

One of the strengths of Team™ is its weeks of control. One application puts an end to crabgrass and goosegrass for up to 20 weeks.

The control's not just longer, it's more effective, too. Research by leading universities shows that Team provides outstanding annual grass control all season long while being gentle to all turf species.

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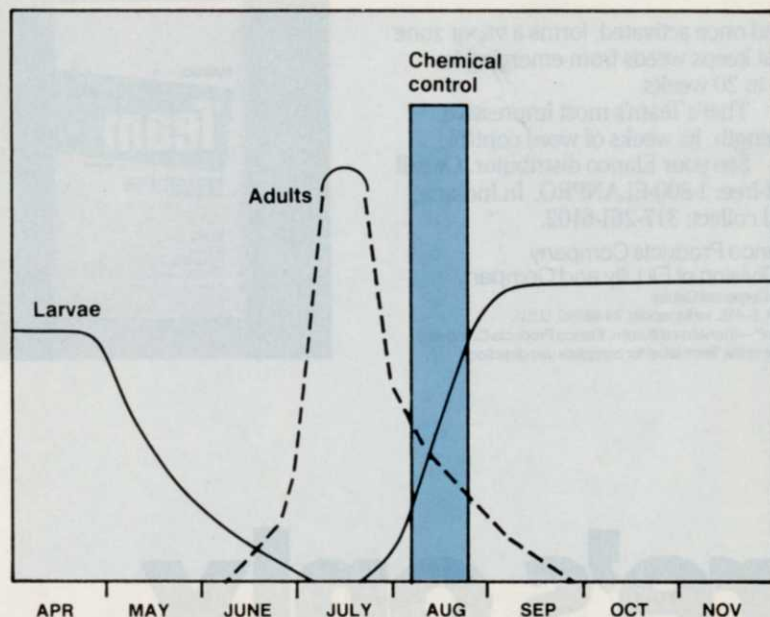


There's only one thing more impressive than Team's strengths.

Its weeks.



NUMBER OF GREEN JUNE BEETLES



The green June beetle life cycle showing the period to apply chemical controls in order to prevent turf damage in Maryland.

many more may have pupated by the time damage is obvious. Once the grubs reach the third stage in August or September, they migrate freely and

can easily move from an infested area to an adjacent area.

To protect golf course greens, treat the greens, collars, and a few yards

beyond the collars. Insecticides which also control sod webworms, cutworms, and armyworms may be selected.

If fairways are treated, the rough areas should be spot-treated where there are high grub populations. The highest grub populations are likely to be found where the adult beetle population was most concentrated.

The green June beetle grubs are effectively controlled by a number of insecticides labeled for grubs (see Table 1). Even insecticides that do not penetrate the soil work well because these grubs come to the surface and are exposed to the materials.

Sevin and Diazinon are consistently effective in controlling the green June beetle grubs and both are registered for homeowner use. Proxol and Turcam also provide good control.

Application of these insecticides must be immediately followed by irrigation with $\frac{1}{2}$ inch of water, or timed with rainfall.

In Maryland, spring applications of Oftanol have not effectively controlled the green June beetle grubs. Late summer applications of Oftanol also failed to provide adequate control of these grubs within one week. However, tests will be continued to investigate Oftanol grub control over longer time periods.

Turfgrasses recover from damage significantly once stress factors are removed. For example, species with stolons and rhizomes may repair the damage once the grub population is controlled.

The damage resulting from the grub tunneling is less severe when grass receives sufficient moisture.

A word of caution to those treating for green June beetles: they come to the surface and die, causing a foul odor as they decay.

Turf managers have not found poisoned birds after applying chemicals to control these grubs but it may be wise to consider it a possibility and be watchful.

Finally, monitor treated areas carefully because migrating grubs may reinfest once the chemicals have broken down. It may be necessary to retreat some areas to protect them from damage.

WT&T

REFERENCES

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3. Ritcher, P.O. 1945. North American Cetoniinae with descriptions of larvae and keys to genera and species (Coleoptera: Scarabaeidae). Kentucky Agricultural Experimental Station Bulletin. 476:1-39.

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Because of its unique mode of action, ARSENAL, when used as directed, has no harmful effects on mammals, fish, bees, birds or earthworms. Because ARSENAL is non-volatile and doesn't move laterally in the soil, off-target vegetation is unaffected. ARSENAL is nonflammable. Its unique chemical activity causes a slow "brown-out" in foliage, so it poses little fire hazard. Unlike tank mixes, ARSENAL introduces only one biodegradable product into the environment. And it's applied only once during a season, resulting in a lower chemical burden and a reduction in "touch-up" treatments.

CONTROLS MORE UNDESIRABLE VEGETATION.

ARSENAL has demonstrated control of a broad spectrum of weeds, vines and brush species. Tests in southern states showed that ARSENAL alone (at a rate of two quarts per acre) out-performed several tank mixes for annual and perennial weed control. Even more impressive, ARSENAL was most effective on difficult species like Johnsongrass, trumpet creeper, kudzu and red maple.

ONE APPLICATION GIVES SEASON-LONG CONTROL.

ARSENAL gives you full-season control for up to eight months in temperate climates. It fits your spray schedule, because it can be applied at any time

Always read and follow label directions carefully.

TOUGH ON WEEDS. EASY ON THE ENVIRONMENT.

during the growing season. ARSENAL controls not only existing vegetation, but also new weeds that germinate after application. So you get residual control for the rest of the season. On hard-to-kill vegetation, ARSENAL keeps working on the roots until complete control is achieved. In spray solution, ARSENAL is stable for several days. That means no waste due to decomposition, and no chance of underdosing target vegetation.

ARSENAL offers broad-spectrum control, including these tough species:

Johnsongrass	Dallas grass
Trumpet creeper	Bindweed
Poison ivy	Canada thistle
Greenbriar	Foxtails
Redvine	Red maple
Kudzu	Kudzu
Multiflora rose	Sumac

DUAL ACTION CONTROLS IN A WHOLE NEW WAY.

Unlike many other herbicides, ARSENAL is absorbed through both roots and foliage to stop new plant cell growth. Vegetation absorbs ARSENAL in less than two hours, so rain won't wash off your investment. Within four hours, plant growth ceases. In perennials, ARSENAL translocates thoroughly in the roots to prevent regrowth. This unique chemistry makes the visible results of control more gradual. In some vegetation, loss of color and other outward signs may not be apparent for weeks after application. After a year or more, returning vegetation is mainly desirable annual grasses and legumes.

ARSENAL IS RIGHT FOR YOUR RIGHTS-OF-WAY.

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Rolling hills pose a barrier to efficient water use at Palo Alto Hills Country Club. But Mike Garvale has an answer.

GIVING WATER A HELPING HAND

Two golf courses on the West Coast find a handy tool for helping conserve a precious resource, saving big bucks at the same time.

Yes, water conservation is important during especially dry years, as the East Coast and Southeast have learned the past two summers. But, no, conservation shouldn't be stopped during years in which the rainfall is normal.

Managing water regardless of availability can mean a big cost savings, as well as conservation of our precious resources, facts that haven't gone unnoticed by two California golf course superintendents.

Improving root systems

The goal of Mike Garvale, golf course superintendent at Palo Alto Hills Country Club, is to reduce water use on the 125-acre course by 25%. That would slash nearly \$19,000 from the club's \$75,000 annual water bill.

Garvale, who came to Palo Alto from northern Michigan in October, 1984, took the first step in his con-

servation program by building deeper root systems to improve moisture utilization. "When I started here, it was after the hot summer months and I found very little root systems on the fairways," he explains. To remedy the situation, he double-aerified and verticut, and then applied three pounds of potassium nitrate per 1,000 sq. ft.

The fairways, which are primarily annual bluegrass (*poa annua*), responded well over the winter months. Going into summer, root systems were as deep as three inches or more. Garvale started his regular watering cycle the first of April. Now he feels that he's maintaining a course that will help him meet his goal of 25% less water use.

Built on 90% adobe clay and rock, the 25-year old golf course presents several challenges to efficient water management. Rolling hills "draw down water" and large oak trees sur-

rounding greens also siphon off moisture.

Frequent sampling

According to Garvale, taking daily core samples to analyze moisture levels is the biggest water saver. Regular use of an effective soil wetting agent is also important for overcoming barriers to efficient water use, he adds.

His first experience with a wetting agent was in 1972, when he worked on a Detroit area golf course while still in college. "We applied Aqua-Gro to treat isolated dry spots," he says. That's the same product he now uses at Palo Alto Hills Country Club.

Soil wetting agents primarily work by loosening the bonds that hold water molecules together, which often hinders uniform water penetration and thorough drainage.

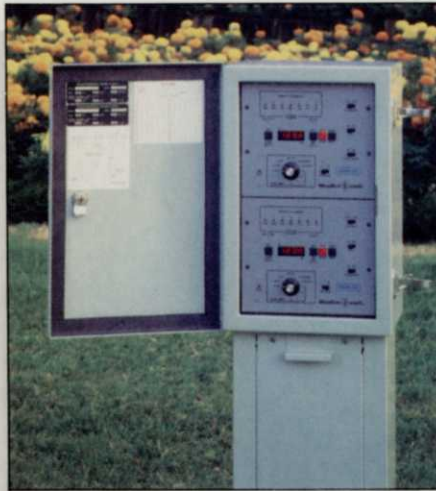
In a USDA survey conducted in the Midwest, it was found that less

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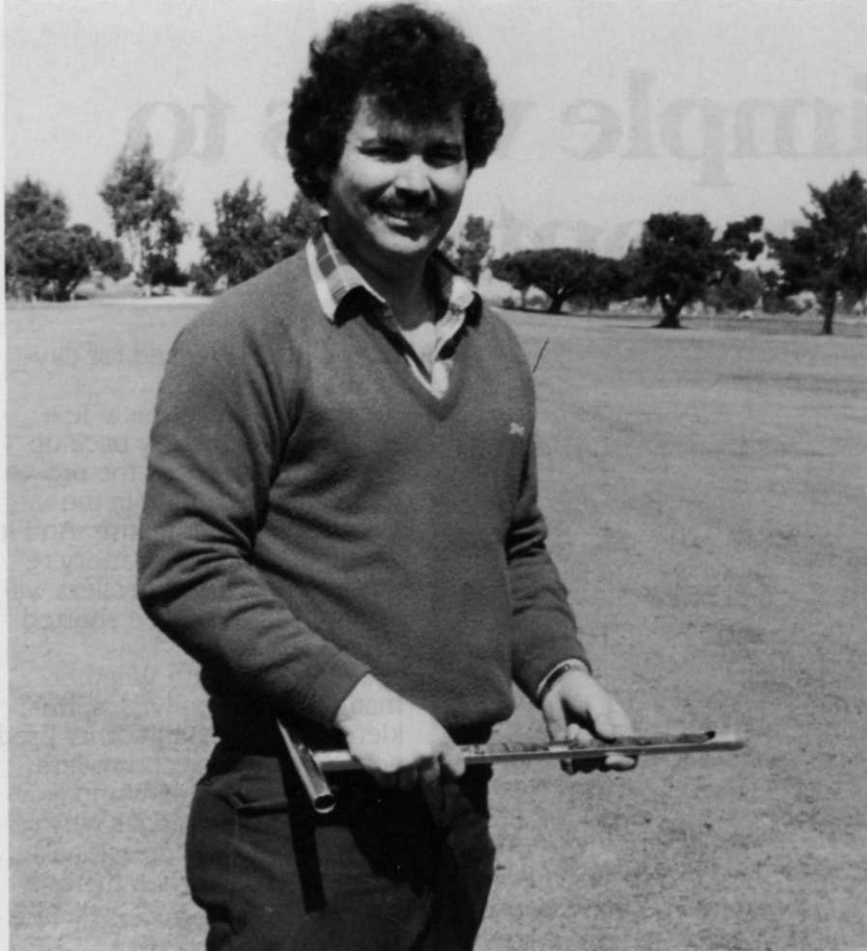
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LAWN AND TURF IRRIGATION



Paul Dias of the Palo Alto Municipal Golf Course must manage six to eight inches of thatch on fairways.

than 20% of total rainfall actually became root zone moisture. The high losses were due to runoff and evaporation.

Garvale notes that wetting agents are often used to improve water penetration on heavy or compacted soil or turfgrass with excessive thatch. What many people overlook, he believes, is that a wetting agent can also be "used to dry down wet soils."

At Palo Alto Hills, he adds, the use of a wetting agent has been especially helpful in controlling runoff on hillsides.

Significant savings

Wetting agents can save significant amounts of water as well as labor if properly used, says Paul Dias, superintendent and manager of the Palo Alto Municipal Golf Course. Built on "mud fills" next to San Francisco Bay, the 200-acre course has as much as six to eight inches of thatch on fairways, which poses a serious barrier to efficient watering and water utilization.

About four years ago, recalls Dias, high winds and compaction caused a severe drying out problem. It prompted "a lot of hand-watering" to supplement normal irrigation, which is supplied by automatic sprinklers. The next year, Dias started a monthly application program with Aqua-Gro and reduced

hand-watering by about 50%.

Dias, who has used wetting agents for 20 years, says he can cut overall water use by 25% the first week after the product is applied. Wetting agents have residuals of about 30 days, he adds, and have been used to control dew on greens in winter.

Unique situation

Though he's located only a few miles from Garvale, Dias cares for a course that is totally different.

It's below sea level and there's no drainage, so "overwatering will turn it back into a mud flat." Annual rainfall is approximately 20 inches, with the bulk of precipitation falling from November to March.

In March, Dias normally starts a seven-day watering schedule, operating his irrigation system from 8 p.m. to 7 or 8 a.m. "We need to provide enough water to overcome salt, but we can't leach it out," he notes.

Watering cycles average eight to ten minutes on fairways and six to eight minutes on greens. The facility is open year round and logs 104,000 rounds of golf per year.

Palo Alto is in the heart of the Silicon Valley's high tech industry. It's municipal course employs eight fulltime greenskeepers. Annual revenues are \$1 million.

One thing Dias shares with Garvale is a desire to cut water use. Annual cost at the municipal course is about \$80,000, a figure Dias believes can be slashed by 20%. Like Garvale, he says the best moisture management tool is to take frequent core samples.

The other management tool is the use of a wetting agent—monthly on greens, Seaside bentgrass fairways at both courses are also treated. The non-ionic wetting agent is applied with a sprayer and watered into the soil.

Dias is currently investigating a special injector to automatically apply the product through irrigation water. The Palo Alto Municipal Course has no electrical hookup for its irrigation system, so the standard injector system can't be used.

Different applications

At Palo Alto Hills Country Club, Garvale uses a "Little Squirt" injector to meter the wetting agent into irrigation water.

First, he uses a sprayer prior to the irrigation season to "establish a base," applying 2¼ gallons of product per acre. He then switches to a "maintenance program" with the Little Squirt injector.

The labor-saving device is used to apply three ounces of Aqua-Gro per 1,000 sq. ft. every 10 to 14 days, as needed. Garvale's regular watering program for fairways and greens usually consists of two, ten-minute sets. There's a three- to four-hour interval between sets on fairways and a two-hour interval on greens.

Based on his experience with wetting agents, Garvale advises anyone starting a program to "use them like a pesticide. The main thing is to read the label directions and contact the manufacturer if you have any questions."

If you also use the wetting agent to improve efficiency of pesticides or fertilizers, he adds, "make sure it's compatible with the other chemicals." He feels it's a "good idea to make a test application and wait at least one week" to see if there are any adverse effects.

Golf course superintendents like Paul Dias and Mike Garvale, whose courses are located in a region that experienced severe drought conditions in the past, realize that water can't be taken for granted any more. Using available technology, they've adopted a practical approach to managing their water that is not only improving the efficiency of their respective operations, but enhancing the playing conditions of their golf courses as well.

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