticides and other noxious organic chemicals into harmless substances. Some researchers recommend designing turf areas to serve as catchment, filtration, and “scrubbing” zones for polluted runoff waters from impervious surfaces in urban areas. Research is ongoing to assess the carbon monoxide cleanup potential of turf planted on roadsides.

Soil Improvement and Restoration

Turfgrasses improve soil through organic matter additions derived from the turnover of roots and other plant tissues photosynthesized from atmospheric CO_2 . Planting perennial turf can accelerate restoration of environmentally damaged soils, such as burned-over land, garbage dumps, eroded rural landscapes, mining operations, and steep timber harvest areas. In time, some of these sites can be developed into recreational areas.

and recovered significantly better at a higher mowing height of $3/4$ " and a higher N fertilization rate of $3.0 \text{ lb N} / 1000 \text{ ft}^2 / \text{mo}$. A mowing height of $1/2$ " was too low for acceptable turf performance under low light conditions.

With unrestricted light, mowing heights of $3/8$ ", $1/2$ ", and $3/4$ " are all acceptable for optimal growth and development of 'De Anza'. (*Better Turf Thru Agronomics*, 'De Anza' Zoysia To Make its Major League Debut, April '98).

Minimum Light Thresholds. To calculate the photosynthetic photon flux density (PPFD), a turf's irradiance requirement is expressed in micromoles ($\mu\text{mol m}^{-2}\text{s}^{-1}$ or $\text{mol m}^{-2}\text{d}^{-1}$). 'De Anza' zoysia and Kentucky bluegrass had thresholds below 22% of full summer daylight ($11.1 \text{ mol m}^{-2}\text{d}^{-1}$), based on satisfactory clipping yields and total biomass in growth chamber studies.

Zoysia's minimum threshold was determined to be $< 22\%$ but $> 8\%$ of full summer daylight ($< 11.1 \text{ mol m}^{-2}\text{d}^{-1}$ but $> 4.1 \text{ mol m}^{-2}\text{d}^{-1}$). Clipping production stopped at 8%. Zoysia needed $> 185 \mu\text{mol m}^{-2}\text{s}^{-1}$ but $< 515 \mu\text{mol m}^{-2}\text{s}^{-1}$ for 6 hr d^{-1} or $> 277 \mu\text{mol m}^{-2}\text{s}^{-1}$ but $< 770 \mu\text{mol m}^{-2}\text{s}^{-1}$ for 4 hr d^{-1} , Cockerham said.

Based on these results, artificial lights were used on the infield to supplement the natural light of late winter and early spring in Phoenix, he said. In the summer, artificial lights were used to overcome the severely shaded areas in right field due to the closing of the roof for the air conditioning, he said.

The type of light to use was based on the results of Cockerham's artificial irradiance experiments noted below.

Artificial Irradiance. Spectral quality was insignificant in laboratory studies using artificial light to irradiate zoysia and perennial rye turf but light quantity (PPFD) was significant, as measured by biomass production.

Three different lamp types were tested: a xenon lamp (pure white light but considerable near infrared heat), a high pressure sodium vapor lamp (unbalanced spectrum with several peaks from 560-620 nm), and a sulfur/micro-wave lamp (smooth, broad spectrum output). The relatively inexpensive and efficient Na-vapor lamps were as effective as the much more expensive lamps with balanced spectra.

Cockerham's UCR colleagues were Ag Operations Staff Research Associates **Steve Ries** and **George Riechers** and Cooperative Extension Environmental Horticulturist **Vic Gibault**.

Temperature Moderation. Turfgrasses and other landscape plantings dissipate radiant heat through the cooling process of evapotranspiration, which saves energy by reducing the interior mechanical cooling needed for nearby homes and commercial buildings. The temperature benefit linked to turf is especially important in California, the second-most urbanized state in the U.S., where absolute urban temperatures have been increasing since 1940.

Recreational Benefits. Every day, professional and amateur athletes experience the cushioning that well-maintained turf provides against personal injuries. Turfgrasses can offer a low-cost, safe surface for outdoor leisure activities and recreational sports. Recreation on turf surfaces improves physical and mental health, relieves stress, and contributes to enjoyment of life, all of which are vital to the quality of life in contemporary society.

It is unwise to cut the school maintenance budget (irrigation, fertilization, pest and thatch control) for athletic fields planted to turf because developing athletes are put at significant risk. In a study of football injuries at 12 Pennsylvania high schools, researchers determined that one-fifth were definitely or possibly field-related. Fields with good quality turfgrass cover have higher traction, cushioning, and resiliency, and lower surface hardness, reducing the probability of injury in contact sports.

A smooth, durable, uniform turf surface is important to the play and outcome of a game. Ball roll and bounce are influenced by the turf cover and its management, as are player movements, such as running, cutting, veering, stopping, pivoting, dodging, lunging, jumping, landing, and walking. The overuse of many community sports facilities can push the limits of turf to recover. Certain grasses have been bred to better withstand traffic from cleats.

Aesthetics and Health Benefits. Within urban and suburban areas, it is accepted that parks and attractive landscaping near homes, schools, and businesses increase property values and neighborhood satisfaction. A beautiful green lawn or golf course enhances the quality of life because of its aesthetic appeal, but, in addition, researchers are finding measurable, verifiable health benefits.

Psychologists who study people-plant interactions quantify their results by testing blood pressure and heart rate to document the health benefits of “nearby nature” (turf and mixed landscapes and natural settings). Views of open green space promote quicker recovery from experimentally induced stress when compared to busy mall scenes. Hospital patients matched for age, gender, pre-surgical health, and socioeconomic status who were provided an outdoor view of nature recovered more quickly and required fewer, less potent analgesics than patients whose rooms viewed a hospital wing.

Attention to roadside aesthetics can reduce commuter stress. In laboratory experiments, participants who viewed nature-dominated roadside environments had quicker and more complete recovery from induced stress than participants who viewed artifact-dominated scenes, as measured by heart rate and blood pressure.

“Cost-benefit analyses will express a truncated view of turf’s advantages to the environment unless turf researchers and green industry leaders are effective advocates of turf’s multifaceted roles in the landscape. As we educate our clientele about well-maintained turf, they will have a comprehensive view of its multiple, essential benefits to the urban and suburban communities,” Gibeault said.

Sources: Beard, J.B. and R. L. Green. 1994. *The Role of Turfgrasses in Environmental Protection and Their Benefits to Humans*. *J. Environ. Qual.* 23:452-460. Parsons, R., Tassinary, L.G., Ulrich, R.S., Hebl, M.R., and M. Grossman-Alexander. 1998. *The View from the Road: Implications for Stress Recovery and Immunization*. *J. Exp. Psych.* 18:113-140.

BETTER TURF THRU AGRONOMICS is prepared for the delegates and membership of the University of California, Riverside Turfgrass Research Advisory Committee (UCRTRAC). Member organizations are the Southern California Golf Association; California Golf Course Superintendents Association (GCSA); GCSA of Southern California; San Diego GCSA; Hi-Lo Desert GCSA; California Sod Producers Association; Southern California Section, Professional Golfers Association; Southern California Turfgrass Council; Southern California Turfgrass Foundation; United States Golf Association; and UCR. The intent is to present summaries of turfgrass research results and topical information of interest to the Southern California turfgrass industries. The newsletter is written by Deborah Silva and edited by Dr. Vic Gibeault and Dr. Robert Green and designed by Jack Van Hise, UCR Printing and Reprographics.

New Fungicides for California Turf, 2002-2004

Frank Wong, UCR Cooperative Extension Urban Plant Pathologist, is evaluating six new fungicides for their control of diseases on California turf. Five are in development for registration here. One is already registered.

Chipco Triton 1.67 SC

(triticonazole, Bayer)

Diseases: Anthracnose, brown patch, dollar spot, gray and pink snow molds, leaf spot, powdery mildew, rust red thread, spring dead spot, take-all patch.

Use Rates: 0.75 – 2.0 fl. oz./1000 ft²

Mode of Action: SI (sterol biosynthesis inhibitor).

Expected Registration: 2004

Banol

(propamocarb, Bayer)

Diseases: Pythium spp.

Use Rates: 1.3 – 4.0 fl. oz./1000 ft²

Mode of Action: Pythium-specific.

Expected Registration: 2003

Emerald 70 WG

(BAS 510 F, no common name, BASF)

Diseases: Dollar spot

Use Rates: 0.13 – 0.18 oz./1000 ft²

Mode of Action: Carboxanilide class.

Expected Registration: 2003

Honor 50 WG

(BAS 505 F, dimoxystrobin, BASF)

Diseases: Anthracnose, bentgrass dead spot, brown patch, dollar spot, leaf spot, red thread, rust, summer patch, take-all patch.

Use Rates: 0.2 oz./1000 ft²

Mode of Action: Strobilurin (QoI) class.

Expected Registration: Pending

Insignia 20 WG

(pyraclostrobin, BASF)

Diseases: Anthracnose, brown patch, bentgrass dead spot, fairy ring, fusarium patch, gray leaf spot, gray and pink snow molds, leaf spot, pink patch, powdery mildew, pythium blight, red thread, rust, summer patch, take-all patch.

Use Rates: 0.5 – 0.9 oz./1000 ft²

Mode of Action: Strobilurin (QoI) class.

Expected Registration: 2003

Medallion

(fludioxonil, Syngenta)

Diseases: Bentgrass dead spot, brown and yellow patch, leaf spot, summer patch, pink and gray snow molds.

Use Rates: 0.25 – 0.5 oz./1000 ft²

Mode of Action: Phenylpyrrole.

Already Registered