of lightweight fairway mowing and the use of PGRs, bentgrass is spreading dramatically in fairways, and there appears to be more of a shift to bentgrass overseeding and away from perennial ryegrass.

More attention is also being afforded the roughs. *Poa*/bent rough areas are being seeded or sodded to Kentucky bluegrass and/or perennial ryegrass to improve their appearance and playability. In addition, more liming, fertilizing, and aerifying is being done to improve turf density in the roughs, especially in areas that suffer through heavy cart use. Finally, more and more courses are raising cutting heights in the roughs, maintaining a four- to eight-foot intermediate cut, and using rotary mowers for the roughs. Rotary mowers are more maneuverable and produce a truer cut by lifting the turf as they cut.

Winter in the Northeast gives the superintendent the opportunity to reflect on last season's successes and failures, and plan for the inevitable problems and challenges of the year ahead.

Great Lakes Region

by JAMES M. LATHAM, JR., Director

WATER WAS a prime problem throughout much of the Great Lakes Region in 1986. Saturated soils left over from November, a January thaw followed by intense cold and then a period of freeze-and-thaw cycles caused a great deal of loss of annual bluegrass and perennial ryegrass turf. Survival was enhanced by rapid surface drainage and snow cover or other protection against varying temperatures at the soil surface.

The value of good drainage was reiterated in July, when a prolonged period of rain was followed by high day and night temperatures. Roots in the saturated soil and thatch were denied oxygen, and most of them died. Plant tissue became so weakened that some turf on closely mown greens was killed by simply using a squeegee to remove surface water. Foot traffic around the holes during this period was equally lethal. Some diseases became epidemic, perhaps because the plants were in such poor physical condition that systemic fungicides could not be adequately translocated through the tissue.

Many northern courses concentrated on increasing the non-*Poa annua* population of fairways and roughs. The color and texture contrasts between contoured bentgrass fairways and bluegrass roughs is spectacular.

The high point of the season for some was the recognition that new, high-sand greens do not have to be hard, pale, thin or dry. The key is finding a *good quality sand*, combining it with an acceptable additive and then fitting the mixture with the other components necessary for good drainage.

The low point of the year was the continuing evidence that too few golf course architects give any consideration to green construction fundamentals, thus leaving the high costs of correcting mistakes to the owners.

THE MOST encouraging observation of the year is the number of courses committed to thatch management on fairways. If lightweight mowing is to be practiced, something has to be done to keep thatch to a manageable level so that roots can become established in the soil and shots can be played from firm surfaces.

Great Lakes Region Summary — 1986:

1. a. Perennial, as in ryegrass, is a misnomer. b. Annual, as in bluegrass, is not.
2. Systemic fungicides do not function very well when the root systems of plants to which they are applied are not functioning well.
3. It is never too late to install drainage on a golf course. Some have waited 70 years to do it.
4. Pure, medium sand (0.25mm to 0.50mm) makes great topdressing; it is the key component to green construction topmixes.
5. Peats should always be as thoroughly tested as sand.
6. When the heat's on, slow green is always better than fast brown.

Western Region

by LARRY W. GILHULY, Director

I THINK WE ALL agree that the primary issue regarding golf course maintenance is the most plentiful compound found on this earth — water. While the Southeastern portions of the country suffered through record drought conditions, the western United States has, by and large, had too much water. Someone once stated that the single most important aspect of golf course maintenance involved good drainage. In the case of the water dumped on northern California in the early portions of 1986, the best drainage in the world would not have been enough. Record-setting amounts of rain caused massive flooding in northern California, and in some cases golf courses were covered with water for weeks until the excess water drained off naturally. At Peach Tree Golf & Country Club, in Marysville, California, several holes and the entire maintenance facility were under water. A dike broke approximately one mile below the course and saved the course from massive flooding problems, but some areas were under water for several weeks. It became so bad that the City of Sacramento came within hours of evacuating major portions of its population.

On the flip side of excess water situations, there is the continuing concern with water shortages in the southwestern portions of the western United States. In Arizona, mandatory water allotments

(Left) Scenery and safety go hand in hand. Tiered tees and a guard-railed golf-car roadway enhance this par-3 hole. (Below) Is this a look at the future or the past?

for golf courses begin on January 1. At that time Arizona will start water allocation at a rate of five acre-feet per year for all golf courses. It is currently the only state with this kind of water law, and other areas will be closely watching this situation. Thus far, clubs have had little or no problem staying at or under their water allotment. With less water being applied, the courses have also shown improvement from an agronomic and playing standpoint.

IN SOUTHERN California, water quality continues to be a problem for those superintendents maintaining greens that are comprised of bentgrass and high *Poa annua* populations. As the salts in the soils continue to increase, many superintendents are finally getting through to their memberships that growing grass under poor soil situations simply cannot be done without good drainage. The rebuilding of older soil-base, non-subsurface drained greens continues in southern California and other areas plagued with this problem.

In addition to flooding problems in northern California, the excessive amount of moisture resulted in a heavy snow pack in Utah. As a result, the Great Salt Lake has risen above its banks and is not only threatening several golf courses but the airport as well. It is unfortunate that all of this excess water couldn't be funneled elsewhere.

Other than the problems with water, the year has been rather uneventful for most superintendents in the western United States. Some superintendents have had problems with disease, while superintendents in Portland, Oregon, and Los Angeles have had their first turf loss from nematodes. Other than these isolated cases, the superintendents in the western United States continue to produce quality playing conditions.

Southeastern Region

by **CHARLES B. WHITE**, Director,
and **JOHN H. FOY**, Agronomist

WITH THE exception of Florida, this year was extremely difficult in the Southeast because of severe heat and drought. They took a toll on many golf courses due to the combination of lack of water, poor irrigation systems, and in some cases mistakes in management going into or during the drought period.

The spring and summer proved to be an educational experience for many superintendents, who found out that if they are managed properly, turfgrasses are actually quite drought and heat tolerant — including bentgrass. Bentgrass was often watered on a two-day irrigation cycle throughout the summer and supplemented with the hand watering of drier areas. These practices helped to maintain good soil aeration and good rooting vigor and depth through the summer, a real feat considering that soil temperatures were as high as 85 degrees for much of the summer. In some cases there was actually new root initiation in June from bentgrass in the Piedmont Southeast following an aerification with small tines and an application of potassium sulfate. This is certainly a credit to good management by superintendents who understand the relationship of low nitrogen and high potash fertility programs.

Among the golf courses that best survived the summer drought and heat were those that had basically a 1:1 ratio of nitrogen to potash, coupled with proper and strategic water regimes. This year many learned that small quantities of water can sustain turfgrass health and playing conditions far better than larger volumes.

DESPITE THE heat and drought this summer, one of the most important factors determining bentgrass success was air circulation. The accompanying picture shows a well-built green with very poor turf in the center when all other greens on the course were in excellent condition. The difference? No air movement due to surrounding banks and undergrowth. Poor air circulation is truly one of the greatest enemies in the turf management business, along with excessive heat, humidity, and drought.

Generally speaking, I thought that golf course superintendents coped extremely well with the drought. Many superintendents did an excellent job of