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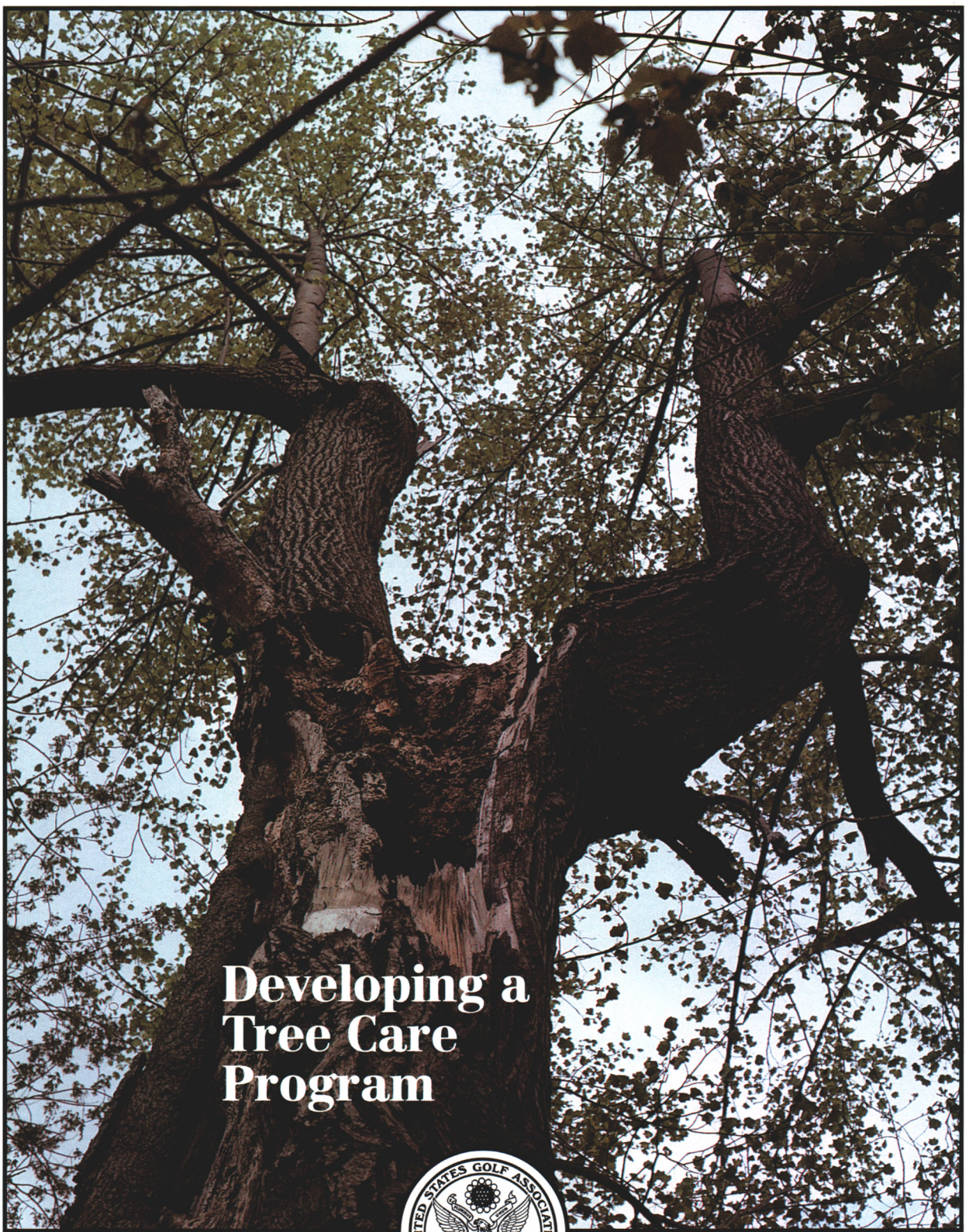

Developing a Tree Care Program

A PUBLICATION ON TURFGRASS MANAGEMENT BY THE UNITED STATES GOLF ASSOCIATION®

MARCH/APRIL 1996
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Cover Photo: This 70-foot tulip poplar was ignored and eventually fell — on the green. Fortunately, no one was injured.

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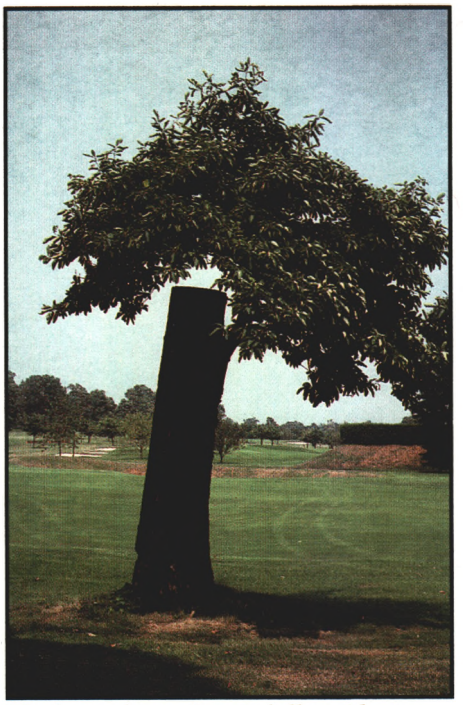
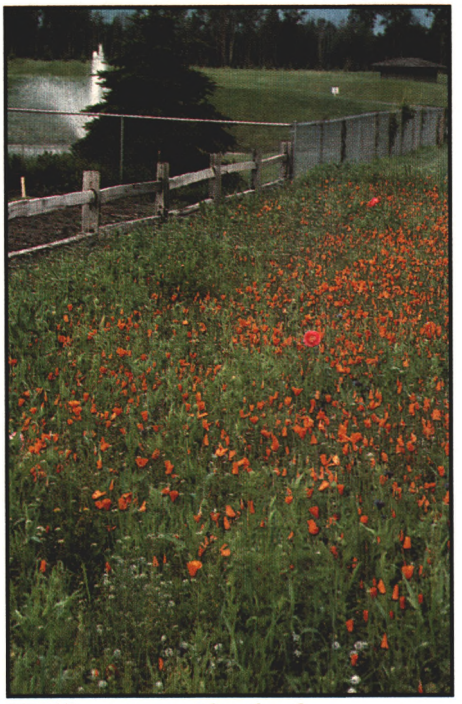


The love of trees is painfully evident with some specimens that people have a hard time giving up.



Wildflowers provide a landscape alternative in many low-maintenance areas, both on and off the golf course.

Fungal fruiting bodies are a good indicator of internal wood decay and potential structural deficiencies that create unseen hazardous conditions.

Developing a Tree Care Program

Trees play an important role on golf courses, and their care and management should be planned carefully.

by JAMES SKORULSKI

TREES are very important parts of most golf courses. Many golfers will protect trees with a zeal matched only by their love for the game itself. This blind affection for trees can result in poor judgement or misguided priorities in tree planting and maintenance programs. Proper planning and maintenance often become secondary as the emphasis is placed on planting more and more trees. This philosophy often leads to hasty decisions with new plantings, resulting in poorly positioned trees that consist of species that may not be well suited for the golf course or the particular planting site. This can create immediate maintenance headaches with the trees and will likely lead to future agronomic problems with the turf. The lack of a good preventative maintenance program also is apparent at such golf courses, as many of the existing trees have structural problems or poor growth form and appearance.

Golf courses with good reputations for their tree plantings realized long ago

the value of a comprehensive program to care for existing trees and properly plan for new tree plantings when and where they become necessary. Those efforts have paid off handsomely with balanced age classes of healthy, well-formed tree species and a minimum of tree-related agronomic problems. This article will examine strategies that can be used to develop the foundation for a good tree maintenance program, and examine specific pruning practices that can be used to maintain healthier, more attractive trees and help rectify agronomic problems.

Program Organization

There are several ways to develop a tree care program. Golf courses that choose to complete the majority of work with their own staff will employ a full-time arborist or tree specialist who has both the knowledge and experience to help develop and complete the practices. The extent of the work completed will vary depending on experience, available equipment, and the amount of liability the golf course is willing to assume. In many instances the arborist/tree specialist will complete smaller scale pruning, tree removal, and pest management work, and have the larger spray operations, climbing/bucket work, and major tree removals completed by outside contractors.

A large number of colleges and universities offer degree programs in forest and shade tree management and arboriculture. Graduates from such programs would be well suited for the position. Students might also be available for summer placement jobs on the golf course and eventually work into a full-time position as they gain experience. The position requires overall knowledge of trees and their specific requirements, including pruning, fertility, irrigation, and pest management needs. Tree pruning and removal skills are a must, as is the ability to properly identify and evaluate hazardous trees.

This is not to say that a good tree maintenance program cannot be developed without first hiring an experienced arborist. The golf course superintendent may have the necessary background to develop and oversee a relatively good program if he is fortunate enough to possess the skills mentioned above and have the necessary time. An even larger amount of the work would probably be completed by outside contractors with a program organized in this way.

Tree Inventory

A tree inventory is beneficial for any level of tree maintenance completed on the golf course. You have to know the tree species, its specific requirements, and the life expectancy in order to plan and prioritize pruning work and other maintenance and planting programs. This information is critical even if the primary maintenance work is completed by outside contractors. The inventory should identify tree species, map their locations, estimate approximate age class and tree condition, provide site characteristics, and any other pertinent notes. The tree's estimated intrinsic and monetary values might also be included in the inventory. Computer software, such as the Trims Tree Management Program, can be helpful in producing the inventory.

Identifying the various tree species may be the most intimidating hurdle in completing the inventory. The services of an arborist or employee with training in tree identification are definitely recommended, especially if a superintendent's dendrology skills have faded. The inventory might serve as a good project for a summer placement student with knowledge in tree identification. There are also many good books and keys available to aid in the identification process. University specialists, extension agents, or local nursery personnel can also provide assistance if the challenge is too great. Estimating monetary values is more complex and should be left to an experienced arborist.

Tree Evaluation

The tree plantings should be thoroughly inspected on an annual basis to

Applying Round-up to control grasses at the base of trees can be a tricky process. By using a form and a wick applicator, a very clean line is produced.

evaluate their condition and establish maintenance priorities. The inspection would determine where tree pruning work, individual tree removals, stand thinning, and new tree plantings may be required. Fertility, pest management, and other maintenance programs should be developed based on the results of the evaluation. Information from the evaluation and tree inventory, together with input from the superintendent, golf professional, and green committee members should be used to target sites where trees affect turf quality or negatively influence play.

Pruning Techniques

Pruning work is a primary part of tree maintenance programs. Unfortunately, the work is not fully utilized in many golf course tree care programs. Pruning is used to enhance or modify a tree's natural growth form. Remedial pruning is completed regularly to remove diseased, damaged, poorly attached, or crowded branches to improve a tree's structure and appearance. Tree size can be maintained to a certain extent with pruning. Pruning is also used to help train young trees. Pruning can stimulate flowering in ornamental trees and vigor in stressed or stagnated trees. Selective pruning is frequently completed on golf courses to increase light penetration and air flow to the tree and surrounding areas. Tree canopies are also raised from the ground to gain more air movement and access below the tree. Finally, root pruning is used to remove girdling roots from the base of tree trunks and where tree roots are aggressively competing with the turf.

The impact of the pruning work on the tree can be minimized by properly positioning and completing the cut. The old standard flush cut is no longer recommended except for adventitious water sprouts or sucker branches. Branches should instead be cut along the outside edge of branch bark ridge (shoulder rings) and collar to minimize the wound's size and allow the tree to callus over the cut more quickly. There are several techniques followed to make a proper cut, depending on branch size. Smaller branches are often cut with hand shears or hand saws, while large hand saws or chain saws are used for larger cuts. Larger branches require a series of cuts to prevent the bark and wood from tearing and splitting back into the tree. The first cut is made on the lower side of the branch, usually 1 to 2 feet from the crotch. The cut is made upward about a quarter of the diameter or until the saw begins to bind. The second cut is completed on top of the branch and placed outside the first cut by 1 or 2 inches. The second cut allows the branch to break cleanly off the tree. The final cut is then made at the crotch, as recommended above. Heavier branch stubs may need to be undercut and/or supported during the final cut to avoid tearing the bark.

Applying wound dressing is no longer recommended. The dressings may actually delay the process by which the tree recovers from the wound. Paints are sometimes used to mask or improve a wound's appearance, but those too will have no other beneficial effects. Trees naturally isolate the wounds by developing a chemical barrier in a process termed compartmentalization. The barrier prevents most decay fungi and bacteria from entering surrounding wood as the tree produces callus tissue which in time will cover over the wound.

The timing of the pruning operations depends on the purpose of the pruning work, the type of tree, and its condition. Minor or light pruning work can be completed at any time of the year. Dead, diseased, weak, or heavily shaded branches can also be removed at any time with little negative effect on the tree. Plant development will be affected least if the pruning work is completed prior to the period of most rapid growth. The majority of deciduous trees can therefore be pruned during winter dormancy and until spring growth resumes to correct structural problems. Evergreen trees should be pruned just prior to spring growth to minimize the chance of cold temperature injury around the wounds. Trees such as maples, birch, and elm can

After several years, moss has started to establish, creating a nice groundcover.

Controlling grasses around the base of trees can speed up mowing and prevent mower damage, but it also creates a delicate situation when it comes to control measures. Careful applications need to be made to avoid injury to the tree.

If left untouched, this girdling root could eventually kill the tree.

Before the girdling becomes too advanced, removal of the offending root can extend the life of the tree.

Site inspections should include reviewing potential agronomic problems caused by trees. The trees surrounding this green need to be selectively pruned to permit more light to penetrate to the green.

bleed heavily if pruned in early spring. The bleeding can be minimized if pruning is completed in very late fall, early winter, or mid-spring. Heavy bleeding can create unsightly stains and delay the onset of callus tissue formation.

Reducing the tree's growth rate and size is accomplished most effectively if pruning work is completed after the season's growth flush has occurred. Pruning work should be scheduled in spring to midsummer for this purpose. Keep this in mind when thinning tree canopies to gain additional light and air flow. Late summer and fall pruning work is least favorable, as larger wounds recover more slowly and are more susceptible to the decay fungi that sporulate in fall. Callusing is most rapid if pruning work is completed prior to or soon after tree growth resumes in spring. Use even more care when completing pruning cuts during and immediately following the rapid spring growth period, as the bark is particularly tender and is easily torn.

Pruning Young Trees

Nursery stock should have relatively good growth form. Do not accept planting material if the structural branches are not uniformly spaced, are too close together, or are poorly attached. However, even good quality nursery stock will likely require some pruning work as the trees mature to maintain good structure and branching. Pruning should be minimal at the time the tree is planted. Broken or damaged branches can be removed, as can adventitious shoots. It is best to complete major pruning work during the tree's early establishment period, as pruning wounds are smaller and the work easier to complete. Large-scale corrective pruning should be spread over several years to avoid excessive stress on younger trees.

Training very young trees is a complex matter requiring knowledge of the tree's growth form and function on the golf course. Young trees should be inspected for uniformly spaced vertical and radial branching and sound branch attachments along the main leader. Remember, these young branches serve as the main scaffold branches as the tree matures. Larger growing trees should have wider spaced main or scaffold branching along the trunk for optimum strength, while smaller growing trees should have more closely spaced branching. The lateral branches should not be larger than the trunk or main leader, as they compete for dominance and result in a weak attachment. Horizontal branching and wider angle branch attachments usually result in stronger connections, which are more desirable.

Root pruning is a common practice on golf courses where tree root competition reduces turf quality. Recent studies have found that root pruning work can be completed at distances closer to the tree than once thought, if the remaining tree root system is left intact.

Pruning Mature Trees

Corrective pruning measures required for mature plantings generally are more severe and costly to complete, especially if the trees received little care in the past. Inspect the tree canopy and specifically look at scaffold or main branching to make sure the tree's canopy is well formed and in balance. Poor quality branches, or those that are diseased, dead, or interfering with each other should be removed. This process is often referred to as *dead wooding*. Tree canopies that create excessive shade, block air movement, affect play, or crowd each other can be addressed through *crown reduction* or *crown thinning*. *Raising the crown* is the term used for pruning work completed to raise the tree canopy off the ground to increase light penetration and air movement.

Dead wooding is especially important for older trees that contain hazardous branching or decayed wood. Such wood should be removed, along with any vines or foreign material. This type of pruning is often completed prior to initiating crown thinning or reduction work. Removing the weaker branches and dead wood makes it easier to determine the additional pruning work required. Dead wooding also is an excellent tool used to manage certain pests. However, diseases such as fire blight and other canker-forming disorders can be spread through pruning wounds, making it necessary to disinfect pruning tools following each cut.

Crown thinning is completed to highlight a tree's branching and to increase light penetration and air movement through the canopy. Trees with overly dense canopies benefit from opening the canopy. The additional light promotes stronger growth of the remaining branches, encourages lateral branch development, and increases branch tapering to make the tree less susceptible to storm damage. Wind resistance can also be reduced by selective thinning work. Crown thinning can result in the removal of a third or more of the tree's canopy, which should not affect vigorous deciduous trees. However, beech, birch, hornbeam, eucalyptus, walnut, and most conifer trees are less tolerant of severe pruning and therefore should have less of the canopy removed at any one time.

Crown reduction is also a relatively common procedure used to keep trees within size requirements. This type of pruning is often used to overcome earlier mistakes in planting judgement. Tree size can be controlled most effec-

tively if pruning is initiated before the tree reaches the desired size. Pruning cuts will be smaller and the tree's appearance less affected. Trees that require frequent crown reduction work probably should be replaced, as their natural appearance will be altered. Crown reduction also can be an effective means to address overcrowded tree stands. The canopies of the smaller and less desirable trees should be severely pruned, allowing the surrounding trees to develop properly. The pruned trees eventually will be removed as the preferred trees develop.

Thinning-out, heading, and *pollarding* are pruning techniques used in crown reduction. Thinning-out is the preferred technique when the tree's natural growth form is to be maintained. It involves pruning branches back to lower laterals (drop-crotching) that are at least a third the diameter of the branch being removed. Heading is used to drastically reduce canopy size. It involves pruning the main branches back to stubs. This form of pruning can leave very large wounds that may never callus, thus providing sites for decay. It also results in very dense, upright, and vigorous branching immediately below the cut. The resulting branching is unnatural in appearance, poorly attached, and generally not safe. It is not a recommended technique for most situations. Pollarding is a type of heading operation used in more formal landscape situations to keep larger growing trees under size control. This technique is rarely used on golf courses.

Raising the crown is often completed on conifer trees whose lower branch whorls affect maintenance or play, or block sun and air flow. This is completed by removing lower branches completely or pruning them back to the next largest, upright lateral branch to reduce weight. Similar work is completed on deciduous trees during the growing season when the branches are in full leaf. This operation is often objectionable to many people, who dislike the unnatural appearance it can create. It is possible to raise the canopy height and still maintain a somewhat natural appearance if the work is done carefully and extended over several seasons.

Root pruning is another common practice on golf courses where tree root competition reduces turf quality. Individual tree roots may also have to be pruned manually if they begin to girdle the tree. Tree roots are severed at a 12- to 20-inch depth using a power trencher, vibratory plow, backhoe, or root cutting saw. Standard recommendations are to provide 1 foot of distance between the pruning trench and tree per inch of tree diameter at chest height. Recent studies indicate, however, that pruning along one side of moderately sized, healthy trees can be completed at distances of 3 feet and closer without seriously affecting the tree's growth rate or survival as long as the remaining root system is intact and unrestricted. Larger and slower growing trees might show more severe effects from such close pruning. The study also demonstrated that the negative effects of severe single- and multiple-side root pruning could be reduced by thinning the tree's crown following the operation. Pruning more than one side of a tree in a given year will cause more stress and could leave the tree less stable.

Trees will continue to be a very important part of most golf courses. Hopefully, this article has changed the way you look at trees and tree care programs at your golf course. It is important to remember that the passion reserved for trees does not have to be devoted entirely to new planting programs. Institute a new philosophy for trees that addresses maintenance needs equally with new planting programs. Develop a tree inventory and, if possible, add a tree specialist to your staff, or become more familiar with trees yourself to better develop and implement pruning and other maintenance programs. The existing trees will definitely benefit, as will new plantings, which will be made with more scrutiny. Turf and trees can coexist nicely, especially if we do not allow blind affection to get in the way of reality.

This 12-inch drainage pipe was filled with willow roots three months after installation.

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Wildflowers on Your Course?

They may provide a welcome new dimension to your course.

by JOHN M. KROUSE

IF YOU haven't planted wildflowers on your golf course yet, you'll probably find it hard to resist the temptation much longer. Wildflowers are everywhere! Whether they're planted along highways or in suburbs, low-maintenance wildflowers have become an accepted landscape alternative to turfgrass and gardens across the U.S. And now that wildflower seed is more widely available than ever before, many golf courses have begun to experiment with wildflowers, too.

The popularity of wildflowers isn't difficult to understand. Wildflowers attract birds and butterflies, are colorful, and are usually easy to grow from seed. In many respects, wildflower plantings have all the desirable qualities that people expect from more formal landscape plantings, but unlike any other landscape planting, wildflowers often seem to have the ability to become part of the landscape. The relaxed way that wildflower plantings fit and blend into a landscape, for instance, may explain more about the reasons for their popularity than their colors or fragrance alone can explain.

It's surprising that the popular acceptance of wildflowers for low-maintenance landscaping has taken so long to develop. There are millions of acres of park and recreational land that fall somewhere into the landscaping middle-ground, that big space that lies between the carefully maintained and the truly wild, and which wildflowers seem so remarkably able to exploit.

Whether wildflowers will someday rank among our most common plantings, or simply become one of the more pleasant ways to mark the transition from the civilized world to the natural world is difficult to say. However, it is certainly clear that there are few landscape materials better suited or more deserving of wider use on America's golf courses than wildflowers.

Like any landscape material, a wildflower planting can't succeed without planning and some provision for its management. The good news is that a

Bachelor's button, corn poppy, and dame's rocket bloom in a first-year planting. These annuals were introduced at low seeding rates to add some color while the perennials got established.

few modest wildflower plantings are probably among the most attractive, most cost effective, and most interesting landscaping improvements a golf course can make. And best of all, superintendents overwhelmingly report favorable responses from their membership when they plant wildflowers.

The bad news is that wildflower maintenance is a very new technology and is extremely dependent upon geography and climate. Because of this fact, wildflower plantings often require management skills that most golf course superintendents don't have . . . yet. Sadly, it is also true that many superintendents who were the talk of their clubs when they planted large wildflower areas were once again the subject of conversation when their plantings were overrun with weeds within a few months. Most just didn't understand the need for selecting wildflower species adapted to their area, or the need to destroy weed populations before seeding.

A breathtaking display of annuals is the hallmark of a well-established first-year planting.

Three Things to Remember

In many ways creating a successful wildflower planting is a complex task, but one which depends upon three fairly simple and universal factors: proper site selection, proper seed mixture selection, and proper timing.

When appropriate sites are selected to plant wildflowers, the most important step is taken towards guaranteeing the long-term success of the planting. Unfortunately, one of the biggest traps that superintendents fall into remains failing to understand the importance of seeding wildflowers in the sites that are best for *the flowers*, and not in those problem sites on the course where *nothing else* really grows well.

Most likely, the species that will be selected for a typical wildflower planting will be the ones that need a lot of sunshine and that require a soil of at least average fertility and water-holding ability. The reasons why are easy to understand: flowering takes energy and nutrients. Without sun, water, and a good supply of soil minerals, the wildflower plants just can't make the growth necessary for good flowering. In general, if the site is too shady, infertile, or droughty to support a good cover of grass, then it is probably a site where wildflowers won't grow well either.

So where to put them? Hopefully, at least some of the sites with good sun and soil will also be among the places most easily seen and appreciated by golfers. Most courses have plenty of transitional spots — those places between fairways, at the edges of woods, and at the borders of the property that everyone can see, but which no one ordinarily notices. Wildflowers work well where the line between deep rough and woods is a bit fuzzy, or where roadways and neighboring fields come within view, but aren't really a desirable part of the scenery. Ironically, wildflowers often look better in the middle ground, the viewing space between 25 and 100 feet, than at closer or farther distances. The vivid colors of wildflowers are easily noticed in the middle ground, but their often scraggly off-season appearance is usually not so objectionable.

Wildflowers also differ in one very important aspect from turf. Wildflowers rarely rebound gracefully from foot or vehicular traffic, so it's usually best to keep them out of places where errant balls often land. A ball that goes into the wildflowers is almost certainly a lost ball, but it only takes a few determined players to flatten a (formerly) nice stand of wildflowers. Make sure you plant them safely out of play.

It's important to give the needs of your workers some consideration, too. A wildflower planting will need some maintenance over the years, and usually more than most superintendents suspect. A typical wildflower planting may only be mowed once per year, but most will require at least a few hours of weeding a few times through the year. Eventually, maybe in three to seven years, most wildflower plantings will require major renovation and reseeding. The one thing you don't want to do is plant your wildflowers in

Good Places for Wildflowers

- Sunny, open sites with good soil and water-holding ability.
- Transition areas, out-of-play rough, edges of woods, fencelines, etc.
- Sites where seasonal color will add interest to the course.
- Easily accessible sites that you can maintain.

Bad Places for Wildflowers

- Small, narrow, or awkwardly shaped sites.
- Windy or busy sites that collect blowing trash.
- Sites with frequent foot or vehicle traffic.

a site where any of these tasks will be difficult or impossible to do.

Wildflowers cannot be squeezed into small spaces. Even worse are long, thin, or oddly shaped island beds or borders that are close to walkways, clubhouses, or parking lots. Naturalized plantings rarely look right in such tight quarters, and under such circumstances the wildflowers invariably behave poorly. They grow tall and flop over, get in the way of lawn mowers and pedestrians, or end up collecting litter. Whenever a wildflower planting is put into a tight or carefully laid-out spot, you can almost bet that the planting is probably also in a highly visible location in the viewing foreground (less than 25 feet away). In the winter it will look shabby and collect blowing leaves, and in the summer it will look too wild for its site and accumulate paper and other debris.

Proper seed mix selection is very important. The key is learning the names of the best adapted species for seeding in your area. Depending upon your region, there may be many native species to choose from or only a few. If your golf course is in the Midwest, for instance, there's probably a wide variety of native prairie species for you to choose from. On the other hand, if you are in the East, there are only a few dependable native species, but also some very good introduced species. As a rule, however, native species are usually the best adapted when planted in their area of origin, and a seed mix that features locally grown native species is the best bet in many areas of the country.

Check with your local cooperative extension service, state highway administration, and local naturalist organizations for their recommendations. The seed for an acre of wildflowers usually costs between $300 and $800. Compared with many club expenses, it's not a fortune, but it's money that you must spend wisely if you want good results. There are literally hun-

Wildflower Seed Mixes to Look For

- Include a variety of perennials for permanent groundcover.
- Many of the species are native to your geographic area.
- Annuals are included at low seeding rates for non-competitive first-year color.
- Color display changes throughout the growing season.

Wildflower Seed Mixes to Avoid

- Mixes that contain predominantly Eurasian annual species.
- Inexpensive mass-marketed mixes; "meadow-cans."
- Mixes that include the seed of tall-growing or weedy species.
- Mixes with inert filler or grass seed included.

Proper site selection is a key to successful wildflower plantings. This location is not a suitable site.

dreds of wildflower seed companies in business today; it's no longer difficult to get good quality wildflower seed. If you don't wish to use a seed mixture that your local seed company offers, many mail order companies will custom mix seed to your specifications, usually at no extra charge.

The biggest problem with establishing permanent wildflower plantings is weed invasion. Most of the time when weeds are a problem, the site was not adequately prepared in advance of seeding, i.e., the perennial weeds and grasses were not killed, and when the area was seeded, the weeds rapidly reestablished themselves. Usually, if time and care are taken, the vegetative parts of colonial perennial weeds can be destroyed before the area is seeded, but this usually requires a minimum of two to three months lead time.

Over the long term, it is usually perennial weeds that are most troublesome in a permanent wildflower planting. Annual weeds are usually a problem in the first year of a planting, and sometimes the second year of the planting as well. Unfortunately, however, many wildflower plantings are ruined after only a few months when aggressive annual weeds are a problem in the first year; there may be no second year.

Once again, check with your local authorities for tips about reducing annual weed seed in the soil, or planning your seeding to avoid the prime germination periods of the most troublesome annual weeds. In certain regions of the U.S., particularly in the Southern Plains, no-till seeding methods can significantly reduce weed infestation. Unfortunately, no-till seeders designed for use with wildflower seed are very costly.

Proper Timing Pays Off

- Order your seed mixes well in advance; supplies sometimes run out!
- Allow several months to complete the necessary soil preparations.
- Kill all perennial weeds before seeding.
- Plant seed when annual weeds will be least competitive.

Haste Makes Weeds

- Hastily purchased seed mixes waste time and manpower.
- Improper soil preparation allows the rapid return of weeds.
- Seeding at the wrong time of year invariably promotes weeds.

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The grass in the foreground was not killed before seeding this two-year-old planting. Over time, the grass has outcompeted the wildflowers.

CONTROL THOSE *SHRINKING GREENS*

Pay close attention to avoid those slow, incremental changes.

by KEITH HAPP

HAVE YOU EVER noticed how the size of a putting green seemingly changes over a period of time? We all realize that putting greens do not actually grow or shrink. However, because of fast growth and frequent mowing, this concern about putting green size is real.

At many courses, seasonal workers are employed to mow putting greens, and many of these employees may not have worked on a golf course before. Prior to mowing that first green, each crew member is instructed on the entire procedure. This includes: lowering and raising the mower when entering and exiting the surface; turning (*off* the collar!); cutting in a straight line; and, the final step, the cleanup pass or passes.

During the training process, mowing a green can be an eye-opening experience. The cleanup pass is always nerve racking for new employees because they do not want to make a mistake. When their training is complete and crew members are on their own, the last thing they want to do is scalp the collar. To minimize the chances of this occurring, they tend to mow just inside the green/collar perimeter, and over time the putting green surface area can shrink. If this pattern is left unchecked,

Over time, a great deal of putting surface, as well as hole locations, can be lost to shrinking greens.

(Above) Originally two paint guns were used to mark the collar width of each green. The tool is held together with PVC pipe, but moves easily along flowing putting green contours.

(Left) The tool has been modified slightly since its inception. The collars are checked periodically during the year. If major changes are necessary, they are performed in the fall.

collars begin to widen while greens become smaller.

Some facilities do not rely on seasonal help. Rather, they opt to employ part-time (nine or ten months) or full-time workers to meet their staffing needs. Crew members are cross-trained in many jobs so that daily course preparation can be completed. But even well-trained and reliable crew members tend to err on the conservative side when completing the cleanup passes for each green mowed. Again, the greens may begin to shrink.

Jim Loke, CGCS from the Bent Creek Country Club, Lititz, Pennsylvania, devised a method to address the shrinking green problem. Initially, two paint guns were used to mark a consistent collar width around each green. The paint guns are held together by PVC pipe. It produces a rigid marking tool that allows Scott Chaffee, Assistant Superintendent, to check the 36" collar width. The marking apparatus has since been modified to allow the process to be more efficient and user friendly.

The procedure is performed periodically during the season, and if the shape of the green being marked has not changed, then there is no need to paint an edge. However, if major adjustments are needed, they are made in the fall. This tool provides a fast and accurate method for maintaining the shape of the putting surface and a consistent collar width to control those *shrinking greens.*

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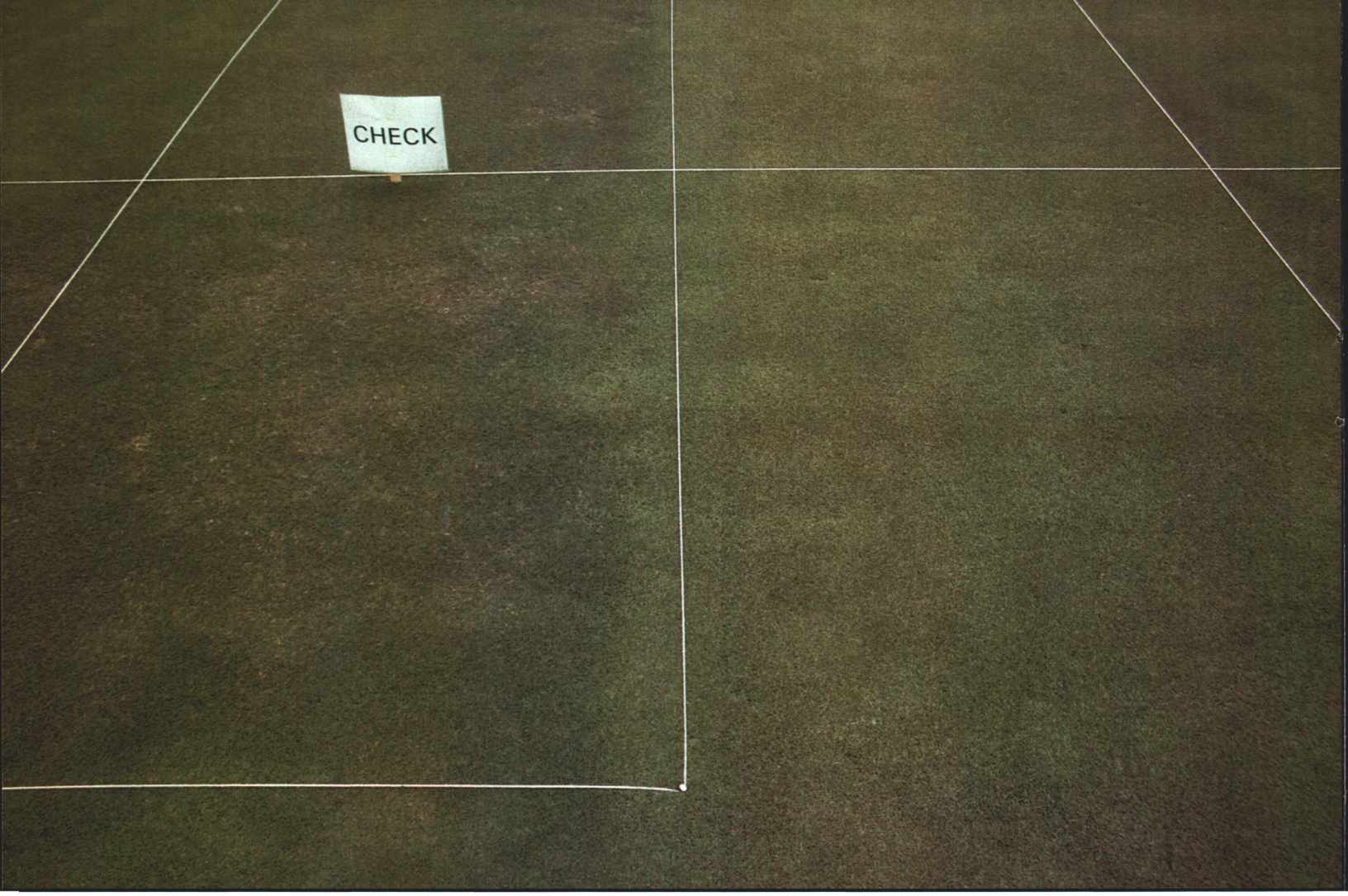


A phosphorus deficiency often shows up as purple areas that resemble wilt. While this is more common on high-sand-content root zones, soil testing is the key to accurate diagnosis.

A Practical Approach to Putting Green Fertilization

Have you ever felt a little confused about how to fertilize putting greens?

by R. A. (BOB) BRAME

PUTTING GREEN fertilization is high on the list of potential agronomic pitfalls in golf course maintenance. There are many different types of fertilizers available and just as many thoughts on how best to use them. This situation makes it easy to understand how the subject can be confusing. To simplify the process, consider the following three-point approach to bentgrass/*Poa annua* putting green fertilization. The focus is on maintenance fertilization, not grow-in, and the target area is the central and northern part of the country.

Before a putting green can be properly fertilized, soil testing must be done. Regular, yearly testing has the greatest value in monitoring soil chemistry. Testing every second or third year, and/or collecting samples from different areas each time, reduces the value of information collected. Samples should be submitted from each green on the course, or representative sampling may be appropriate. If all the greens are constructed the same, rep-

resentative sampling should work well, while helping to hold down costs. Identify the best, worst, and one average green. Collect the samples at the same time each year and stay with the same laboratory. This process eliminates a few variables that can compromise the value of the data. Consistent soil testing will produce a database of information that can expose trends and/or potential problems that may be present. Soil tests make it possible to focus on needed nutrients and the proper ratio for applying them.

With soil tests in hand, the first step in a solid putting green fertilization program is pushing plant growth in the fall. This should be initiated in late summer/early fall, when nighttime air temperatures moderate and soil temperatures decrease. The actual date will vary, but when growth accelerates from cooler nights, it's time to go to work. To achieve maximum push of plant growth, select fertilizers that contain readily available nutrients. Avoid slow-release fertilizers during the important late summer/early fall window. The first application should be made at or slightly below one-half pound of nitrogen per thousand square feet. Split the rate in half and apply in two directions, perpendicular to each other. This should be lightly watered-in immediately after application.

Often, this application will coincide with early fall aerification. Aerification provides the space for root growth, and fertilization adds the food to make it happen. If the nutrients in the fertilizer are readily available to the plant, growth response will be conspicuous. Closely monitor clipping production and when it levels (or begins to drop) for two days in a row, make another application at the same rate. Using readily available nutrients, it is possible to allow the growth response from an application to dictate when the next feeding is needed.

As the fall season progresses and soil temperatures continue dropping (plant nutrient uptake slows), the time between fertilizer applications will increase. If there are different CEC (Cation Exchange Capacity) levels in various greens, monitoring growth response (on each green) will aid in determining application frequency. Lower CEC levels will require more frequent applications. Keep in mind, also, that the same package and analysis of nutrients may not be appropriate for all greens. Sometimes all the greens on a course can be fed the same; however, often this is not possible. Regular soil testing and the use of readily available nutrients in the early fall are the keys to determining nutrient needs and application frequency.

Step Two is the application of a slow-release fertilizer in late fall/early winter, when top growth has nearly stopped. Natural organic fertilizers can work well as a late fall/early winter feeding, even though theory may suggest that other forms ought to work better. After the last mowing for the season (or what may be the last mowing for the season), a natural organic fertilizer can be applied at a high rate. Depending upon the actual product being used, a rate of between one and two pounds of nitrogen per thousand square feet should work well. Avoid mowing for a few days following the application. Recognizing there are differences in the natural organic fertilizers on the market, there would be value in establishing a few test plots to determine which works best for you. A synthetic slow-release fertilizer, at a lighter rate, could be an alternative to the use of natural organic materials.

The heavy feeding, in late fall/early winter, will trickle feed the turf through the winter (depending upon soil temperatures/microbial activity) and on

The presence of moss often indicates, as the Scottish say, "poverty in the soil." Surface moisture and low mowing heights can combine with hungry turf to enhance moss encroachment. The long-term control of moss will involve carefully reviewing soil tests to identify any deficiency and/or increasing overall fertilization.

into the spring season. The combination of pushing growth through the fall, with readily available nutrients, and closing out the season with a heavy application of a natural organic fertilizer, will help reduce (if not eliminate) the need for springtime applications of granular fertilizers. Excessive nitrogen fertilization in spring can result in the production of lush top growth at the expense of root development. Should mid-spring fertilization be needed (possibly with lower CEC levels, i.e., high-sand-content root zones), select slow-release fertilizers. Keeping spring fertilization to a minimum and focusing on fall and early winter feeding places the emphasis on root growth, while reducing the chances of lush top growth.

The third and final step is the use of soluble (readily available) fertilizers, applied through a spray tank, from mid-spring through the summer months. As soil temperatures increase, a grass plant (cool season) will not pull nutrients efficiently from the soil. Instead, to survive, it will use carbohydrates stored in the root system. This is one reason why roots normally shorten as the summer season progresses. Foliar feeding of the turf will help reduce root shortening. Soluble fertilizers, sprayed on the grass plant, are predominately absorbed through the foliage. This eliminates the need to depend upon roots to take up nutrients. The results, as the summer season progresses, are more stress-tolerant plants and deeper roots.

Select a soluble fertilizer containing N, P, and K. Soil test results can be a guide for the ratio of N, P, and K to use. However, even if soil tests show adequate levels of P and/or K, each should be present in the soluble fertilizer used. Often, field experience has shown a 1-1-1 ratio to work well. A little experimentation may be necessary to decide the best ratio of N, P, and K for your program. In most cases, minor nutrient applications should be done in the fall, via granular materials, as soil tests dictate. The exception could be an occasional application of soluble magnesium, especially on greens containing a high percentage of *Poa annua*, or iron for color.

Initially, target applications of soluble fertilizers at a rate of .10 pound of nitrogen per thousand square feet every seven to ten days. Well-maintained and properly calibrated spray equipment is very important. If a growth surge occurs, reduce the rate. The intent is not to push growth, but to maintain plant development from previous fall and spring (if necessary) feedings. When applied at light rates, soluble fertilizers are safe even when it is hot. If there is apprehension during abnormally high temperatures, slightly lower the rate.

Commonly, soluble fertilizers can be tank-mixed with fungicide applications. To do this, first check the fungicide label(s) for compatibility. Even if it is necessary to apply a soluble fertilizer by itself, the benefits more than justify the cost. The key to achieving full value from spoon feeding with soluble fertilizers is consistency with the light and frequent applications.

We have all heard it said, "You are what you eat." In a like manner, the grass plant *is* what it is fed. Fertilization is a foundational component in the maintenance of healthy putting green turf. A healthy plant is more stress tolerant, providing a greater margin of safety when times get tough. Healthy turf also means more dependable playing surfaces.

This three-point approach . . .

(1) push growth in the fall with readily available nutrients

(2) close the season with a high rate application of a slow-release fertilizer

(3) light and frequent applications of soluble fertilizers from mid-spring through the summer

. . . will provide continuity from year to year while still permitting flexibility in managing traffic volume, weather conditions, and different soils.

Thin, hungry turf opens the door for Poa annua *and other weeds to invade. Weak turf is also more vulnerable to stress factors of all types. Good playability is directly tied to good fertilization.*

R. A. (BOB) BRAME *is Director of the North-Central Region of the USGA Green Section.*

Managing Wildlife and Habitat

Consider the ways your course can fit into the environmental "big picture."

by RON DODSON

Interspersing native vegetation throughout the course not only provides a beautiful, diverse landscape, but important travel corridors for wildlife. Breckenridge Golf Club, Breckenridge, Colorado.

HABITAT. What is it? Where is it? Who's responsible for managing it? Some people seem to believe that habitat is a nesting box (what), hanging on a tree (where), that was put there by the state fish and wildlife department (who). Although this may be a popular view, managing wildlife and habitat requires a broader perspective of the needs of wildlife and a greater understanding of habitat requirements.

Habitat is the necessary biological component that all living things need to survive and prosper. To carry on the biological functions of life, all species need food, shelter, water, and space. Therefore, the nesting box described above clearly provides shelter, but it does not provide water, food, or adequate space; therefore, a nesting box is not habitat. It is merely a component of habitat.

It is important, then, to look at your property in its entirety, not just one small portion of it. In fact, it is vital to look at the entire area *surrounding* your property, including land and water that you do not own or manage. Wildlife does not recognize the artificial borders that we have established to define human land ownership. Birds merely fly, reptiles and amphibians merely crawl, and mammals merely move wherever they want to secure what they need in order to survive and carry on life. That is why the farmer's field may be an excellent feeding ground for Canada geese, but your lake or pond and mowed turfgrass may provide excellent shelter and protection as well. So the habitat you create on your golf course may be only a small portion of a much larger habitat area that extends well beyond your ownership borders. On the other hand, some species of wildlife will never leave your property at all, and some may not even move beyond a few square yards.

Although it may be true that various government agencies have the legal responsibility for fish and wildlife regarding hunting and fishing, they are not the only people who have wildlife management responsibilities. Every one of us must shoulder responsibility in this regard. For example, local land planners who give or deny permits for construction affect wildlife and their habitats because of their decisions. Homeowners affect wildlife and their habitat by the manner in which they landscape their lawns and select materials to use in building their houses. Golf course superintendents, too, are really much more than just "keepers of the green." They are in fact natural resource managers, and the decisions that they make, or that they are guided to make by the members of their course, can and do affect wildlife and their habitats.

These decisions start right around the clubhouse with the selection of landscaping materials. Why not select plants not only for their beauty, but for their value to butterflies and hummingbirds? Why not identify out-of-play areas that are presently maintained with constant mowing and maintenance and revert these areas to native or naturalized habitat areas that will benefit wildlife? To cite another case, why not include a simple bird bath near the clubhouse for a water source? Out on the course, consider the back sides of tees as potential habitat enhancement areas. Look at the forests and fields between fairways as potential places to provide shelter, food, and even water in a way that will not diminish the game of golf, but enhance the opportunity for a variety of wildlife species to move from one part of the course to another.

Course water features can also be managed with wildlife in mind. For

Steep slopes are perfect locations for natural, "no-mow" areas.

example, creating buffer or no-mow zones around the edges of water features not only provides a buffer between managed golf areas and the water, but provides habitat for frogs, toads, turtles, and many bird species. In addition, taller vegetation around the edges of ponds and streams can create a cooling effect on the water temperature, thus benefiting many varieties of aquatic creatures, that may in turn be important food sources for fish. Placing basking logs in water features where turtles may sun themselves is an important and necessary habitat requirement for these species, and an easy project to undertake.

The most important point to remember regarding our wildlife management responsibilities is to think about the property in its entirety. Do not relegate your wildlife management efforts to a small portion of the overall property. The wildlife that uses your property is not confined merely to the areas you manage. We all manage wildlife, whether we know it or not. Every decision you make as a land manager affects wildlife. The effects can be positive or negative. The goals should be to affect wildlife and their habitat positively and blend the needs of wildlife into the overall management objectives of the game of golf. In the end, wildlife will flourish on your course, and the game of golf will be better off for your efforts.

We are looking for slide photographs of great examples of "conservation golf holes." If you have a good slide of one of your best examples of how you have blended great wildlife habitat into your golf course, send it to: On Course With Nature, c/o The Audubon Cooperative Sanctuary Program, 46 Rarick Road, Selkirk, New York 12158. The best examples will be used in future publications to spread the word to others about your efforts.

Spotlight on Wildlife and Habitat Management

The Standard Club
Duluth, Georgia

The Standard Club consists of 300 acres of diverse habitat, including woodlands, lakes, ponds, and wetlands, and fields of clover, wildflowers, broomsedge, and prairie grasses. In addition to the extensive natural areas on the course, there are 60 bluebird nest boxes, as well as nest boxes for wood ducks, woodpeckers, and bats. Two large perennial gardens were planted to attract butterflies and hummingbirds, and five different feeders are provided for songbirds. Water features on the course are maintained with extensive vegetative buffers in out-of-play areas. The Standard Club's wildlife inventory currently includes 36 bird species, 13 mammal species, 18 reptile and amphibian species, and 29 butterfly species. Plans for the future include restocking two ponds with bass and bream, expanding the number of nest boxes, and extending natural areas.

Breckenridge Golf Club
Breckenridge, Colorado

The diverse habitat at Breckenridge Golf Club includes coniferous woodland, lakes, streams, and freshwater wetlands featuring beavers. In addition, club staff has seeded wildflower areas, created a hummingbird garden, and planted pine, spruce, cottonwood, and aspen trees. Landscaping with native plants throughout the course provides additional food and cover for wildlife, and establishing a nest box program provides valuable sites for cavity-nesters. The success of Breckenridge's wildlife cover and food enhancement projects is illustrated by the extensive wildlife inventory that currently boasts 47 species of birds, including northern goshawks, kestrels, flycatchers, ravens, warblers, mountain bluebirds, and a great horned owl with her two fledglings.

Gull Lake View Golf Club
Augusta, Michigan

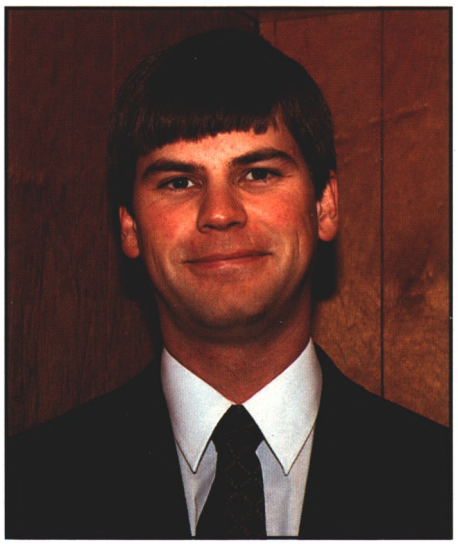
The Gull Lake View Golf Club includes five courses encompassing 860 acres of northern hardwood habitat. The site includes woodlands, tall grass, lakes and ponds, freshwater wetlands, and a creek. Their wildlife inventory includes an abundance of species, including 49 birds, 18 mammals, and more than 13 reptiles and amphibians. This year alone has featured a mating pair of red-shouldered hawks, a resident mink, and a breeding pair of red-headed woodpeckers. A unique contribution of the club has been its involvement in 15 years of Canada goose banding research in cooperation with the Kellogg Bird Sanctuary located in Augusta. In addition, Gull Lake View has had wonderful success with its nest box program for bluebirds, wood ducks, and purple martins. These boxes also serve as overwintering sites for cedar waxwings and bluebirds. Raising mowing heights around ponds and creating brush piles has also helped to provide additional cover for wildlife.

RON DODSON *is President of the Audubon Society of New York State, with headquarters in Selkirk, New York.*

NEWS NOTES

Matt Nelson Replaces Bob Senseman in the Northeast

The Green Section is pleased to announce that Matthew C. (Matt) Nelson has accepted the position of agronomist with the Northeastern Region. He will be located in the region's main office in Easton, Pennsylvania, working with Regional Director David Oatis and Agronomist Jim Skorulski. He will conduct Turf Advisory Service visits in the North-



Matthew C. (Matt) Nelson

east, with the majority of his time concentrated in New York and New Jersey.

Matt most recently has worked toward securing his Master of Science degree in Turfgrass Science at Washington State University, in Pullman, Washington. His duties included service as a research/teaching assistant where he helped with turfgrass research projects and taught the lab for the turf management class.

A native of Whitefish, Montana, Matt attended Willamette University in Salem, Oregon, where he earned a Bachelor of Science degree in both Biology and Environmental Science. He has served on the greenkeeping staffs of several golf courses, including Whitefish Lake Golf Club in his hometown of Whitefish.

The Green Section extends a warm welcome to Matt. The golf courses in the Northeastern Region will surely benefit from his knowledge and enthusiasm.

Bob Senseman, who served as agronomist for the Northeastern Region of the Green Section since February of 1994, has left the staff to return to the Pacific Northwest as the golf course superintendent at Oswego Lake Country Club in Lake Oswego, Oregon. The Green Section thanks him for all his fine work on the USGA's behalf, and wishes him all the best in his new duties in Oregon.

USGA Receives Award

Renew America, a Washington, D.C.-based network of community groups, environmental organizations, businesses, government leaders, and civic activists involved in environmental improvement, has selected the USGA to receive its Certificate of Environmental Achievement. The USGA will be listed in Renew America's 1996 **Environmental Success Index**, a compilation of over 1,600 outstanding environmental programs from around the country. Before being included in the Index, programs such as those sponsored by the USGA must undergo a rigorous verification process, including community references, review by state and local experts, and careful screening by the National Awards Council for Environmental Sustainability, a coalition of 60 environmental organizations coordinated by Renew America.

Monty Moncrief, Southeastern Region Director from 1960 to 1982, was honored posthumously with the Georgia Turfgrass Association's Lifetime Achievement Hall of Fame Award. Monty's wife, Mrs. Joy Moncrief, was on hand at the Georgia Turfgrass Conference and Show, December 13, 1995, to accept the award from Doug Moody (middle), Executive Director of the Georgia Turfgrass Association, and Patrick O'Brien, USGA Green Section Southeastern Region Director. Monty visited more than 5,000 golf courses from the Carolinas to Arizona during his 22 years on the USGA staff. His expert eyes first detected "Tifdwarf" bermudagrass, a variety that is still the predominant putting green grass used on southern golf courses.

GREAT EXPECTATIONS

The top 10 results of a survey of what playing conditions golfers prefer.

by LARRY GILHULY

PSST! Superintendents! Want to start a lively discussion with a group of golfers? Ask this one: "What expectations do you have regarding the playing conditions, maintenance, and overall atmosphere of a golf course (home or away) when you play?" In the time it takes to line up a one-inch putt, the answers will fly.

This same question was asked of a cross section of members of the Pacific Northwest Golf Association and Washington State Golf Association Boards of Directors, volunteers, and other association members that included men and women of varying ages and playing abilities. Some of the answers were predictable, while others describe the difficulties that are faced by those responsible for the maintenance of a golf course. Without further ado, the "Top Ten" answers were as follows:

1. Smooth greens of adequate pace. When John Bodenhamer, Executive Director for the PNGA and WSGA, asked the question, the first and most emphatic answer in most cases was fast greens. Upon further discussion, most of the respondents really wanted smooth greens with decent speed, not fast greens. Not surprisingly, those who still insisted on fast greens were single-digit players.

2. Notice of aeration date. It is not surprising to see this make the list; however, when it appears this high, somebody is not doing a good job of communicating. Whatever it takes, get the message out to your players that aeration will occur on certain dates. The best way to address this situation is to set the aeration dates one year in advance, with tournaments scheduled around these "holey days."

3. An open-minded superintendent. Let's face it. Maintaining the playing field for over 400 people from various walks of life is like walking through a mine field! Emotions frequently become involved from both sides, and simple issues can rapidly lead to *superintendent decline*. Don't fall into this trap! Remove your emotions from the table and look at questions from players as an opportunity to educate or learn, not as an attempt to tell you how to do your job. Treat every player's questions or concerns with consideration and respect, and the chances are you will get the same in return.

4. Proper course setup. Improper tee marker alignment and hole locations often receive the fastest and most heated response on the day of the occurrence. Creating a *T-square* from one-inch irrigation pipe is a simple and fast method for tee mowers and course setup personnel to eliminate misaligned markers. Proper hole location comes with basic training and a knowledge of the game.

5. Bunkers maintained. Regularly raked and edged bunkers provide hazard definition and eliminate footprints or other irregularities.

6. Firm (dry) conditions. If you have to deal with a poor irrigation system, inconsistent soils, inadequate labor, or any number of other variables, trying to achieve firm conditions without losing turf is extremely difficult. Trying to explain these situations to a player who doesn't care to listen may prove to be one of the most difficult tasks faced by a superintendent. On the other hand, applying too much water does nothing for the game, the grass plant, or the budget. It can expand the superintendent's resume if continued over an extended period of time.

7. Protect the environment. Golfers are asking more questions about how golf courses affect our environment. These players need to be educated by those who maintain their facilities. As a starting point, the results of the USGA Environmental Research study and the benefits golf provides to people and the environment can be found at your regional USGA Green Section office.

8. Level tees. A simple problem that can be corrected only by reconstruction.

9. Green grass. To all of those players who believe this is achievable on a year-round basis in combination with point number 6, it is time for a reality check! Only golf courses with high budgets, excellent irrigation systems, consistent soils, and weather patterns that seldom change have a chance of achieving this goal. Furthermore, maintaining a totally green golf course increases the use of water, fertilizer, and pesticides. Golfers need to realize that a golf course maintained with firm conditions and some brown areas is far superior in every way to a *sea* of green!

10. Variety in course setup. This is another easy one that can be addressed by establishing a series of hole location charts that assure diversity on a daily and weekly basis.

So, what can we learn from this survey? Three points immediately come to mind, including:

1. There is a glaring lack of education among golfers regarding the environment as it relates to irrigation practices and the need to have a totally green golf course.

2. The expectations for smooth greens of adequate pace, notice of aeration, proper course setup, defined and maintained bunkers, and variety in course setup are all reasonable and should be achievable.

3. Most important, the fact that many golfers in this survey believe superintendents are close-minded points out the need to work on communication skills. Even if a question or comment from a player appears trivial or is based on emotion, the way the superintendent responds will create the perception of open- or close-mindedness. If you are perceived as close-minded, even logical explanations to suggestions or requests may be considered excuses and will hurt your credibility. Remember, an open mind can open many doors, while a mind that is closed can only shut them.

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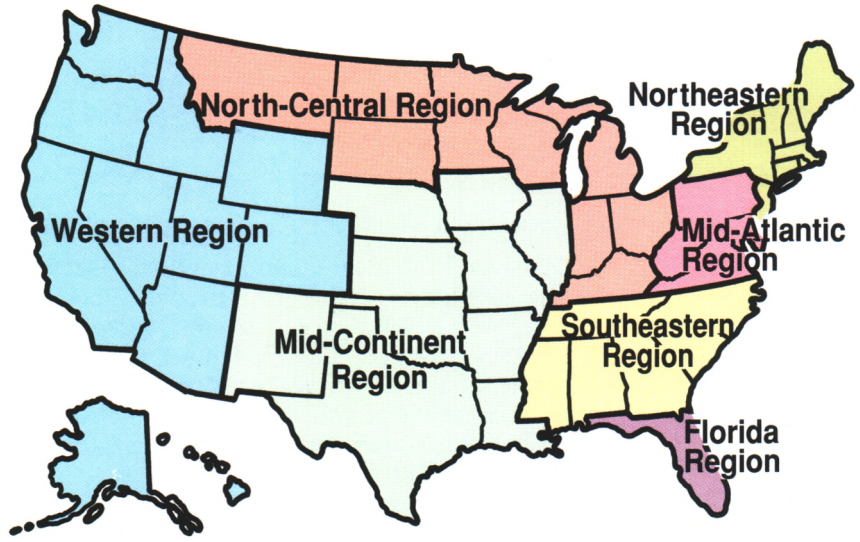

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REGULAR SOIL TESTS

Question: How often would you recommend running soil tests? (Kentucky)

Answer: In an ideal situation, annual soil tests are recommended. To keep costs down, representative testing can provide good information for most normal 18-hole operations. Select your best, worst, and one average green, tee, and fairway. This means that you will have identified nine areas for testing. Collect the samples from the same areas, at the same time each year, and use the same soil testing laboratory. This technique will provide good representative information while eliminating some of the variables involved with soil testing. Feel free to contact your local Green Section office for help in interpreting the test results.

ESTABLISH GUIDELINES FOR

Question: We are considering the purchase of a roller to address players' desires for faster and smoother greens. I am concerned about roller use causing excess compaction. What guidelines should we follow? (Oregon)

Answer: Current research indicates that rollers can cause damage if used excessively, especially on the outside perimeter of the green. With this in mind, the following guidelines are suggested:

- Do not exceed two rollings per week.
- Time rollings to provide maximum speed and smoothness for the majority of the players. This usually involves a Wednesday/Friday or Thursday/Saturday schedule.
- *Avoid* rolling when the green is excessively wet, growing slowly, or under stress.
- Increase aeration frequency to a monthly schedule, using water or small tines. Spiking weekly will also be helpful.
- Raise mowing heights if rolling frequency is increased to three or more times each week. The additional leaf area will help compensate for the extra stress from increased rolling.

DEFINING FERTILITY PROGRAMS

Question: I'm having problems maintaining consistently healthy, dense turf coverage throughout my Tifway (419) bermudagrass fairways. Given the predominantly sandy soil conditions throughout much of the course and the results of the soil nutrient tests, it's apparent that my approximate 1.5 lbs. of actual nitrogen per 1,000 sq. ft. per year is too lean. Due to the significant budget increase required to provide a more appropriate fertility program throughout this large acreage, the finance committee has repeatedly cut back this budget item. How can I convince the *budget slashers* that the added expense will be well worth it to maximize overall fairway turf quality? (Florida)

Answer: Select one fairway, preferably a par 3 or par 4 with small acreage, and practice an appropriate nutritional program, which will not significantly alter the fertilizer budget. Towards the end of the growing season, when the golfers inquire as to why this fairway is much healthier than the rest, explain how the fertility program was adjusted to better meet the needs of the turf. More than likely, the increase for this line item in the next budget period will pass without a problem.