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TURFGRASS TRENDS

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TURFGRASS PEST CONTROL

The Changing of the Guard in White Grub Control Insecticides

By Kevin Mathias

A combination of federal regulatory rulings and economic decisions by insecticide manufacturers has dramatically changed the landscape of white grub insecticides and control strategies. At the beginning of the 1990's white grub control insecticides consisted mainly of organophosphate and carbamate based chemistries with only a few biorational products available (Table 1). As a group, the organophosphate and carbamate insecticides, have a relatively short residual activity and are highly efficacious when used in curative control programs.

Optimum results are attained if the products are applied in mid to late August or into September, as white grub damage is first noticed and when the grubs are young and relatively small.

Optimum results are attained if the products are applied in mid to late August or into September, as white grub damage is first noticed and when the grubs are young and relatively small.

As we enter the new millennium many of the curative control products have been replaced by a group of new insecticides. These insecticides, Merit and Mach 2, offer greater applicator safety, have less adverse effect on the environment, provide a longer window of application due to their extended soil residual activities, have minimal impact on beneficial predators, and provide excellent control (+90%) of white grubs.

Merit and Mach 2 affect the early instar stages of white grubs and are much more effective in preventative than in curative control programs. A review of field evaluations for white grub control reported in Arthropod Management Tests from 1998 to 1999 demonstrated that applications of Mach 2 or Merit applied within the early June to early August time period provided excellent control (+90%), however, if these insecticide were applied from late August through September the average level of control dropped to 80%.

A recent survey conducted at the 2001 Maryland Turfgrass Conference illustrates how turfgrass managers have incorporated these new insecticides into their insect control programs (Figure 1). Merit was used by 60% of the respondents, followed by Dylox at 28%, and then Mach 2 at 19% for white grub control.

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Dylox, an organophosphate, was applied as a curative control for spot treatment to sites that had not been treated with Merit or Mach 2.

Organophosphate / carbamate update

The ongoing review process mandated by the Food Quality and Protection Act of 1996 and under the direction of the Environmental Protection Agency (EPA) has continued to affect product choices for turfgrass insect control. Dursban's (chlorpyrifos) new turfgrass labeling removes the application of this product to residential sites and restricts applications only to golf course and industrial sites. It also limits maximum application rates of 1 lb. A.I./acre per season.

Though never a stellar white grub control product due to its tendency to bind to organic matter, Dursban was effective at the 2 lb. A.I./acre rate for adult control of the black turfgrass ataenius beetle. When applied in early spring prior to egg laying, Dursban will control the adults thus preventing or reducing egg laying.

Various pyrethroid insecticides such as Talstar and DeltaGard are now replacing Dursban for this use.

Turcam (bendiocarb), a carbamate insecticide manufactured by Aventis, will no longer be produced for turfgrass insect control in 2001. This was a voluntary decision by the manufacturer based on economic considerations. Current supplies can be sold until the existing inventory is depleted.

Diazinon is the most recent product to see future regulations affect its use in the market place. It will lose its labeling for all lawn and garden uses beginning in 2003 (see TurfGrass TRENDS, February 2001, Pg. 15). In the mean time annual production levels will be reduced for the 2001-2002 seasons. With the impending cancellation of Diazinon only one insecticide, Dylox (trichlorfon), will provide effective curative control of white grubs.

New product information

A new insecticide from Syngenta is planned for introduction in 2001. The product is Meridian (thiomethoxam) and white grub evaluation studies have shown excellent efficacy when applied preventatively. Field evaluations of Meridian demonstrated excellent control (97%) when applied within the June to early August period (Table 2). However, if applied in a curative manner, late August through September, control levels dropped to 80% for Japanese beetle, masked chafers, and oriental beetles.

European chafer control showed an even greater drop when used as a preventative, 82% control, to 22% control when applied in a curative manner (Table 2).

The proposed labeling for Meridian recommends an application window for white grubs 45 days before adult flight activity to second instar development with optimal timing at peak egg hatch. Additional insects for which Meridian will be labeled for include billbug larvae and fire ant control and suppression of chinch bugs and mole crickets.

What we must do as turfgrass managers and researchers is to continue to improve our abilities to predict the likelihood of white grub damage.

Natural control influence of insecticides

Our understanding of the important role which the invertebrate community plays in the turfgrass habitat has just started to be elicited by a number of researchers. This invertebrate community consists of an array of predatory insects such as ants (Formicidae), ground beetles (Carabidae), and rove beetle (Staphylinidae). Also predatory mites (Mesostigmatidae), spiders (Araneida), and a host of decomposers such as springtails (Collembola), mites (Orbatidae) and earthworms (Lum-

TABLE 1. WHITE GRUB CONTROL PRODUCTS

ORGANOPHOSPATES	CARBAMATES	BIORATIONALS
1990		
■ Dylox	■ Sevin	■ Milky disease nematodes
■ Oftanol	■ Turcam	
■ Mainstay		
■ Diazinon		
■ Dursban		
■ Triumph		
■ Mocap		
2001		
■ Dylox	■ Sevin	■ Milky disease nematodes Naturalis
■ Diazinon*	■ Merit	
	■ Mach 2	
	■ Meridian**	

* DIAZINON CANNOT BE APPLIED TO GOLF COURSE TURF OR SOD FARMS
** MERIDIAN IS EXPECTED TO OBTAIN EPA REGISTRATION IN 2001

bricidae) are part of this turfgrass community.

All of these invertebrate play an integral role whether it be in natural control, enhancing soil tilth and productivity or offering a stable food source for various predatory groups of arthropods.

Researchers at the University of Kentucky (8) were first to quantity the level of predation in the turfgrass community. Predators such as spiders, ants, rove beetles and ground beetles were responsible for consuming up to 73% of Japanese beetle eggs. Zenger and Gibb (10) have reported egg predation by the thief ant and various rove and ground beetles to reach mortality levels of 65%.

The use of the older, broad spectrum insecticides have been shown to have an adverse effect on a number of different predator groups and various decomposer groups. Cockfield and Potter (2) reported Dursban and Oftanol applications caused a significant reduction of predators such as spiders and rove beetles for a period of six weeks. Also, work by Vavrek and Niemczyk (9) demonstrated how Oftanol caused significant reduction to mites, springtails and rove beetles for periods ranging from 13 to 43 weeks. Other researchers (1,3,5,11) have also reported on the adverse affect organophosphate and carbamate insecticides have on the invertebrate community.

Rove beetles have been reported to be one of the principal egg predators of the black turfgrass ataenius beetle in Michigan(Smitely, personal communication). Their populations seem to be relatively stable in habitats which have an adequate food supply of springtails. However, if springtail populations decline, then rove beetle populations will also decrease thus resulting in lower predation of ataenius eggs.

The interrelationship of predator-prey

relationships at a lower level provides insight into the complexity of the turfgrass habitat and in its natural control system which can be easily altered by the application of broad spectrum insecticides.

The new soil insecticides such as Mach 2 and Merit are reported to have less adverse effect on beneficial insects, mites, spiders, and earthworms when compared to the older curative control products such as the organophosphate and carbamate insecticides. Kunkel et.al. (5) found that Mach 2 had no adverse effect on beneficial invertebrates such as earthworms, springtails, mites, and various insect predator groups.

Merit caused short-term reductions, though often slight, for earthworms, springtails, hister beetles and larvae of ground and rove beetles. Work by Zenger and Gibb (11) found that Merit and Mach 2 did not adversely affect ants and in particular the thief ant, Solenopsis molesta, to prey upon Japanese beetle eggs. However, when Oftanol and Diazinon were applied a reduction in ant populations occurred for a period of 4-8 weeks which resulted in lower white grub egg predation.

A synergistic effect has been reported for Merit and the entomopathogenic nematode, Heterorhabditis bacteriophora, for controlling several masked chafer species (4). This synergistic effect may be due to the way Merit alters the defensive behavior of white grubs to nematode attack. No adverse effect was observed to the entomopathogenic nematode, Heterorhabditis marelatus, when Mach 2 was applied (7).

Since Mach 2 and Merit have been shown to have a minimal impact on the non target invertebrate community natural control by way of predation and the various other important roles which these beneficials play is not compromised.

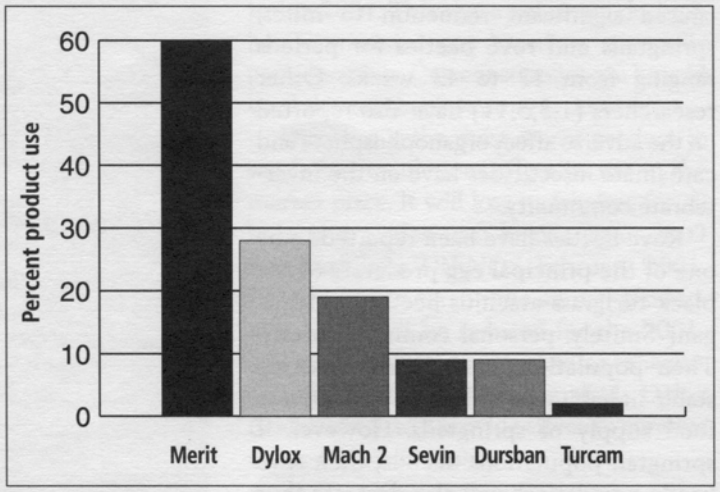

Figure 1. Survey results demonstrating the choice of white grub control used by turfgrass professionals in Maryland for the 2000 season. The survey was conducted at the 2001 Maryland Turfgrass Conference.

Multiple targeting

The possibility of controlling more than one turfgrass insect pest with these new insecticides is possible due to their long soil residual activities. For example an application of Mach 2 if timed properly could control sod webworm or cutworm larvae while also providing excellent white grub control. However for this to occur the turfgrass manager must be aware of the life histories of the major insect pests within their region.

At Maryland, black light trapping has been done at various golf courses since 1996. A number of turfgrass insect pests are collected and counted throughout the season and then posted on our home page (http://iaa.umd.edu/umturf/umturf.html). Adult scarab beetles such as masked chafers, the black turfgrass ataenius beetle, the oriental beetle, June beetles, and the asiatic garden beetle along with the Lepidopteran pests such as sod webworms and black cutworms are monitored from May through August.

The light trap data can provide excellent insight into the proper timing to maximize control with the new preventative insecticides. Adult sod webworm and masked chafer cumulative counts have been tabulated over the past four years (Figure 2). If Mach 2 were to be used several windows of application can be evaluated. For example if the major goal is to control white grubs then the timing of Mach 2 could occur between mid-June to early August.

TABLE 2. WHITE GRUB CONTROL PRODUCTS

WHITE GRUB SPECIES	MEAN % CONTROL *PREVENTATIVE	MEAN % CONTROL **CURATIVE
■ Japanese beetle	97%	80%
■ Masked chafers	97%	80%
■ Oriental beetle	97%	80%
■ European chafer	82%	22%

* PREVENTATIVE CONTROL APPLICATIONS OCCURED BETWEEN MID-JUNE TO MID-AUGUST PERIOD
** CURATIVE CONTROL APPLICATIONS OCCURRED BEWTWEEN LATE AUGUST THROUGH SEPTEMBER

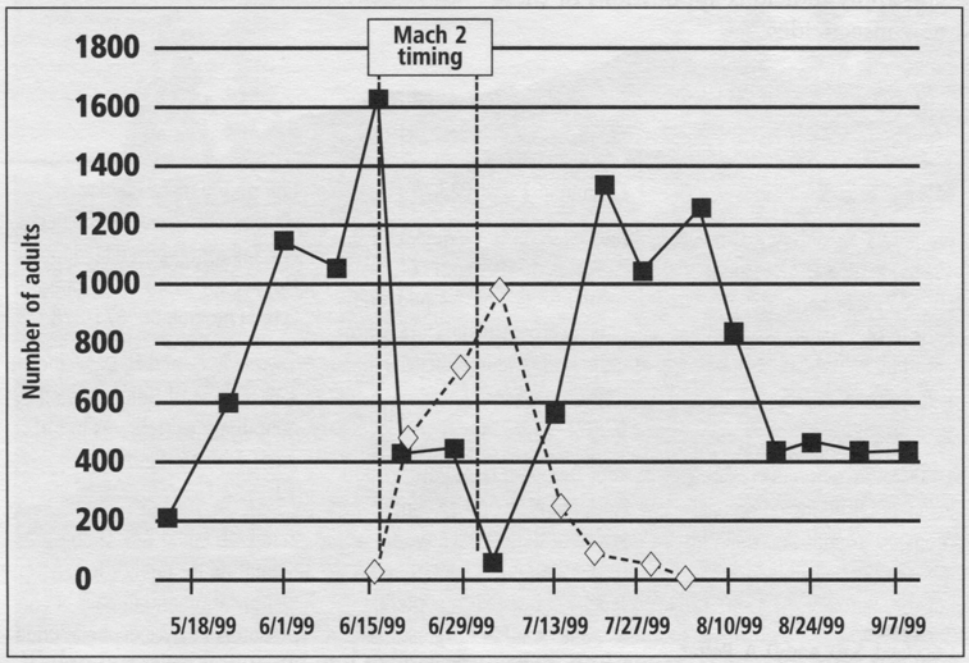

Figure 3. Optimum timing for targeting of Mach 2 for sod webworm and masked chafer control based on light trap results from 1996 to 1999 at Westwood C.C.

However if one wanted to control 1st sod webworm larvae and masked chafer grubs then an application timed between mid to late June would control both of these turfgrass insect pests (Figure 2). Another possible multiple targeting example is the use of Merit to control billbug larvae and white grubs by timing an application in mid to late May.

Summary

With the changing of the guard from the older broad spectrum insecticides to the newer more selective insecticides, turfgrass professionals will now see improved levels of control, greater applicator safety, and less interference of natural control.

However, one major issue with the application of these new insecticides is their use in preventative control programs.

If we rely too heavily on these products and apply them annually to large turfgrass sites without regards to the principles of integrated pest management then the likelihood of resistance and enhanced biodegradation of these products will occur.

What we must do as turfgrass managers and researchers is to continue to improve our abilities to predict the likelihood of white grub damage.

Greater emphasis on record keeping as to where and when white grub damage occurs, black light and pheromone trapping, and a better understanding of scarab (white grub) behavior are needed. Only then can we better identify high risk sites and apply judicious applications of these new insecticides.

Dr. Kevin Mathias has served since 1979 as the Turfgrass Lecturer and Advisor for the Turfgrass and Golf Course Management Program at the Institute of Applied Agriculture at the University of Maryland. It is a two-year program offering certificates in Golf Course and Turfgrass Management, Horticulture, Equine Management and Agriculture Business. He received his Ph.D. in 1988 from the Entomology Department at the University of Maryland. His major responsibilities are in program development and teaching within the Institute of Applied Agriculture, as well as in extension presentations, Web development of the Turf Online homepage, turfgrass insect monitoring and as an advisor to the Maryland Turfgrass Council.

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Site Analysis for Golf Course Development

There will be specific issues involved in the development of each course based on the characteristics of the property, climate, surrounding land uses and local regulations.

Wetlands are an important and delicate feature on any course. (Photo by Mike Klemme, Golfoto)

By Bill Love

Developing a golf course with today's environmental and economic issues is a complex process.

Every new course presents a unique series of design challenges and solutions because no two pieces of property are ever the same. The property on which a course is located will give it an inherent character and designing the course is an exercise in utilizing the property in the most advantageous way to produce an enjoyable, intriguing golf experience for every player.

There will be specific issues involved in the development of each course based on the characteristics of the property, climate, surrounding land uses and local regulations. Given the substantial investment of time and money involved through planning and design provides the best opportunity for the successful development of a golf course.

The beautiful Homestead course in Virginia blends in with its mountain surroundings.

Site analysis, which refers to the investigation and study of the existing conditions on a piece of property, is the most important step in the planning and design of a golf course. It is not, however, the initial step. Determining the feasibility of the project will come first with a demographic and economic study to provide a financial overview.

Next, accurate base mapping of the property must be assembled. The base mapping will include surveyed property boundaries, topographic information, locations of utility or other easements and a preliminary delineation of environmentally sensitive areas. This information is necessary to understand the development potential of the property, which in turn, is used to project construction costs and consequently, economic feasibility.

At the same time, the objectives for the golf course are weighed against the development potential of the property and then confirmed. The project objectives will establish whether the course is to be for public or private use, be a stand alone facility or part of a larger development.

The course can serve as a recreational amenity for a community, provide an attraction for a resort or enhance a residential development. This basic design criteria for the course must be established to evaluate its feasibility. Specific criteria, such as the number of holes, configuration, length and par for the course must also be established, but ultimately the specific design of the course will be based on the opportunities and constraints presented by the site.

Once these initial steps have been completed, a detailed site analysis is conducted to identify and provide a thorough understanding of the existing conditions on the property. With the infinite variety presented by different sites, the existing conditions will be the most important consideration in how the development of each golf course is approached during design, construction and management. Only after the site analysis has been substantially completed should preliminary design of the golf course take place. The site analysis will produce the information that is necessary for all specific design decisions. With accurate information on existing conditions, the right design decisions can be made.

Decisions that will minimize the time and expense involved in the regulatory review and approval process and allow for the most economic construction of the course.

These decisions will also produce efficient maintenance and operation of the course when it is opened and provide the opportunity to create the best golf experience from the property.

To achieve these results, the design of the course will be in concert with the property's physical characteristics and natural systems. Even on land that contains no exceptional features, there will still be basic existing conditions that must be considered in the design process. Site analysis investigates all these physical characteristics, as well as environmental issues and land use to

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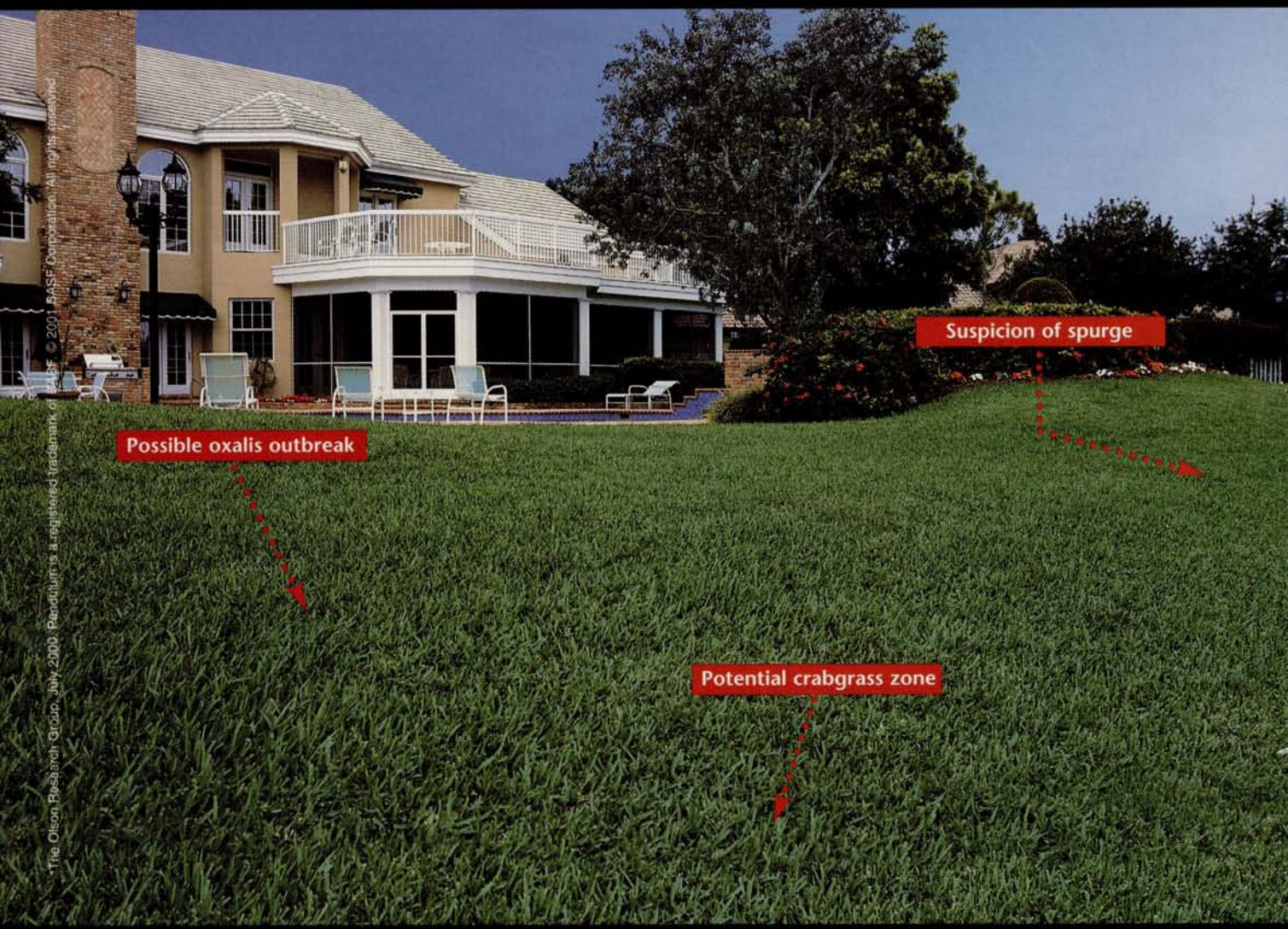

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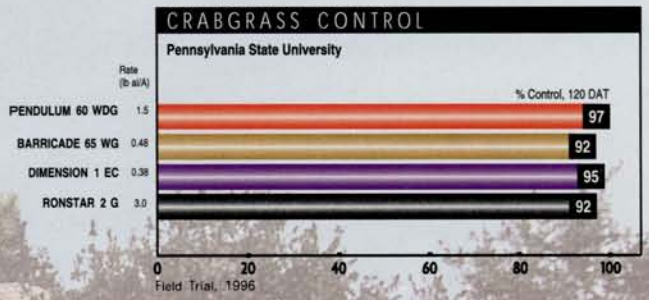

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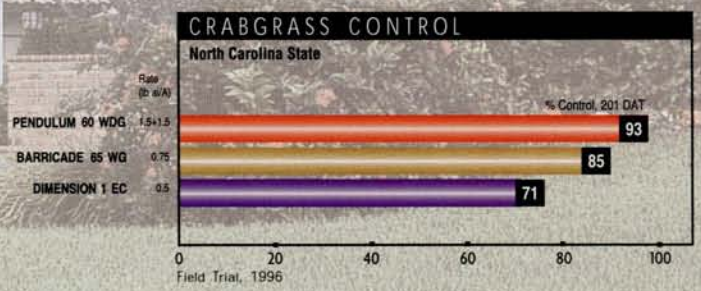

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produce information necessary for creating a golf course that lays lightly on the land and is compatible with its surroundings.

A series of maps are used to delineate the different aspects of the site analysis and when reviewed together will illustrate the potentials and constraints involved in the property. Each site will contain unique aspects, however, the following aspects of every property are typically investigated:

Climate

Average seasonal temperature will determine the types of turfgrass that can be used, which affects the playability, aesthetics and maintenance practices on the golf course. Annual rainfall is also considered in the selection of turfgrass and the requirements of the irrigation system for the course.

Sun orientation has a bearing on the layout of the individual golf holes, especially the starting and finishing holes that are played as the sun rises and sets. Sun exposure is always important to the maintenance and quality of turf. However, it is also important to the operation of the course in more those climates that experience frost and the occasional snowfall.

Prevailing winds in some parts of the country play a major role in the layout of golf holes. Playing against, with or across the wind can have a significant impact on the level of challenge in a specific hole and help enhance the overall experience of the course.

Topography

The slope of the land is one of the major issues involved in the layout of the course. Areas of the topography that contain milder slopes will generally be more conducive to the location of golf holes. The slope of the land involved in a hole will have a direct impact on how and at what pace it is played.

Steeper slopes tend to be avoided to prevent an unreasonable challenge for some players and minimize grading during construction. Changes in elevation are important to the location of tees, fairways and greens to prevent blind shots that can detract from the visibility and therefore, the strategy and visibility of a hole. Higher elevations provide views that enhance the overall experience of the course.

Slope and elevation also establish the drainage patterns for stormwater and must be considered in the placement of the golf holes for maintenance and play.

Drainage patterns

The natural drainage patterns of the property must be carefully considered in the layout of the course to prevent maintenance problems and allow the course to remain open for play as much as possible. Where the surface water flows is important to the placement of features on each hole and the amount of grading that will be required to direct drainage away from areas that come into play most frequently. The drainage patterns also indicate the potential location for impoundments which can be used to maximize the collection of rainfall for use in irrigating the course or as features incorporated into the golf holes.

These impoundments often serve another purpose to control the surface runoff during storms events and prevent erosion problems from occurring either on or off the property.

In addition to the patterns of surface runoff, sub-surface sources of water are studied during site analysis to determine the most efficient and reliable way to supply irrigation for the course.

Water availability

In addition to the patterns of surface runoff, sub surface sources of water are studied during site analysis to determine the most efficient and reliable way to supply irrigation for the course. Often, the impoundments on the course will serve as the main source of irrigation water and are supplemented with underground water on an as needed basis.

Withdrawal of underground water must be studied to determine the quantity required and its impact on the supply for adjacent property. If the withdrawal of groundwater for irrigation may affect the water supply of an area, irrigation require-

ments can be altered, as necessary, to prevent any impact or depletion.

Alternatives to groundwater, such as the collection of stormwater and use of effluent, should be investigated as a source of supply irrigation. Recycled water can lessen the demand on potable water supplies in areas that have little rainfall or experienced persistent drought conditions.

Soils and geology

The quantity and profile of the existing soils on the property are important to the eventual establishment and maintenance of turfgrass for the golf course. Poor or inadequate soils will require amendments either during construction or as a part of seedbed preparation for grassing.

Depending upon political jurisdiction, there may be requirements for safety distances, buffer zones or transition areas.

The geology of the property will have a bearing on the design of the course concerning earthmoving and drainage requirements during construction. Site analysis may include a bedrock composition and depth study to evaluate the additional cost of rock removal.

Environmental issues

Environmental issues will typically establish most of the constraints to the use of the property. However, once carefully delineated and studied, they also represent opportunities for the incorporation of natural features into the golf course and provide enhancement from both an environmental and aesthetic standpoint. Most projects will be required to address the following environmental issues, although depending on where a piece of property is located, there will be specific environmental issues involved and they must be addressed accordingly.

Wetlands

The most sensitive areas on a site will often be wetlands. Avoidance of impacts should be a priority.

Early in the design process, the issue of altering or impacting wetlands and other sensitive areas can be addressed. After field reconnaissance, environmentally sensitive areas are delineated. Using this information, the golf course can be routed so that play will be adjacent to or over the sensitive areas, incorporating them as part of the strategy and aesthetics.

However, in some instances the best overall design solution may require that there be some minor encroachment into low quality wetland areas. Thus, mitigation or new wetland areas will be included as part of the golf course to offset the impact of encroachment. This provides the opportunity to improve the quality of the wetlands and create an attractive feature that provides conservation as well as wildlife habitat.

To prevent impacts to these areas during construction, best management practices are implemented, and then continued as a part of the maintenance for the golf course.

Water quality

The proper design and location of erosion and stormwater management control features address the issue of potential pollution of water quality from earth disturbance during construction.

These features, installed prior to and during construction, will contain the movement of sediment caused by stormwater runoff and the erosion of disturbed areas, thereby protecting existing streams, ponds and sensitive areas from contamination.

Once the grading of the site has been completed, and turfgrass or other vegetation has been established to stabilize the disturbed area, some of these features will be removed. However, if properly designed, most erosion and stormwater management control features will often remain on a permanent basis and continue to provide protection for sensitive areas as a part of the responsible management practices involved in the maintenance of the golf course. These features will be used to filter stormwater runoff from the golf course and to prevent fertilizer, herbicides and pesticides from entering adjacent sensitive areas.

The issue of groundwater contamination from chemical application for turfgrass can be addressed through the preliminary development of a program for resource conservation and Integrated Pest Management (IPM) during the site analysis. Maintenance requirements and practices can be determined that will avoid impacts to groundwater from application of chemicals for disease and insect control.

Numerous studies support the use of an IPM program and promote the benefits of quality turfgrass in avoiding impacts to the environment. Often, an experienced golf course superintendent, who is a licensed chemical applicator, will be involved in the site analysis or design process to provide input in the development of an IPM program that addresses the site specific practices that will be required for a proposed golf course. The responsible management practices contained within an IPM program will address environmental issues and prevent impacts from the ongoing maintenance of the course after construction.

Plant and wildlife habitat

The impacts to plant and wildlife habitat are also addressed during the routing of the golf course.

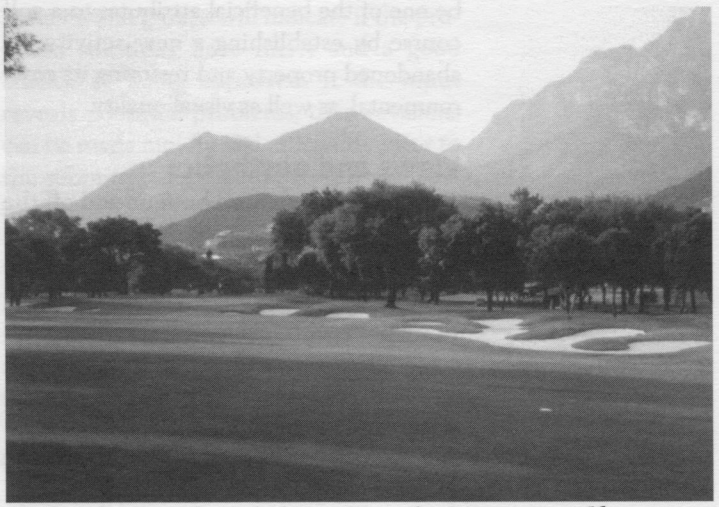
Natural areas, consisting of specific types of indigenous vegetation, can be designed as features to provide a natural setting, enhance existing wildlife habitat and stimulate endangered species. Impacts to sensitive areas of habitat are avoided by carefully removing only the necessary trees and understory plants and then employing responsible management practices during construction of the course.

Conservation areas and wildlife habitat incorporated into the design of the course are protected as an ongoing part of maintenance through the best management practices.

Historic and archeological areas

The same approach is taken with the issue of significant historical or archeological areas.

Old buildings, cemeteries, and ruins with aesthetic qualities can contribute to the character of a golf course. These areas can be preserved by being located within the routing of the golf course, lending interest and a sense of history. If a site of historical or archeological significance is discovered during construction, it may require modifications to the golf course if relocation proves to be unfeasible.



This is the view down hole no. 13 at the Campeare golf course.

Natural features

If a site has an inherent character with distinctive natural features, such as exceptional topography, rock outcroppings or specimen trees, the course can be designed to utilize these features and produce a character that is unique to that property.

The natural features are located and studied during site analysis to determine opportunities for incorporation into the design of the course and identify the areas of the property that may be protected by regulation.

However, the property may be virtually featureless and lacking in character or appearance. This is most often true of land that has been abandoned after intensive use such as quarries, landfills or agricultural fields.

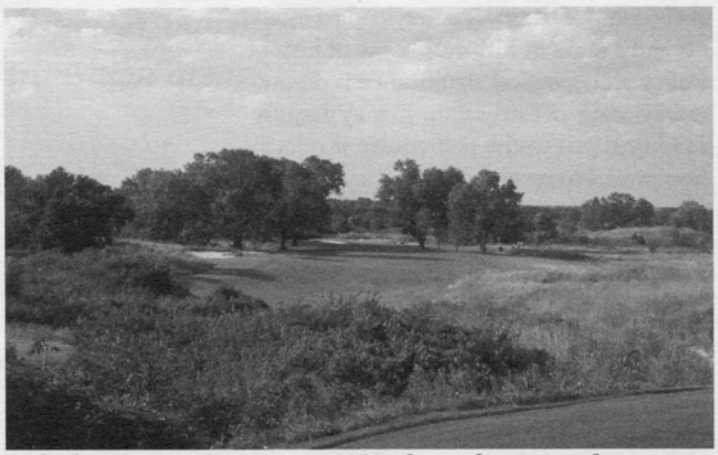
Site analysis will determine if the property contains severely disturbed areas from previous use that would otherwise remain unproductive, they can then be incorporated in the design of the golf course and rehabilitated as features of interest. Land improvement through adaptive reuse can

be one of the beneficial attributes to a golf course by establishing a new activity for abandoned property and restoring its environmental, as well as visual quality.

Views and aesthetics

The views experienced both on and off the property will lend a great deal to the character and setting of the golf course. The site analysis will determine the outstanding views of exceptional features on the property, such as ponds, wetlands, rock outcroppings and specimen trees or distant views to features of the surrounding landscape, such as mountain ranges, large bodies of water or even the skyline of a nearby city.

Incorporating these views into the design of the course can give the individual holes an interesting character and enhance the overall setting by providing a sense of place unique to the region in which the course is located.



A look at Prairie Dunes, in a 1993 photo, showing its harmony with the surroundings.

Feature design takes into consideration the views offered by the property. Tee complexes are often located to take advantage of distant views and green complexes are located in a setting that makes up the more interesting views within the property. The location tees, fairways and their features and greens are designed to blend compatibly with their surroundings.

It is this combination of designed features and views that enhance, or in some cases create, the aesthetic quality of the golf course.

Access

Access to the site establishes a critical first impression and determines the location of the facilities involved in the golf course.

The site analysis will identify potential access points to the property which are then evaluated for their sight and safety distances on existing roads, ease of ingress and egress to the property, and use for primary and secondary entrances. Once access has been determined, the site analysis information is used to establish the vehicular and pedestrian circulation patterns within the property that will provide the most economic construction and efficient operation of the course.

Easements and rights of way

All utility, scenic and conservation easements or right of ways on the property are identified as a part of the site analysis. These easements must be considered during the preliminary design process because they will often present limitations to the location of features, removal of trees or other vegetation and the allowable earth moving involved in the golf course.

Depending upon the political jurisdiction, there may also be requirements for safety distances, buffer zones or transition areas between the golf course and environmentally sensitive features of the property or adjacent land uses.

Adjacent land uses

Adjacent land uses, both existing and those that may occur in the future, are investigated during site analysis to determine what impacts they may have to the use of the property. If there are unsightly qualities, a high level of noise or obnoxious odors involved in the adjacent land use, the design of the golf course may have to mitigate these circumstances.

Existing conditions involving drainage and easements onto or off the property may also impact on the design of the course.

All applicable land use, environmental and construction regulations must be reviewed to complete the site analysis and identify the various issues that will be involved in the development of a golf course.

A clear understanding of the regulatory process at each level, from federal to local, will allow the design team to evaluate the project objectives and determine the proper approach to the development of the course. This information can help determine whether environmentally sensitive areas can be incorporated compatibly into the design of the golf course, or if they must be avoided to prevent potential impacts.

There can be instances when the environmental aspects of the site will require modification of the project objectives or consideration of alternate sites.

Preliminary design

Once the site analysis is complete, it is interpreted as the physical constraints and opportunities of the property. This information provides a basis for the decision making process during the preliminary design process of the golf course.

By carefully considering the site analysis information, innovative design solutions can be determined that will satisfy the project objectives and, at the same time, addresses the environmental issues of the site in a responsible manner.

At this stage it is important to arrange informational meetings with representatives of the regulatory agencies that will be reviewing the project and interested, local community or environmental groups. The site analysis information and concept for the golf course can be discussed to evaluate the project objectives, as well as any environmental issues.

These meetings provide the opportunity for communication and education about the project. Input received from the various agencies and groups will indicate if the proposed solutions have merit and a good chance of being approved. It the input reveals potential problems, then revisions can be made rapidly and efficiently prior to the submittal of a plan for review and permitting.

Complete and detailed property information is critical to the successful development of a golf course and should be the starting point for the design process of every project. Site analysis is the most effective method for compiling this information and providing an understanding of the opportunities and constraints involved in a piece of property.

The most sensitive areas on a site will often be wetlands.

A golf course that is designed based on a thorough site analysis will undergo a more reasonable regulatory process, cost less to construct and offer all players an enjoyable test of golf that fits responsibly and compatibly with its surroundings.

Bill Love is the Chairman of the Environmental Committee of the American Society of Golf Course Architects and the principle of W.R. Love, Golf Course Architecture, located at 7309 Baltimore Avenue, College Park, Maryland 20740.

Letters to the editor

DEAR EDITOR,

While we are always glad to see United Horticultural Supply or its products appear in print, we are extremely concerned about the way our Signature fertilizers were misrepresented in the March TurfGrass Trends article, "Spoon-Feeding with Granular Materials," written by Dr. Nick E. Christians and Mark J. Howieson.

As your title states, the article was intended to showcase various granular fertilizer options for providing nutrients to sand-based golf course greens.

For trial material, you picked fertilizers primarily from Andersons/Scotts, Lesco and UHS.

Our Signature 14-14-14 product does not compare in any way to the other materials when it comes to its designed purpose. It clearly states on the label that the product is intended for use on landscape ornamentals. It's SGN size and minors package is built for hand broadcasting and feeding ornamental plants, not spreading on USGA-specified greens.

We are extremely curious to know why a product never designed for, recommended for, nor sold for use on sand-based greens would be included in a trial for that purpose.

While we do not know who funded your study, nor particularly care, it saddens us to see our product dismissed as "the only fertilizer that we would hesitate to include in a spoon-feeding regime."

We are sure nothing deliberate was done to defame our products, but we feel a clarification is needed to keep readers from thinking Signature products are poor performers, which they most certainly are not when used correctly.

BRIAN PAYSENO, MARKETING DIRECTOR
UNITED HORTICULTURAL SUPPLY
DENVER, COLORADO

Dr. Nick Christians replies:

First of all, I want to apologize if the article caused any inconvenience for UHS. It was not our intention to put UHS 14-14-14 in a bad light or indicate in any way that it is not a good product. It was our intention to evaluate products with varying particle sizes and this just happened to be the material with the largest particle size among the materials tested.

Notice on page 10 of the article that we clearly acknowledged that the UHS product was not designed for spoon-feeding and that we state that it is a good product when used as it is designed to be used.

While we regret any misunderstanding, it is often necessary in research to include a variety of materials that may not always be designed specifically for the objectives being studied.

NICK CHRISTIANS, PROFESSOR
DEPARTMENT OF HORTICULTURE
IOWA STATE UNIVERSITY

We'll miss you, Mike

By Curt Harler/Managing Editor

Dr. Michael Villani, Cornell entomologist and one of the original board members of TurfGrass Trends, died May 15 of cancer. Mike, who remained a vital force on this newsletter, will be remembered as an international leader in the area of soil insect ecology, with emphasis on turfgrass pests, and an all-around good guy.

He was the author of many scientific publications and books, and was the recipient of numerous state and national awards for his work, including the Distinguished Service Award from the Turfgrass Council of North Carolina in 2001.

Villani

"He had focused on key soil insect pests including white grubs and mole crickets, which was of benefit to those of us in the south," says Dr. Rick Brandenburg, North Carolina State University.

Maria Haber, past publisher of *TGT*, recalls Mike as "a wonderful person to work with." She credited him for helping shape *TGT* into the publication it is today.

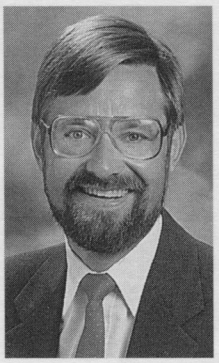
"When he was on his summer break doing research in the jungles of Honduras or collecting bugs in North Carolina, he knew I would need help. He always left me with a list of colleagues to help me out of any bind that I might get into during his absence," Haber recalls.

Another example of his dedication took place after a full-day session at a past GCSAA Conference in Orlando. "Although it was his birthday, he spent it teaching Integrated Pest Management!" Maria says. "He surely deserved the best dinner room service could provide and some private time to respond to his family's birthday wishes." Instead, Mike took a break, spoke to his family and and helped Maria structure the next series of articles on IPM for *TGT*.

He received the Citation of Merit in 1999 (the highest award presented by the New York State Turfgrass Association) and the 1997 Urban Entomology Award presented by the Entomological Society of America.

Perhaps more important, the night before he died, Mike went out to the ballpark with his daughter to see one final game.

"He represented the best in what a scientist can be – not only through his work, but also through his kind and caring personality which made him a leader. He will be missed professionally and personally," Brandenburg says.



Curt Harler
Managing Editor

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