Testing, testing

MICHAEL BIRD on the steps to take to calculate spring fertiliser requirements

Assessing and satisfying the spring fertiliser requirements of fine turf are probably the two most difficult tasks faced by the greenkeeper. Soil type and structure, climate, moisture levels and existing soil nutrients all play a significant part when determining the present and future needs of the turf. The influences of just one or all of these factors can greatly affect the requirement for and availability of the essential nutrients required for plant growth. There are more than a dozen different chemical elements in the soil which are utilised by growing turf. The most important are those which are needed in greatest quantity: nitrogen; potassium; phosphorus; calcium; magnesium and sulphur.

However, it is vital that trace elements such as iron, manganese, zinc and boron are not overlooked as all are vital during the numerous stages in growth. Nutrient non-availability and losses occur for a variety of reasons. Although formed within the soil, plant-available nitrogen, for example, is not retained naturally and is leached out quickly by drainage water. It can also be lost through gaseous release.

Potassium is held naturally by clay soils but not by those containing a high level of sand. Phosphorus becomes increasingly insoluble – and less readily available – the more acid or alkaline the soil becomes. It is therefore most readily available under neutral conditions.

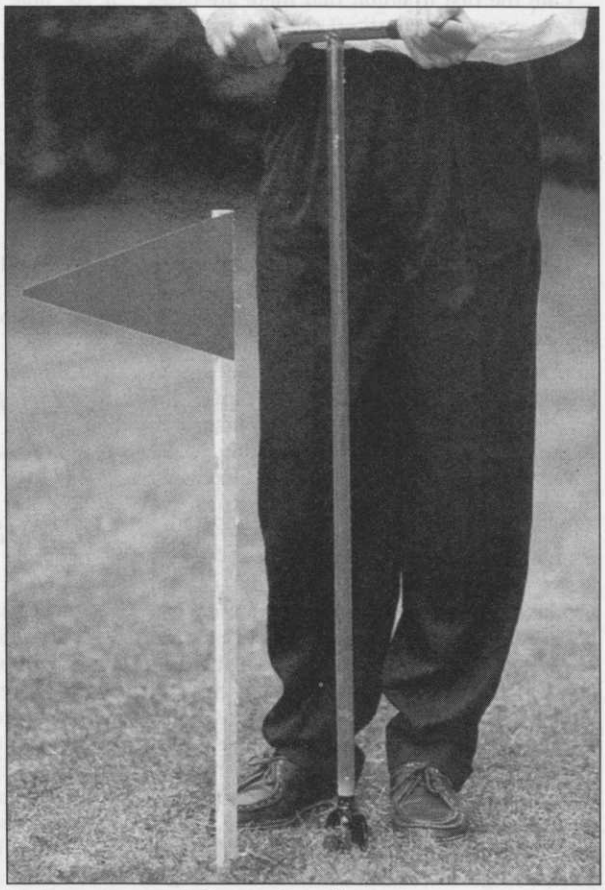
Although heavier soils are able to retain nutrients due to particle and ionic bonding, the increased level of moisture present can limit the microbial activity which helps to naturally recycle soil nutrients. Such factors also effect the availability of other soil nutrients to the point where, not so many years ago, assessing plant requirements in the spring was left primarily to experience and previous management practices.

Only when the season was well advanced, with its longer daylight hours and higher soil temperatures, could the turf professional then assess whether the initial treatments had had their desired effect. But guess-work should be playing an ever-decreasing role, stresses Dave Lawson, soil chemist with the STRI: 'Soil chemical analysis should be carried out well ahead of the spring', he says. 'In most rootzones, only phosphate and potassium nutrients will require analysis. However, testing for magnesium, copper, zinc and manganese will also be beneficial in extremely sandy conditions'.

Mr Lawson points out that there are no completely reliable tests at present for the level of plant-available nitrogen in outdoor soils due to the variable rates at which organic matter is mineralised. Established methods such as growth rate and grass colour are still important, therefore, to establish soil nitrogen levels and requirements. Because of the large number of factors affecting plant growth and nutrient availability at any time of the year, increasing use is being made of slow release fertilisers to ensure a ready and continuous source of nitrogen available to the plant as and when it is needed.

Their low solubility and reduced leaching characteristics means that application does not have to be restricted to periods of active growth. Indeed, many products can be applied safely and cost-effectively from December onwards, and even earlier, so that during periods of milder weather, sufficient nitrogen is available for plant growth and greening without risk of disease. Furthermore, the required nutrient is then present in the soil to encourage and sustain vigorous plant growth when conditions are suitable in the spring.

Slow release fertilisers can be had in straight 'N' or compound form to suit the turf's needs, as determined by soil chemical analysis. Dave Lawson recommends that soil pH should be tested at the same time as its nutrient status due to the effect that different fertilisers can have on a soil's acidity or alkalinity. Both the chemical analysis and pH of the soil can be assessed using hand-held test kits, taking care to ensure that a representative sample is taken from the area under examination. In the case of soil testing for phosphorus, potassium, magnesium or levels of micro-nutrients such as iron, manganese or copper, Mr Lawson recommends that random samples be taken to a depth of 10cm. All samples taken should then be mixed well together to form one sample for testing. The same advice applies when measuring pH levels.



To ensure representative results, soil samples should be taken at several locations across the area to be tested, marking each sampling point prior to using the soil auger

Using the results, decisions can be taken with regard to the amounts of phosphate or potash needed by the plant, applied either before the growing season together with a slow-release nitrogen or as part of the spring dressing programme, applied in granular form. Mr Lawson comments that the soil test for magnesium and trace elements can often reveal relatively low levels in the rootzone. 'Visible symptoms of deficiency are not normally seen in turf grass, even on sand-only rootzones', he points out. 'However, if the soil test reveals low concentrations, then it is important that remedial treatment is carried out.

Soil pH levels have a major bearing or the grass species grown. More acidic conditions increasingly limit the availability of nitrogen, phosphorus, calcium, potassium and magnesium to the plant. As a result, many grasses will not

flourish or even survive. Similarly, many trace elements, as well as phosphorus, become less available to the plant as soil alkalinity increases. Therefore, the majority of grasses are selected and grown for their tolerance to the prevailing conditions, although soil pH can be adjusted over the years using top dressings of the required pH, enabling different grasses to be established to suit prevailing conditions and course requirements.

Changes of a more immediate and less lasting effect to soil pH can be made also through different fertiliser applications. An ammonium sulphate-based nitrogen fertiliser can, for example, be used to reduce the alkalinity of a soil to better support red fescue and browntop bent grasses, noted for their hardiness and ground covering abilities. Care must be taken both with application rates and evenness of spread to avoid scorch. Washing-in by rain or artificial watering is also recommended for optimum results. Top dressings of a neutral pH value are normally used to reduce soil acidity. However, where there is serious acidification, lime can be applied in the form of ground limestone or chalk, although great care should be taken on established turf to avoid over-application which can lead rapidly to disease problems. Ideally, treatment should be made before the growing season to allow rain to wash the dressing into the soil. Also, Mr Lawson commends a laboratory soil lime test to establish the precise application rate required. Apart from the nature and structure of the soil, the grass species and the level of nutrients already present, the removal or return of grass clippings can play a significant role in assessing the turf's fertiliser requirements.

Dry leaf material contains approximately 3% nitrogen, 2% potassium and 0.3% phosphorus. On longer, rougher parts of the course, adequate nutrients can be returned to the soil by leaving the grass clippings, allowing them to degrade naturally. However, where clippings are boxed off, close attention must be given to ensure that the nutrient reserves removed in the grass box are returned through the annual fertiliser programme.

Most experts agree that the application of large quantities of potash and phosphates prior to or during periods of rapid growth are wasteful. Testing has shown soils on many golf courses have accumulated high levels of phosphates, and lower levels of potassium, due to over-applications in the past and the inability of the plant to absorb them, irrespective of whether the turf in question was mown with the grass box on or off. This situation still exists today, making regular soil testing an absolute must on all courses. The type of fertiliser chosen and the form in which it applied will depend very much on the results of a soil analysis and the experience and eye of the greenkeeper.

Demand and expectations from golfers for surfaces all-year round has highlighted the importance of fertiliser applications being made with care, accuracy and close regard to the needs of the turf. The use of slow release fertilisers, dependent on suitable moisture or temperature levels (both, in some cases) means that applications need not be restricted solely to times of active growth. However, there can still be a need to boost the application rate, particularly to help the grass recover from winter wear or to give a greening-up ahead of an important tournament.

Long-term benefits have also been reported from the early application of root and shoot growth stimulants in the form of liquid organic fertilisers containing seaweed extract or farm slurry, together with added trace elements and micro-nutrients. These factors all underline the importance of measuring the level of nutrients within the turf so that accurate and cost-effective supplementary treatments can be made. The margin for error is substantial when one considers the wide range of major nutrient application rates that may be necessary each year on golf greens, tees and fairways.

According to Dave Lawson in his essential publication 'Fertilisers for Turf' published by the STRI*, a traditional golf green or tee may require between 8 and 20gm^2 of nitrogen, up to 20gm^2 of phosphate and between 6 and 15gm^2 of potassium during the year, with 25% additional N for a sand-constructed green. A similar range of NP&K will be needed on tees, again depending on soil analysis, and between 8 and 12gm^2 of nitrogen on parts of fairways which come under heavy wear, often applied in two or three dressings. On these areas, slow release fertilisers have proved particularly useful. If fairway clippings are boxed, a full re-assessment of requirements will have to be made with the help of a soil test. 'And greenkeepers should not forget that selection of the appropriate fertiliser is not the end of the matter', comments Mr Lawson. 'It still has to be applied accurately and evenly. So, the winter period must be used to check over the machine for wear or damage prior to the spring. Also, it is vital that the spreader is calibrated to give the required output with the fertilisers being used, due to the large variations in flow characteristics shown by different products'.

Calibration is carried out by setting the spreader according to the manufacturer's recommendations and then driving through a line of one metre square trays at normal working speed. The fertiliser collected is weighed and compared with the required output in grams per square metre. Any machine adjustments can then be made and the calibration re-checked before going to work.

■ The writer, Michael Bird, based this feature on discussions and correspondence exchanged with David Lawson, Soil Chemist, STRI.

*** 'Fertilisers for Turf', by D M Lawson, is published by the STRI, Bingley, W Yorkshire BD16 1AU. It costs £4.50 including postage.**

Because of the varying flow and spread characteristics of different fertilisers, pre-calibration of a spreader with the material to be spread is essential for accurate and cost-effective results