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2 Fast, maneuverable, simple operation.

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collected debris can be flushed out during normal maintenance.

4 No scalping.

Rear deck rollers work along with the front wheels to keep the deck and blades off the ground, even over rough terrain. Springs are also available to absorb deck weight and allow the deck to "float" with the contour of the ground. (These anti-scalp packages are optional, depending on the contours of your particular turf.)

5 Year-round versatility.

The Cushman Front Line doesn't go out of service when the mowing season is over. It can work for you all year 'round when you add accessories like the ROPS structure and weathertite cab, 60" rotary broom (gas unit only) and the 48" snow thrower.

6 Service when you need it.

Your Cushman Front Line dealer stocks parts for the engines, tractors and decks, and services the entire unit. He's an experienced, thoroughly trained professional, dedicated to keeping your Front Line mower in service.

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It stands to reason.

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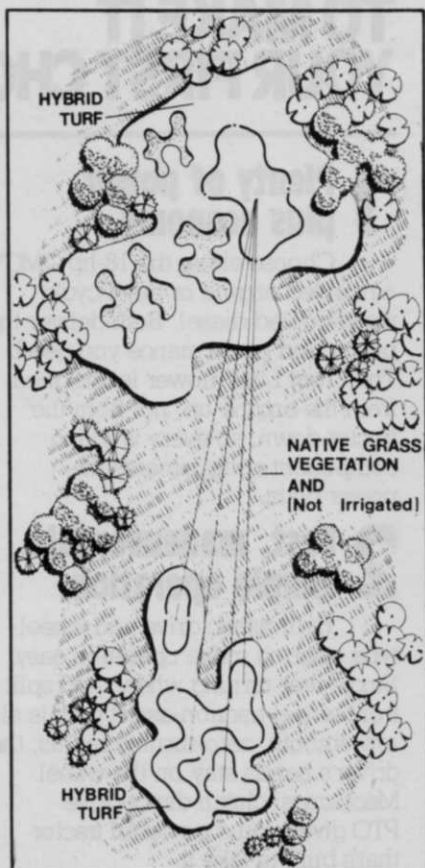
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approached the \$300,000 per year budget to maintain their turfgrass programs. This rapid cost increase in course maintenance, particularly in labor, equipment, replacement parts and materials, must be passed to the overall fee structure of play or yearly membership dues.

Environmental regulations: Sensitive wetlands are now surfacing as one of the new criteria facing development, and will also have an impact on proposed golf courses. Governmental agencies, mandatory land use plans, and the preservation of wetlands are forcing owners and planners to more limited development. The new golf course will be forced to encompass airspace over wetlands, rather than convert these areas to lakes, and use more marginal areas of terrain. The developer, however, still must recapture the total cost of all airspace.

Inexpensive fossil fuels: The decline of inexpensive fossil fuels is a world problem, and definitely the major contributor to inflation. All materials are affected as we deplete our resources of fossil fuels, particularly oil, and later, coal. Gasoline now is averaging about \$1.40 per gallon, and can you forecast golf course construction and operating costs when depletion raises this price to \$2, \$3 and even \$4 per gallon?

Water shortage: Perhaps the most serious single item having the greatest impact upon new golf design and construction programs is the water shortage. This is not a new subject, for water scarcity and availability have been problems throughout many portions of the western United States. In the early 70's, I was personally involved with a California-based developer where several courses paid fees to the water districts for water consumption, and recording meters were attached to wells. The cost for local well water on a California project was so excessive that we converted to potable water at a more favorable fee, and at the same time eliminated a high soluble salt problem. A Hawaii project paid the state \$100,000 for water rights just to irrigate the golf course!



Typical par three hole demanding irrigation only in proximity of tee and green with native grasses and vegetation between the tee and objective target point.

The surfacing of water problems has just hit the eastern United States and in particular Florida. In recent months, numerous articles on this subject have been produced, written and published in national publications such as Life, Newsweek, and turf management journals.

Lake Okeechobee, the major source of potable water to south Florida, and which physically aids in recharging underground fresh water reserves and aquifers, reached an all time low of 9.75 feet in July, 1981. South Florida counties and cities are under modest water use restrictions, but this is expected to escalate this winter, barring recharge by a major storm and human efforts of cloud seeding with silver iodine crystals. The recent high level mark of this lake at 12.09 is not enough to prevent restrictions during the 1981-82 winter dry period.

If the water management districts impose 25%, 50% and then more cuts or moratoriums, we are in serious trouble, and this could be just the beginning. A major catastrophe of acute water shortage could cause enactment of new governmental regulations, increased monitoring of fresh water usage, less obtainable wells, and then limitations on non-humanitarian uses, such as parks, golf courses, and large recreation green belts.

The underground drawdown of fresh water is now tremendous and will accelerate each year as population increases. The fresh water aquifers in both south and north Florida are being depleted, with many wells accelerating in salt content. There have been reports that by the year 2000 we will nationally be consuming 35% more potable water from our available resources. How can we compensate and adapt to future available sources, principles and demands on the game?

Future trends

The golf course architect is to be confronted with a most difficult and acute task by the 1990s. Keeping the game alive and healthy must require an acceptance of both new and old techniques and principles of the game.

Sure, we have been spoiled. That is pure fact!

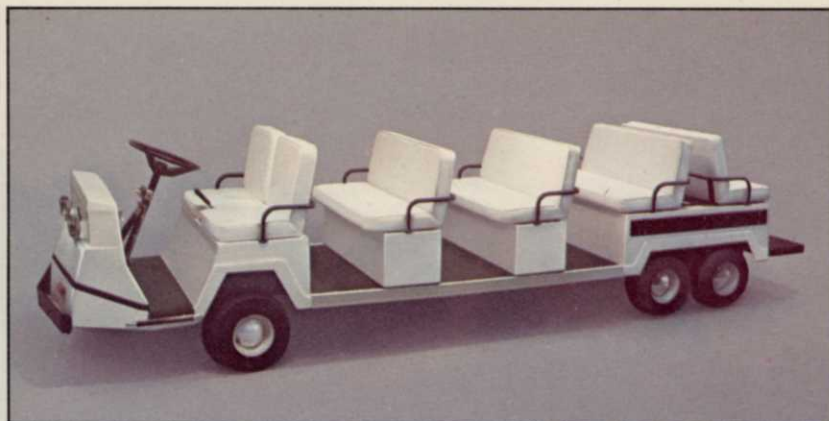
This past year I had the pleasure of spending ten days in Scotland playing courses of our heritage; Royal Dornoch, St. Andrews, Prestwich, and Turnberry to name a few. Royal Dornoch at over 300 years of age, and St. Andrews of up to 500 years was indeed pleasurable, and with the least amount of maintenance on fairways, and irrigation only on tees and greens.

As a youth in West Virginia, I developed and learned the game on public courses without fairway irrigation, and loved it, for I really didn't have exposure and accessibility to the elite facilities.

In the past year I have reviewed many pessimistic reports on the negative factors confronting new golf projects; the reduction of product goals due to depletion of natural resources, a complete return to the

Continues on page 34

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original Scottish principles of management, etc. However, I am not a firm advocate of such drastic action and am very optimistic that we need not retreat to this level and forfeit many of the exciting advances of modern design. Rather, we can compromise to integrate the technology of the future and the sound principles of our past.

We have within our means the ability to produce a high caliber playing course with both natural beauty and designed aesthetics, yet cut the cost of construction, maintenance, and demands on natural resources.

Return to basics

By discouraging and abandoning the construction of the 7,000 yard golf course in favor of shorter courses in the 6,100 and 6,700 yard range, we place a premium emphasis on shot placement, accuracy, "strategic" and "heroic" golf holes. We can design, develop and use more dramatic and exciting greens artwork, contour mounding and hazards, either natural or created. The target areas of fairways can be more defined, and complemented by site terrain, sculptured features, natural or planted tree cover and vegetation.

To enhance the strategic shorter course, we can:

A. Use more definition of greens putting surfaces and pin placements, with exterior trapping and interior contours to emphasize putting and shot making to a "position of the green."

B. Develop more natural curvilinear, split-level, and attractive tee forms, rather than simple elevated box or rectangular tee positions. By curved forms, we can change direction in addition to distance.

C. Use more modulating and sculptured target zones of fairways to demand a science of strategic shot making. This can be supplemented with attractive trapping and tree plantings (or curved clearing lines in wooded areas) to serve as a hazard. Extremely level fairways tend to eliminate the varied skills required to play the ball below or above the address position. Rolling or modulating fairway/fairrough

zones prevent a particular hole from becoming routine, or monotonous play, plus they are more attractive.

D. Define the fairway zone from the rough zone by using different grass species and/or mowing heights. Future courses may use more native non-irrigated turf in roughs. On most courses in Scotland, only the fairways are maintained at a short cut, and the rough is purely native vegetation.

Lobby the U.S.G.A. to revise their system of ratings to allow for more credits for natural or design features and hazards rather than too much emphasis on distance. The rating committees may not realize that their formulas have caused many developers to direct architects to lengthen courses just to pacify the terminology "championship", and a rating which matches or exceeds par of the course.

Land usage

As land prices soar, combined with high interest rates and a premium on borrowed money, expect pressure from the owners to instruct the architect to utilize less space. New development regulations and environmental rules may also force the architect to use sites of less interest, for in many cases, the purchase cost per acre includes both developable and non-developable terrain for housing units.

We can partially relieve this pressure by building shorter strategic courses, and more cluster or core golf courses which utilize less space. In recent years, development trends emphasize numerous single-routed holes exposing more saleable property, but using large parcels to achieve their goals.

More professionally designed executive courses, occupying considerably less land mass than regulation layouts, can easily be adapted to small projects. A quality executive course will have a reduced total cost and overhead, and can be marketed to the golfer at lower prices. They also are valid as aids to encourage new players, and do not usually require golf cars—a fact which has also prevented many young players from taking up

the game.

The exception will always occur for those projects where more affluent clients have abnormal high assets, and in rural areas where land costs are more lenient, and/or development rules and land use plans prevent high densities, thus allowing more space for the golf course property.

Effluent and ground water

As irrigation and ground water reserves decrease, we may have to reconsider our present irrigation methods. Trends may arise that place more emphasis on design technology to irrigate with less water, calculate automatic surface applications more carefully, and consider the future increased use of effluent water.

Presently, millions of gallons of effluent water are wasted daily into our native waterways and streams. A percentage of this resource could easily be recycled, and indeed there are efforts now proceeding in this direction. Because of old pipelines and discharge sources, the most available effluent waters for future usage will probably be derived from new development design and engineering directed specifically to land and turf applications. A project using effluent wastewater on their golf course, even as a percentage of total requirements, then would suffer the least in the event of restrictions imposed by government regulating agencies. Recently I received a report that about one-half the golf courses on Hilton Head Island were now using effluent water, and that in the next twenty years, all could be irrigated partially or entirely by this method.

Irrigation companies can also assist by encouraging the design of new systems using less water per sprinkler head, and even accelerating experiments to produce sprinklers with a longer arch of coverage, combined with less gallons per minute.

Superintendents can also be more considerate toward programming of the automatic controllers to minimize discharge at particular stations, rather than setting out a blanket of coverage and assuming

Continues on page 38

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15-25 minutes per station. I have personally observed many courses where overwatering was prevalent, to the point of creating unhealthy greens and tees.

When more restrictions and limitations are applied, the architect on each project will have to work more carefully with the owner to direct design applications, at first toward the key areas of play and artwork features. This is now a very common practice in the western United States which has a history of water shortage.

Turfgrass and soil studies

For tees, fairways and greens we presently have several excellent hybrid varieties developed to produce an outstanding quality turf, yet many golf courses have a problem of being subjected to play all year. Owners, management and golfers are always critiquing the maintenance of turf and pressuring the superintendent for continuous high levels of turf color, uniform

mowing patterns, and cringe at the site of a native weed!

My particular problem in determining turf for roughs and fair-roughs is the lack of varieties available which are drought tolerant, yet pleasing to the eye and adaptable for golf play. The most frequently used varieties are Bahia, common Bermuda and occasionally Centipede, (except for wall-to-wall hybrid turf). In the northern geographic regions of the United States, we can choose from many more seeded varieties, and also have limited seasons to play and traffic.

I personally receive very little input from associates and professionals in the business about experiments on new or improved species of drought tolerant turf for certain areas. Increased research and soil studies in this area is warranted.

As an example, the contrast of perimeter Bahia in the rough to 419 Bermuda fairways gives a most natural appearance, but I wish there were more slow growing or dwarf

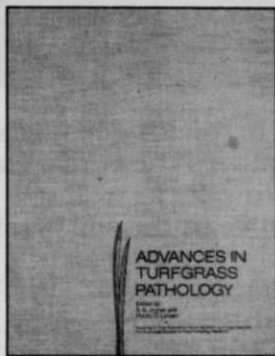
varieties of Bahia from which to choose. This has been mentioned before by members of the American Society of Golf Course Architects. However, the testing stations, companies and agronomists with expertise in the turfgrass industry should be persistently exploring solutions to this ever growing complex situation.

The modern golf course architect is required to be more sophisticated than our peers of the past. Previously, we selected the most conducive sites for new courses. Now we must accept what is given us, and frequently, the worst property in a given location not financially suitable for other purposes.

From a previous single page sheet, we now are preparing a 50 lb. packet of documents and exhibits to pacify the demands of the future course, plus the burden of satisfying the requirements of a multitude of governmental agencies. The next twenty years will be interesting and a process of evolution. **WTT**

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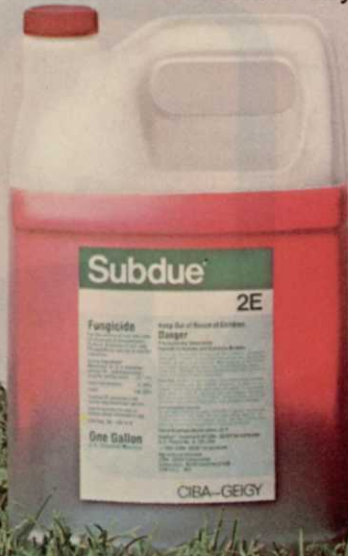
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