Mike Canaway of the Sports Turf Research Institute looks at what's best for new greens which have to be ready in a hurry.

Comparison of seed versus turf for greens establishment – trial plots at the STRI

SEED OR TURF?

With increasing commercial pressure to bring newly established golf courses into play as quickly as possible, it is often no longer feasible to allow long periods for greens to establish following sowing. Temptation, or indeed the necessity, is to use mature turf for establishment of new greens to minimise the time needed before play can take place. However, the use of mature turf carries with it risks.

Modern methods of golf green construction involves the use of rootzones with a very high sand content, for example in the USGA method of green construction, or indeed sometimes pure sand, to provide free-draining conditions and hence the ability to play even after heavy rain. Importation of turf onto such rootzones brings with it the indigenous soil on which the turf was grown and with it the risk that fine silt and clay particles within this soil will cap the sand rootzone, much reducing its capacity to remove water from the surface.

An experiment carried out a few years ago at Bingley with football type turf showed that even turf grown on pure sand could cause a great reduction in infiltration rates due to the importation of an organic layer at the rootzone surface. On golf greens such layers can become buried by applications of top dressing to present an intractable problem in subsequent years. A further risk is that weed grasses such as annual meadow-grass, present in the turf production fields, will also be imported along with the turf. Ways of minimising

Why do we get these gross differences in water

these problems include the use of turf grown on soil compatible with the rootzone, the use of washed turf where the soil is washed away from the turf before relaying using high pressure water jets, or by the use of juvenile turf typically grown on soil-less media and harvested 6-8 weeks after sowing. The juvenile turf studied at Bingley was a product known as Coronet Turf, which is grown on a thin soil-less mulch placed on polythene sheeting on the field. Various grades can be produced for different purposes.

In 1990 and 1991 we carried out an experiment at Bingley to compare different establishment methods for newly laid golf greens, including seeding at two seed rates, the use of mature turf (2 grades), the use of washed turf and juvenile turf (Coronet Turf). The effects of these different establishment methods were studied on grass ground cover, annual meadow-grass ingress, playing quality in terms of hardness and green speed and water infiltration rate of golf green turf established on a sand rootzone.

The experiment was carried out on a pure sand rootzone overlying a gravel drainage carpet, the rootzone consisted of 250mm of medium-fine sand overlying 50mm coarse sand, which formed a blinding layer above the gravel drainage carpet. The aim of the experiment was to simulate conditions where a newly laid golf green was intended to be brought into use as soon as possible. Therefore we aimed to impose artificial wear using a "wear machine" fitted with golf spikes just four months after seeding or laying of turf on the new greens.

The construction was done in the early part of 1990, final seedbed preparation taking place in mid-April 1990. Alginure soil conditioner was applied to aid moisture retention and also to supply micro-nutrients. A proprietary fertiliser was applied to the seedbed. This contained a slow release form of nitrogen (IBDU) to prevent or reduce the potential leaching losses of nitrogen from the seedbed. Both the Alginure and the fertiliser were raked into the upper 50mm of the seedbed.

After this the different experimental treatments, which comprised different methods of establishment of golf green turf, were applied to the experimental area. These were:

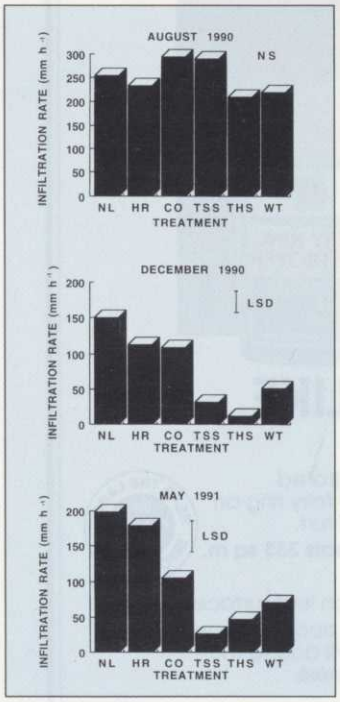
1. Bent/fescue mix sown at 35 g/m^2. This mix contained 40% Chewings fescue, 45% slender creeping red fescue and 15% browntop bent split between two cultivars, 'Bardot' and 'Highland'.
2. The same seeds mix sown at 100 g/m^2 – a much higher than normal rate.
3. Coronet Turf. This is a commercially available product and it was grown on a netted, organic, soil-less mulch and delivered typically at 6-8 weeks after sowing. The plastic mesh netting was incorporated by the grower to facilitate lifting and handling of the juvenile turf.
4. Turf grown on sandy soil. This was a mature turf sown with a mixture of 80% Chewings fescue and 20% browntop bent. On delivery it comprised about 50% bent, 40% Chewings fescue, 8% dead matter and traces of meadow-grass species. The soil attached to the turf was defined as a sand in textural classification.
5. Turf grown on heavy soil. This was a mature turf which consisted on delivery of 65% fescue, 15% bent, 7% annual meadow-grass and 1% smooth-stalked meadow-grass, the remaining 12% comprising dead matter and bare ground. The soil attached to this sod was described as a clay loam, ie a heavy soil, comprising 35% sand: 33% silt: 32% clay.
6. Washed turf. This was the same turf as described in (4) above, but with much of the soil removed by washing using high pressure water jets.

The trial was given intensive maintenance to encourage the grass to establish as quickly as possible with a target date for the start of "play" four months after the initial sowing and laying of the turf.

Much data was collected from the trial as mentioned above, however, in this article I want to draw attention to the effects of the different treatments on the ability of the turf to remove water from the surface, ie. water infiltration rate. Clearly the purpose of a sand-based green is to provide free-draining conditions. If the turf supplied caps the rootzone then clearly much of the effort which has been put into the golf green construction has been wasted. The diagram, right, shows the water infiltration rate at three different stages during the experiment.

Four months after sowing, in August 1990, the different plots of golf green turf were considered ready to receive artificial wear treatments using our wear machine fitted with golf spikes. Infiltration rate measurements were made using an apparatus known as a double ring infiltrometer. The results showed that the different methods of establishment had no significant effect on infiltration rate at this stage, although some differences were observed these were statistically not significant one from another. *(NB: key to the experimental treatments in the diagram as follows: NL = normal seeding, HR = high rate of seed, CO = Coronet Turf, TSS = turf grown on sandy soil, THS = turf grown on heavy soil, WT = washed turf.)*

infiltration rate among turf treatments?



By December 1990 when the artificial wear treatments had been in progress for some time, a dramatic reduction in the infiltration rate of the green surface had occurred. From values in excess of 200 mm/hr before the wear treatment started, infiltration rates were reduced on all treatments but most dramatically on those treatments where mature turf had been used in the construction process. The water infiltration rate on the sod grown on heavy soil was reduced from 211 mm/hr to only 12 mm/hr in December 1990. The turf grown on sandy soil and the washed turf gave higher values of 32 and 51 mm/hr respectively. The Coronet Turf and the seeded treatments both gave infiltration rates at this stage in excess of 100 mm/hr. After a further period of wear in May 1991, the seeded treatments and Coronet Turf still retained water infiltration rates in excess of 100 mm/hr, although the seeded treatments at this stage were considerably higher than the Coronet Turf. This was because these had effectively started to wear out and therefore the sand surface had become exposed, the Coronet Turf and the mature treatments, however, had resisted the action of wear following the short period of establishment to a much greater extent. Although there were some differences in water infiltration rates among the mature turf treatments, ie. the turf grown on sandy soil, heavy soil and the washed turf, statistically these differences were not significant. In studying the results for both December and May, there does seem to be some benefit in the use of washed turf if mature grades of turf have to be used. In the UK, turf washing has not become prevalent, but in other countries it is widely practised, for example in Australia. Perhaps the findings of this trial will encourage some of the turf growers to experiment with systems for turf washing.

The question remains: why do we get these gross differences in water infiltration rate among turf treatments. Part of the explanation is doubtless the mineral matter imported along with the turf as discussed above. However, one of the measurements which was made during the experiment was the depth of the organic and mineral layer at the surface present in the different turf plots at the end of the experiments in May in 1991. Thickness of this surface layer ranged from 3mm thick in the seeded treatments (at the low seed rate) to 17mm thick in the case of the turf grown on heavy soil. We found that the loss of water infiltration rate was strongly correlated with the thickness of this layer and its organic matter content. In other words, it is not just the importation of mineral matter which is important, it is also the importation of the organic matter at the soil surface which contributes to the loss of infiltration rate in the case of mature turf. The washing process not only removes much of the mineral soil matter, it also has the effect of root pruning and removal of organic matter as well and therefore this is the most likely explanation for the improvement seen in the washed turf. In the case of the Coronet Turf, because it is still at a juvenile stage, although it is grown on an organic mulch it does not have the time to form the matted, fibrous type of organic layer often seen at the surface of mature turf. You could argue that a sward established from seed or from juvenile turf will also produce organic matter and so, in time, the situation will be no different. Although this would be true if no remedial action were taken, the aim of top dressing with sandy materials, as part of a golf green management programme, is to dilute this organic matter with a permeable material as the organic matter accumulates. In contrast, in turf production fields, this top dressing would not be carried out and furthermore in many cases clippings would be returned at least at some stages of the turf growing period, further aggravating accumulation of organic matter at the surface.

In conclusion, the use of mature turf for establishment of golf greens has increased greatly over the past 20 years and it seems likely on the basis of the results presented here, that we may actively be causing problems of our own making. Even if we use turf grown on very sandy soil, very large reductions in infiltration rate can occur even in a relatively short period of time. This could lead to development of other problems, such as black layer. The problem can be reduced by the use of washed turf or by the use of a juvenile turf where there is insufficient time for establishment using seed. The Coronet Turf had no detrimental effects on playing quality, apart from some initial softness which soon disappeared. Furthermore, it was completely free of annual meadow-grass contamination which was not the case with the turf grown on heavy soil. I do not want to create an alarmist impression with this article, suggesting that we should not use mature grades of turf for golf green establishment. There are many good suppliers of turf who go to great lengths to provide the best quality turf for golf green construction, both in terms of botanical quality and the soils used in production fields. Furthermore, in the short experiment carried out, the mature grades of turf did show the greatest durability in response to the wear treatments. What the experiment does show is how essential it is after golf green construction to carry out remedial action where mature turf has been used, due to pressure of time. Such remedial action could include intensive hollow tine coring to remove some of the organic and mineral matter, together with sand top dressing to provide permeable channels for the movement of water and air into the profile.