



Pretentious Poa annua

Dr Terry Mabbett casts his eye over the most ubiquitous grass around

Poa annua is a real conundrum variously called the 'bête noir' or 'black sheep' of the sports turf sward, and described as 'persona non grata' even though annual meadow grass has been estimated to be the dominant species on up to 70% of golf greens in the United Kingdom.

On balance, and in practice, the majority of turf managers scorn Poa annua but others tolerate and even welcome and encourage the grass, perhaps more philosophically than professionally, on the basis that it is better to have Poa annua than no grass at all. And paradoxically Poa annua may not be 'annual' at all because there are actually two different biotypes, which means the universal name annual meadow grass is a misnomer.

They are Poa annua var annua, which is the 'real' annual meadow grass and the less common, but equally significant, perennial biotype called Poa annua var reptans. The two types are not easy to tell apart but the annual biotype is distinctly more upright in its growth habit. The word 'reptans' refers to the creeping habit of the former.

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Poa annua is native to Europe but now spread throughout the world where climate allows. The species is well established and frequent on golf courses in North America and Australia, where you hear roughly the same kinds of comments and prejudices about Poa annua as are voiced in the United Kingdom.

North Americans call Poa annua annual bluegrass and the Australians have named it 'winter grass', because it is only present during winter and spring, dying out in the hot dry summers when warm season grasses like Kikuyu grass (Pennisetum clandestinum) and couch grass hybrid cultivars (Cynodon dactylon), also in the turf mixture, take over.

Picking out Poa

Picking out and identifying different grass species is no easy task and especially in low cut professional turf where other grasses fail to produce seed heads.

But Poa has some unique distinguishing features, with Poa annua being one of only few species able to produce seed heads and seeds at low heights of cut.

I found this very much to my advantage back in the 1960's, thrown straight from school, where grasses did not feature on the A Level Botany syllabus, into a degree in Agricultural Botany at The University College of Wales, at Aberystwyth, one of several



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centres of excellence for grassland agronomy at that time.

Our lecturers made it as easy as possible – chew the leaf and if it tastes bitter from coumarin then you have sweet vernal grass (*Anthoxanthum odoratum*).

Red stripes down leaf sheaths on the 'pyjama grass' meant Yorkshire fog (*Holcus lanatus*) for sure. Poa annua was made equally easy by looking for the typical and characteristic 'boat-shaped' leaf tip and almost certainly a crinkling of the blade part way along the leaf.

Annual meadow grass has light green flattened stems which are bent at the base and regularly rooted at the lower stem joint.

The light apple green coloured leaf blades often have a band of lateral crinkling part way down and are from 2.5 to 7.5 cm long with the typical boat-shaped tips of species belonging to the Poa genus.

The ligule takes the form of a tall white membrane. A ligule is a structure typically found in grasses at the junction of the leaf sheath and the leaf blade.

It may take the form of a prominent white membrane, as in Poa annua, be reduced to a fringe of hairs (called ciliate) or absent. Most grasses possess a ligule and the shape, length and appearance of the ligule margin are important and consistent characters for separating genera and species within this notoriously difficult to classify group of plants.

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Poa annua has a relatively shallow and weak root system that requires a regular supply of moisture from rainfall or frequently applied irrigation for survival.

This grass grows well in moist areas under direct sunlight but will also thrive in semi-shaded conditions, and competes well in compacted soil conditions where dedicated turf grass species find it difficult to survive.

In inherently warm climates or during unusually hot and dry summers the true annual form of Poa annua brown off and dies out.

The inflorescence (flowering structure) of Poa annua takes the form of a terminal panicle which together with stalk varies in length from 2.5 to 10 cm long. Seed is amber coloured and about 1.5 mm long.

A greedy grass

Poa annua has been called the 'greedy' grass and with good reason. This shallow rooting, fast growing grass takes everything on offer in nutrients and water from fertiliser application and irrigation. Fast growth rate means Poa annua is a high thatch producing species predisposing both the annual meadow grass component and the turf grass sward as a whole to disease.

Inappropriate fertilisation and irrigation practice are two of the main reasons for high and unwanted Poa annua presence and inclusion in turf. Inappropriate aspects of fertiliser usage include reliance on types and formulations which have a neutral reaction on soil pH and inappropriate application (volume and composition) at wrong times of the year.

This may result in forced, sappy and therefore weak grass growth which is more susceptible to wear and tear and fungal disease attack from pathogens like *Microdochium nivale* (Fusarium patch) and *Colletotrichum graminicola* (anthracnose).

Such weak sappy growth is a particular problem for swards containing a high percentage of Poa due to its shallow root system providing a poor weak foundation and footing for golf courses and sports fields. Poa annua is easily 'kicked out' of football pitches.

Poa annua thrives on excessive applications of phosphate which allow this inherently fast and shallow rooting grass to get even more of a head start over other slowing growing and more valued turf grass species. Red fescue and browntop bentgrass prefer lower phosphate levels. Phosphate is a key nutrient in seed germination and establishment and root growth.

As a general rule and to minimise Poa annua 'infestation', turf managers should aim to provide an acid reaction root zone of about pH 5.5 for fine turf and 6.0-6.5 for amenity swards with a high perennial ryegrass component.

Low pH (acidic) conditions especially in the surface layers soil are reported to inhibit the germination of Poa annua seeds and therefore prevent the grass from gaining a foothold in the sward at the expense of other main components of fine turf swards like *Agrostis tenuis* (browntop bentgrass).

Applications of iron (ferrous sulphate) as a 'green up' tonic for turf will not only acidify the surface layers where the Poa annua root system is located but also pro-

duce 'harder' growth making root anchorage stronger and the foliage less prone to disease. Furthermore it will deter surface worm casts which are instrumental in providing germination sites for annual meadow grass seed.

Irrigation practice should encourage the penetration and secure the establishment of deeper rooted finer turf grasses like bents and fescues. Frequently applied irrigation which simply wets the top 25 mm of soil profile and keeps it in a soft and moist condition encourages and promotes Poa annua into producing surface roots that outcompete finer turf grass species.

Any attempt to irrigate a hard pan soil surface, without first alleviating the compaction, is an open invitation for even more annual meadow grass. Such inappropriate irrigation regimes leave water lying on top of the turf, unable to penetrate the surface, and allowing Poa annua to 'drink up' the moisture and further consolidate its position and hold.

Use of deep and infrequent irrigation is recommended to discourage development of annual meadow grass. Water should be withheld until the desirable species are just beginning to show drought stress, by which time annual meadow grass will be on the way out. Always avoid turf management practices and use programmes that tend to cause and exacerbate soil compaction.

Poa annua is regarded as a 'high maintenance' grass which is the supreme irony considering most turf managers regard it as a coarse grass weed of fine turf. Truth is the majority of sports turf situations including golf courses can't do without it and any attempts to exclude it completely would mean even higher maintenance and cost.

Seeds of success

Frequent flowering and prolific seed set across a huge variety of amenity habitats including in low cut turf, a feat not managed by any other turf grass species in the UK, is secret to the success of Poa annua.

Seed head initiations start as soon as the plants are 6 weeks old with plants still small at just 4 to 5 tillers. Prolific seed set and production, up to 100 seeds per panicle within just 8 weeks, is high for such a relatively small grass plant. Viable grass seed may have formed within just several days after pollination which puts Poa annua in a good position to reseed even in frequently low cut turf.

This grass can produce seed all year round providing the conditions of temperature and moisture are suitable, with peaks of production in April and May and October and November under UK conditions. There does not appear to be any severe photoperiod restriction on flowering and seed set.

In moisture stress conditions turf containing a sizable proportion of *Poa annua* assumes an even more insipid light green colouration than usual because the plants suffering from a lack of nitrogen. The roots are unable to absorb nitrogen as soluble nitrate from the soil due to a lack of moisture.

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This may leave unsightly thin areas and gaps in the sward which fescue and bentgrass components cannot quickly colonise because they are also under moisture stress and inherently slower growing.

Threadbare areas and gaps remain as ideal germination niches for *Poa annua* seed, either previously produced on nearby plants which have died out or arriving from outside seed banks. These will include grass verges, flower beds, gravel paths and even soil filled gutters where the ubiquitous and opportunistic annual meadow grass is regularly found.

What's more seeds and especially those produced by the annual biotypes do not germinate straightaway, but remain dormant for months ready to colonise and regenerate in turf when conditions become right, usually in spring and autumn.

Any cultural practice or failure in management practice which opens up the sward with thin areas, abrasions or bare patches will provide ideal germination sites and an open invitation for annual meadow grass.

High thatch and soil compaction are two turf features closely

associated with *Poa* predominant swards. Scarification, aeration and verticutting used to control thatch and alleviate compaction, and thereby enhance permeability and porosity of the soil profile to encourage deeper rooted dedicated turf grass species at the expense of *Poa annua*, may make matters worse if carried out in appropriately or at the wrong time.

For instance, recommendations from around the turf world where *Poa annua* is considered a problem include not performing such operations during inappropriate soil conditions which may cause surface smearing and germination opportunities for *Poa annua*. More specific recommendations include not carrying out hollow-tining during peak periods of annual meadow grass seed germination. And not hollow-tining followed by top dressing when the tine holes can't be quickly colonised by dedicated turf grasses, but do provide ideal germination sites for annual meadow grass seeds.

Greenkeepers and groundsmen are urged to use sterilised top dressings ensure there is no *Poa annua* introduction from contaminated sources. To always use grass seed which is certified free of annual meadow grass. To carry out any over-seeding required at the optimum time for grass seed germination and seedling establishment, so that desirable turf grasses are given the best chance of establishment, and definitely not to delay this important operation due to playing considerations.

Boxing off grass clippings removes seed set on low cut fine turf and reduce the numbers of viable seed reaching the soil, as well as helping to discourage surface casting earthworms coiled deposits of which provide ideal germination sites.

Practice a programme of worm cast management by spraying dedicated wormicides, acidifying the surface soil layer using iron containing fertilisers and formulations and removing worm casts as they appear. Ideally mowers should be cleaned after each operation especially during spring and autumn which are peak periods of annual meadow grass seed set, production and germination.

What's wrong with *Poa annua*

So what is actually wrong with *Poa annua* from the greenkeepers' and players' point of view? *Poa* predominant swards have an unattractive insipid light green colour



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aggravated when plants produce seed heads and especially so when *Poa annua* is under moisture stress during hot dry summers.

Poa is one of the highest maintenance turf grasses, grabbing all on offer in the way of fertilisers and irrigation, while being one of the least sustainable species due to poor drought tolerance and a high susceptibility to diseases aggravated by high thatch production.

Annual meadow grass is susceptible to a range of diseases including *Fusarium* and especially anthracnose. However, greenkeepers wanting to passively reduce *Poa* may see anthracnose as a 'blessing in disguise' for 'weeding out' annual meadow grass using a natural and novel biological control agent.

Poa produces slower putting and bowling surfaces than do fescue and bentgrass dominated swards. The presence of seed heads, as well as *Poa*'s differential growth rate compared with these desirable turf grasses, contributes significantly to uneven surfaces.

Be that as it may many turf managers may muse that it is 'better the *Poa* you know' than to have broad leaved weeds occupying threadbare patches and gaps in turf.

For all its faults *Poa annua* is the re-generation grass of turf as seen this spring and early summer in southern England. By early May *Poa annua* dominated swards had browned off completely but by late June were green again as though nothing happened in the 'Great 2011 Drought' that never was.



MAIN LEFT: Close up on the flattened stem of *Poa annua* with leaf sheaths and blades

ABOVE: Consequences of having too much *Poa annua* during drought conditions, but bouncing back and re-greened after sustained rainfall in June 2011

RIGHT: *Poa annua* exploiting compacted soil along with plantain another indicator weed of compacted ground

BELOW RIGHT: *Poa annua* in the fairway along with ryegrass and white clover

BELOW LEFT: *Poa annua* 'down under' in South Australia where it is called 'Winter Grass'. Seen here with a single *Sparaxis* one of the many colourful exotic bulbs that invade Australian turf



BELOW: *Poa annua* growing quite comfortably on a gravel path

BOTTOM MIDDLE: *Poa annua* recolonizing golf a tee after the Spring 2011 drought in southern England along with some unwelcome sow thistle

BOTTOM RIGHT: Inflorescence takes the form of a terminal panicle. Prominent white membrane-like ligule is visible

