Troublesome turf weeds in South Australia

Dr Terry Mabbutt travels to the other side of the world in his search for exciting new turf weeds.

First visit to a new country and climate on the other side of the world always provokes excitement at the prospect of hitherto unseen plants, even if they are troublesome turf weeds.

Like many plant scientists I started out as a botanist trained to appreciate plants for what they are in their natural environment, but graduated out of necessity into applied disciplines. These included managing plants growing in the wrong places such as amenity grass and fine professional turf of golfing green quality.

That apart some plant species have become so well adapted to turf that for all intents and purposes they are in their 'natural' environment. Bellis perennis (common daisy) in the United Kingdom immediately springs to mind. Moreover, you can appreciate such plants for their ability to colonise turf which is not the most weed friendly of environments. With the UK behind me and still carrying some botanist's 'baggage' I arrived in the Adelaide Hills of South Australia intrigued about what weeds I might find growing in turf.

I was not to be disappointed. Turf in this relatively wet and mild southernmost area of South Australia up to 700 metres above sea level is forced to contend with many different weeds on par in range, number and frequency to the UK. This is not surprising since apart from three to four hot dry summer months (December to March) turf grass and weeds grow relatively unrestrained.

Distance and climate apart the same attributes which make for successful weeds in UK turf apply in South Australia, and in some cases to the very same species. Turf weeds in South Australia include a high proportion of non-native species arriving as contaminants or escaping from gardens and subsequently adapting to turf. Some which originated in cool temperate climates like the UK appear to have discarded their normal perennial habit to become annuals, thereby allowing survival as seed through the long hot and dry South Australian summer.

Rosette and matt-forming weeds with creeping stems (stolons) or tap roots and fine-leaved plants (grasses and non-grasses) are clearly at the same advantage as in the UK. However, there are visibly but more Australian turf weeds with underground stems as bulbs and corms. They grow in winter, flower in spring and go dormant in summer. As such they are clearly well adapted to exploit good growing conditions in winter and spring

Cape dandelion is a classic rosette turf weed

Creeping oxalis is a serious weed of close cut

Flat weed (cat's ear) appears to be a bigger problem

Lamb's tongue (ribwort plantatin) and trifoliate burr medic

One leaved Cape Tulip, pretty as a picture but a weed nevertheless

The leaves of onion grass blend in well but its pink

and subsequently survive adverse summer conditions. Moreover bulbs and corms are an ideal mode of reproduction and spread. Many like sparaxis/harlequin flower (Sparaxis sp) and one-leaved Cape tulip (Moraea flaccida) [all garden escapes] produce stunning spring flowers highly prized in UK horticultural and garden industries, but for South Australian greenkeepers and groundsmen they are simply weeds.

The following account describes some of the most frequently seen weeds of turf in the Adelaide Hills area of South Australia some 20km south east of the capital Adelaide.

All were observed and photographed in amenity turf. Australia has a vibrant sports turf industry with a sophisticated arsenal of herbicides, its 'guns' apparently not yet spiked to the degree experienced in the UK courtesy EU (European Union) legislation. Weeds mentioned here can establish in amenity grass, wide area sports turf including fairways and poorly managed professional turf. However, like the UK only a minority of turf weeds are likely to be frequently seen in close-cut, well-managed professional turf.

Rosette forming weeds

Cape dandelion, Cape weed or Cape marigold (Arctotheca calendula) is a classic rosette-forming turf weed of the family Asteraceae (Compositae) with an extremely rapid growth rate. Deeply lobed basal leaves lay flat on the ground up to 25cm in length when fully grown, thus translating into massive rosette diameters of 50 cm. And all the more impressive because Cape dandelion unlike other related turf weeds (eg. English dandelion) is an annual herb in South Australia and clearly unable to survive the summer drought unaided.

Like many others is an alien species in this instance a native of the South African Cape with a similar Mediterranean-type climate.

Cape dandelion dies out in the summer heat and drought after shedding its high seed load. Seeds germinate in autumn and plants grow rapidly throughout the mild wet winter months. Key to survival and spread is its prolific spring and early summer flowering when poorly managed turf suddenly becomes a carpet of large bright brash daisies with light yellow ray (outer) florets and black/purple disc (inner) florets.

Seeds are covered with pale brown wool which clearly helps dispersal by wind, animals, on clothing and most significantly by grass cutting machinery. Cape dandelion possesses a tap root but apparently not robust enough to survive the summer months.

Other 'big' rosette-forming turf weeds of the Asteracea need no introduction to UK groundsman because Australia was 'cursed' with early introduction, by seed or through contaminated soil by Taraxacum officinale (British dandelion), Hypochoeris radicata (common cat's ear) and H. glabra (smooth cat's ear).

In the UK dandelion is more widespread and frequent than cat's ear but the opposite appears to be the case in South Australia where they do not appear to be as robust or free flowering as those in the UK, although the flowering period is much longer and may extend over the entire year. As in the UK Taraxacum officinale is a perennial with robust tap root and apparently able to withstand the summer heat and drought.

Cat's ear is called 'flat weed' in Australia due to its large flat basal rosettes of leaves, and appears more widespread, frequent and larger than in its native UK turf environment. Plants spread at speed smothering and killing turf grass underneath. Its broad basal leaves form large flat rosettes that merge to cover sizable areas to leave 'dead spots' when the plants die. H. glabra has maintained its annual habit.

The more common H. radicata is predominantly perennial as in the UK, but in drier areas of South Australia adopts an 'annual habit', expiring in summer after seed set and dispersal.

Cat's ears are therefore common even in the drier areas where the tap root is unable to survive the summer drought. H. radicata and H. glabra are normally difficult to distinguish and widespread hybridization between the species makes this virtually impossible.

Limited infestations are controlled by severing tap roots 2-4 cm below soil level using dedicated hand-tools. Same procedure can be used for dandelions using similar but deeper-penetrating tools, but as in UK is generally less successful given new plants that can grow from root fragments.

A similar relationship exists for two plantain turf weeds, ribwort plantain (Plantago lanceolata) called lamb's tongue in South Australia and common plantain (P. major) called broad leaf plantain. In spread, frequency and size ribwort plantain outstrips broad leaf plantain, which is opposite to the situation in the UK.

Ribwort plantain covers turf with multitudes of rosette-forming plants which block sunlight and smother grass plants beneath, it's well developed tap-root facilitates year round survival in South Australia.

Ability to maintain the same perennial 'lifestyle' exhibited in its native cool temperate (UK) environment appears to be secret of its success as a turf weed in South Australia, putting the plant at relative advantage over similar rosette weeds including other plantains.

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Stems above and below ground

Creeping Oxalis (Oxalis corniculata) is perennial weed spreading quickly in all types of turf and particularly persistent in low cut grass due to flat stems (stolons) that creep across the soil invariably escaping the mower's blades. Trifoliate leaves of three heart shaped leaflets together with the running stem habit makes creeping oxalis look just like a clover, but it comes from a completely different plant family called the Oxaldicaeae (Wood Sorrel family). The plant is additionally called yellow wood sorrel because of its yellow flowers which though small are conspicuous in close-cut turf. Seed capsules shaped like miniature cucumbers throw ripe seeds several feet in all directions further aiding dispersal and spread.

O.corniculata is a locally abundant weed in the UK called 'Sleeping Beauty' found mainly near gardens from where it migrates into turf. In Australia it is completely cosmopolitan turf weed with many sub species making its exact alien origin unclear.

Other Oxalis species found in South Australian turf include O. purpurea (purple or large flowered wood sorrel) native to South Africa.

Plenty of Poa (winter grass) and a single 'shining'

Purple flowered wood sorrel persists and spreads by corms

Soursob is one of the most difficult weeds to control

Three cornered garlic grows literally everywhere

Its stunning carmine-coloured flowers open in the sun and hardly make for a classic turf weed but this garden escape is still a plant in the wrong place at the wrong time and as such a weed of turf. It lacks the stolons of creeping oxalis but has underground stems (corms) presenting their own problems for weed persistence. Limited infestation can be removed by hand-digging because the corms are in a shallow situation just beneath the surface of the ground.

Underground stems (bulbs and corms) are clearly to the advantage of any turf weed in South Australia with three to four months of extreme heat and drought. Two bulb/corm bearing species, both non-native garden-escapes and now invasive weeds, grow literally everywhere including woods, waste-land, gullies in gardens and in turf. Three cornered garlic (Allium triquetum) after its three-sided flower stalks and native in the Mediterranean and Soursob (Oxalis pes-caprae) with striking yellow flowers and native to South Africa, can quickly invade and take over whole areas of amenity turf. Soursob, so called because of the sour acidic taste of its leaves and flowers, has a long underground stem bearing numerous bulbs making it one of the most difficult weeds to control. Soursob thrives in infertile soil and is suppressed by sound fertiliser programmes.

Few areas of turf grass outside the tropics escape white clover (Trifolium repens) and South Australia is no exception. This classic matt-forming leguminous weed is just as widespread and problematic as it is in its native UK environment. White clover adopts the same perennial habit despite shallow rooting. Spread is by stolons (runners) which root at the nodes of the ground hugging stems where they come into contact with the soil. White clover's ability to adapt to most soil types together with a relatively long winter flowering period (May to September) clearly helps ensure its success as a turf weed in South Australia.

There are other closely related matt-forming leguminous weeds such as Burr Medic (Medicago denticulate), a larger and more robust looking version of UK turf's black medick (Medicago lupulina).. Like white clover this southern

European native has small trifoliate leaves, the middle top leaflet on a longer stalk than the other two. Flowers are small yellow-orange and pea-like in solitary clusters on thin axillary stems.

Burr medic lacks the stolons of white clover but compensates with an efficient annual habit including prickly seed pods possessing hooked burrs which attach themselves to virtually anything they touch.

Burr medic is becoming more problematic with high infestations slowing down mowing and increasing the volume of clippings. Successful management requires effective control before plants come into flower during spring.

Grass plant look-alikes and the real thing

Plants with grass-like growth habits and leaves have a real advantage as turf weeds, not least because they are difficult to detect and therefore manage.

One such weed is onion grass or Guildford grass (Romulea rosea), another South African native and so called because its leaves look like those on onion or chive seedlings. This monocotyledonous species with bulbs (corms) is from the plant family Iridaceae, and therefore not too distant from the Allicaeae (onion family). Onion grass is a small erect perennial herb bearing extremely fine linear leaves with thickened edges and a prominent midrib. You would not know it was there until spring when turf starts to sparkle with numerous tiny 'star-shaped' (6 petals) pink or rosy purple flowers.

South Australian turf facing hot dry summers and wet but essentially frost free winters offers the ideal 'meeting point' for grasses of both temperate and tropical origins. As such it has become overburdened with alien grass species from almost every part of the world, with rough grass weeds in turf generally divided 'winter' grass or 'summer' grass depending on when they grow and reproduce.

Main 'winter grass' requires no introduction. Poa annua (called 'winter grass in Australia) crops up everywhere in South Australia where it behaves as a winter annual as opposed to a summer annual in the UK. It flowers in winter and dies out in summer, although some perennial sub species are reported on golfing greens.

As in the UK controversy continues over its value as a constituent of golf greens. Winter grass germinates in the autumn and grows quickly and flowers profusely throughout winter, finally seeding in spring when heads can cause an uneven playing surface on the fine turf such as golf greens. Perennial types of winter grass can become established in some fine turf situations. Winter grass continues to thwart those greenkeepers striving for 100% bent-grass playing surfaces. It remains widely present on greens (average golf green throughout Australia has been variously estimated to comprise 40-80% Poa annua) and is common on fairways.

'Summer grass' infestation is mainly by Paspalum dilatatum a tufted perennial tropical grass originating in South America. It is nominally frost sensitive but since South Australian winter temperatures rarely fall below freezing it can survive winter in a dormant state.

Moreover it is relatively drought tolerant and a combination of watering and high nitrogen during summer sees growth and infestation take off. Seed is sticky and spread easily on shoes clothing and grass cutting machinery. Strict hygiene with machinery and footwear scrupulously cleaned after working in Paspalum-infested areas of turf is essential to minimise seed dispersal and weed spread.

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Getting Back to the Cutting Edge

Former greenkeeper and current lecturer, Jonathan Knowles, raises an old question: Is greenkeeping horticulture, agriculture or ecology?

Is greenkeeping horticulture, agriculture or ecology? Not my question, but a consideration that was raised around 20 years ago. It was suggested in a paper at the Proceedings of the World Scientific Congress of Golf 1990 that greenkeeping management has much in common with functional approach of ecology.

It's an interesting point isn't it? Canaway (1990), additionally offered a succinct golf greenkeeping management plan that centred on playing quality. The playing quality was defined as a study of the ball roll, ball impact behaviour (spin), and green hardness.

Not long after, Canaway & Baker (1992) tested five common turfgrass species and tested which grasses provided the 'fastest' paced greens. A sward of Festuca rubra ssp. Litoralis was the fastest surface, while Poa annua consistently was the slowest in the trials.

A few years later, a large study was carried out (Baker et al., 1995); in part they investigated what grass species inhabit UK golf greens. More than half the greens were dominated by P. annua. The Festuca spp. was found on the Links and Heathland. Agrostis spp. had around a third coverage on more than half the greens. Young establishing greens were also included, and this, for me, is where the study is very interesting. The largest proportion of Festuca spp. was found in greens less than 5 years old, and the dominance diminished over the age of the greens with the ingress of P. annua. Moreover, a later study (Hagley et al,. 2002) found that older greens greater than 70 years were populated with the perennial P.annua var. reptans.

I believe most greenkeepers will agree and will have experience in seeing a newly established green whether turf or seeded go from high a content of Festuca spp. to an apparently very low representation. Why is there a diminishing of the

ABOVE: The TORO Turf Evaluator for measuring the effective height of cut

Festuca over the time, while weeds ingress? Should this be a question of greenkeeping practices and is this related to a holistic management principle, as suggested?

While I accept that greenkeeping and the condition of a golf green is subject to many, many variables, the aims of my research was to evaluate whether cutting heights can have a negative effect on the sward, viz. encouraging P.annua, disease, and slow putting speeds etc.

In the research, more than two-thousand grass identifications were made across twelve different golf courses of England and Scotland. An understanding of the mowing practices was needed from each site, this involved looking at the bench setting and the effective height of cut.

The bench setting is the set up by adjustment of the mowers rollers to the bottom blade and the effective height cut is simply the height at which the grass stands following a mow a TORO Turf Evaluator was used for this, see Plate 1.

It was then important to compare and test the two methods, especially as they were found to be different. The effective height of cut was generally greater by 1 mm. How is this important? Well, we all read texts and research on recommended heights of cut for the golf green. However, it is not usual for authors to state whether it is an effective height or a bench setting measurement. If it is a bench setting being recommended then the variables of soil moisture content, grass coverage, grass type, and machine type/weight need to be equated so that the resulting effective height is optimum for health and play.

The species composition of the green was then measured using an Optical Point Quadrat, with the species being recorded at a random hundred per green, see Plate 2. This also allowed an opportunity to delve into the head greenkeeper's mind, and compare their perception of the composition with the findings of the Optical Quadrat. A third of the head greenkeepers considered P.annua to be less than 65% coverage, however most perceived it to have high ground coverage.

The observations did show that there were cases of very high P.annua content greater than 93% coverage, but Agrostis tenuis is well represented with a third of the greens making up more than a half of the counts. During the study, most head greenkeepers were surprised by the counts of the Agrostis spp. species and, likewise, the lower counts of P.annua. It was apparent that there was an inaccurate perception of the sward composition by an inspection of a 'walk over' compared with the Optical Quadrat.

How does this matter? Well, in consideration, how can the effectiveness of an over-seeding program be measured, without an accurate starting point or a measure for the present coverage? Then, the natural progression is to be able to value the maintenance regime that is implemented, for example, is the regime causing a positive or negative effect on the establishment of the desired species?

These findings were consistent with Baker et al,.(1995) where a significant proportion of the head greenkeepers distinguished a poor green from a quality one by the number of bare areas, and not the species composition or playing quality.

Stimpmeter readings were taken at each green, again this was to affirm any trends and compare with the earlier studies of grass species and ball roll. The readings were calibrated to the USGA recommendations for regular play.

With the effective heights of cut categorised as low (2-3 mm), medium (4-5 mm) and high (>6 mm) it was possible to analyse the data of the three most common species (P. annua, Agrostis spp. and

about the author

Jonathan Knowles has been involved in Greenkeeping for 17 years, first as a greenkeeper and latterly at Myerscough College. Recently he has been working on a research project that discusses the effects of cutting height on the grass species in golf greens and the associated trends for adapted ecological methods for greenkeeping.

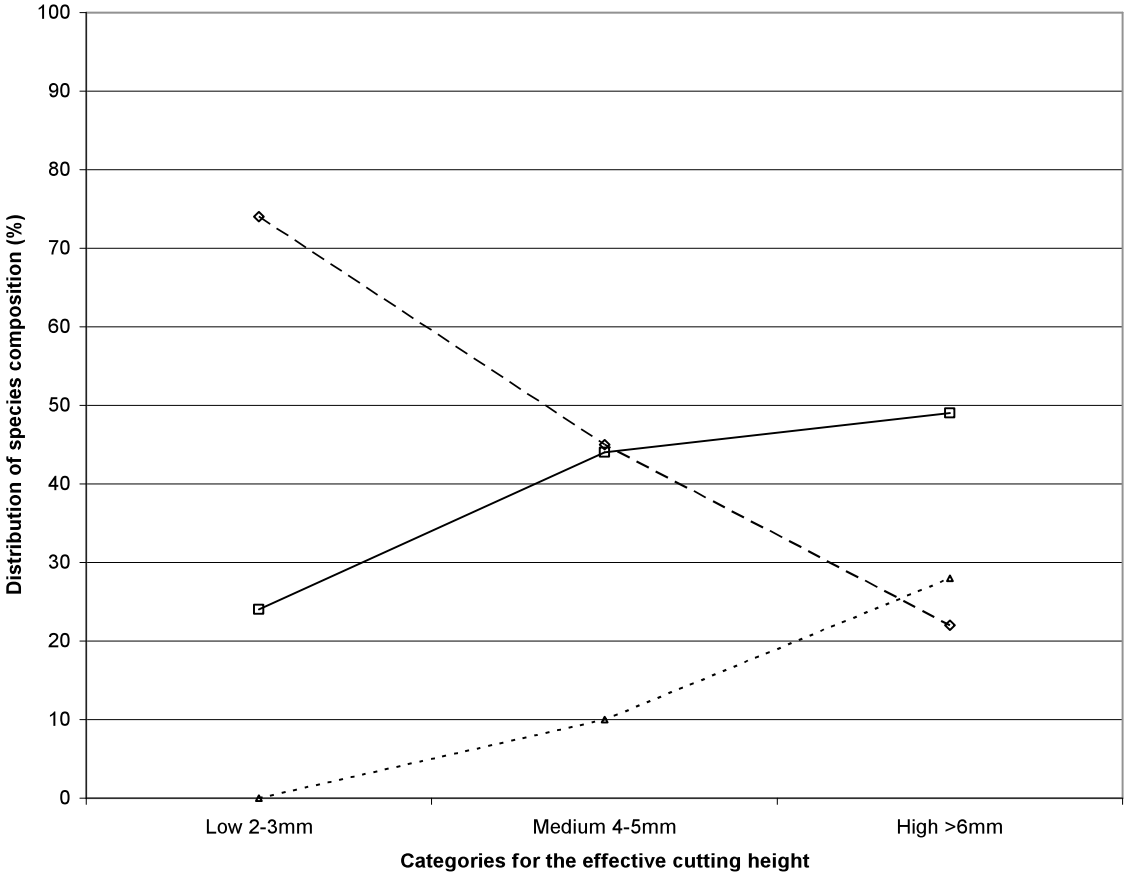

Figure 1. Linear trends in the species decline and ingress over the changes in the categories for the effective height of cut.

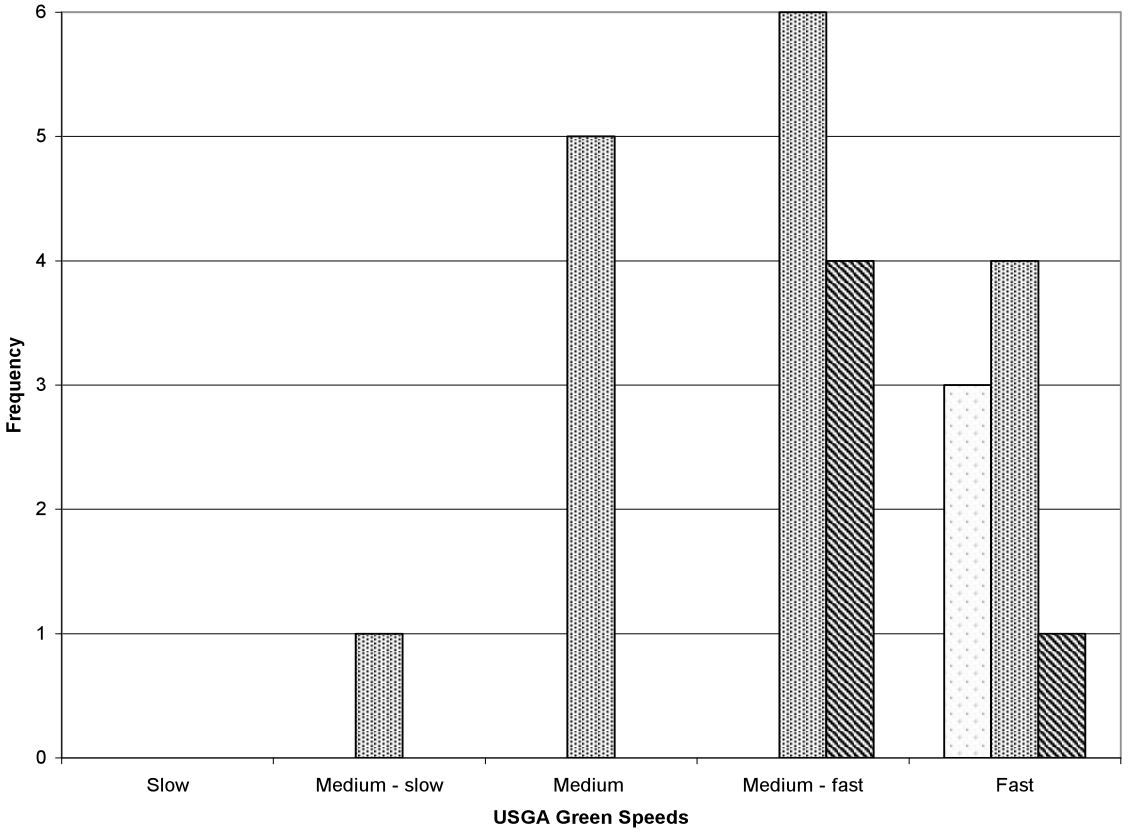

Figure 2. Green speeds and the frequency of occurrence for the different heights of cut. The green speeds have been calibrated for 'regular play'. The highest heights of >6 mm has provided the fastest surfaces, cutting at a range of 4-5 mm has occurred in most speed categories, while cutting at a 2-3 mm has only provided fast surfaces.