

Grass Selection for Drought Affected Sites

A precious resource - will water become more difficult to access in the future.

By Megan Hood.

At home and abroad, Britain is perceived as being a water-rich nation. It is not surprising then that the severe water restrictions of 2006 in South East England caught many people napping. While some parts of England and Wales have relatively reliable rainfall, we also have high population density. This means that there is relatively little water available per person, particularly in the South East of England, where rainfall is low in a high population area.

In 2006, two dry winters and a dry early summer diminished available water supplies in the South East of England and severe water restrictions were imposed. The consequences for some turf facilities were disastrous in both agronomic and financial terms. As we look toward the future, greenkeepers will need grasses on their courses that are sustainable under low irrigation regimes, without compromising on turf quality.

So, do you need to consider changing the grass species on your site?

MINIMISE ANNUAL MEADOWGRASS

Most greenkeepers are aware of the push toward providing sustainable golf courses in the UK. While much of the focus of sustainability has been on minimising fertiliser and chemical inputs, the judicious use of water is likely to become a major issue in the near future (in some areas it is already a major issue). Overseas experience shows that maintaining annual meadowgrass on golf courses with limited water supplies is extremely difficult. While annual meadowgrass can provide an excellent putting surface, golf clubs located within drought-prone areas with high annual meadowgrass populations on their course need to investigate a change to a more suitable grass over time.



Poa Annua green under severe drought stress

TURFGRASS SELECTION

Basically, turfgrass selection is about knowing what you want from your grass. Once you know what you want from your grass, you can utilise the widely available industry information to select the grass that is right for you. So, what do golf greenkeepers need from their grasses?

The plant selected must be able to adapt to:

- Climate
- Growing conditions (soils, drainage, wear etc)
- The intended use (green, tee, fairway, rough)

An inappropriate selection can result in an inferior playing surface or a surface that is more difficult and/or expensive to maintain. The persistence and quality of a turf and the severity of weeds, diseases, insects and other pest problems often reflects known characteristics of specific turfgrass types.

The following should be considered when selecting a turf species to use:

- How will the grass perform under local conditions such as climate and water availability?
- How suitable is the grass for a golf surface?

ADAPTABILITY OF TURF SPECIES TO REGIONAL FACTORS

The grass selected must be suitable for use with the region in which it is grown. From time to time we see warm-season grasses marketed that are completely unsuitable for the British market. It is essential that the grass selected can tolerate other stress factors related to the site. Factors to consider include:

- Resistance to pests and diseases common in the area
- Soil type (sand, soil, nutrient status)
- Soil conditions (e.g. degree of compaction, poor drainage etc)
- Wear (low level, high level)
- Water type (potable, non-potable, recycled)
- Water availability (unlimited, limited)
- Club expectations

Grass Selection for Drought Affected Sites

The level of turf quality desired and the available maintenance inputs also strongly affect the grass selection decision. Density, texture and colour are the primary aesthetic (visual) considerations.

Carefully evaluate the strengths and weaknesses of a cultivar before deciding to use it.

Unlike many drought-affected areas in the world, warm season grasses are not a viable option in the South East of England. Realistically, options available to golf clubs in the United Kingdom are limited by climate to the following grasses:

- Fine fescues (*Festuca* spp.)
- Browntop bentgrass (*Agrostis capillaris* L.)
- Creeping bentgrass (*Agrostis stolonifera* L.)
- Perennial ryegrass (*Lolium perenne* L.)
- Kentucky bluegrass (*Poa pratensis* L.)
- Tall fescue (*Lolium arundinaceum*, formerly *Festuca arundinacea*)
- Annual meadowgrass (*Poa annua*)

HOW SUITABLE IS THE GRASS FOR A GOLF SURFACE?

This will vary depending on the type of area, i.e. green, surround, rough, fairway, tees. Factors to consider include:

- Leaf texture
- Mowing height tolerance
- Wear tolerance and recovery from wear
- Long-term growth habit (e.g. clumpy growth)

For example, bentgrasses are better suited for use on golf greens than perennial ryegrass due to their finer leaf and tolerance of low mowing. Perennial ryegrass on the other hand is better suited for use on pathways than fine fescues because of its tolerance to abrasive wear.

It is vital that the playing characteristics of the grass selected are suited to the particular golf surface you are dealing with. For example, tall fescue is being installed on dry areas of some golf courses. While great advances have been made in the breeding of tall fescues in recent years, questions need to be asked regarding their suitability for golf courses in terms of long-term playability and blending in to the surrounding landscape.

So considering the growth type of each grass and their adaptability to the UK climate, the following grasses are options for golf course use:

Golf Greens

- Fine fescues (*Festuca* spp.)
- Browntop bentgrass (*Agrostis capillaris* L.)
- Creeping bentgrass (*Agrostis stolonifera* L.)
- Annual meadowgrass (*Poa annua*)

Tees and Fairways

- Fine fescues (*Festuca* spp.)
- Browntop bentgrass (*Agrostis capillaris* L.)
- Perennial ryegrass (*Lolium perenne* L.)



Tall fescue on bunker faces can become clumpy and look unsightly

SELECTING GRASSES FOR DROUGHT-AFFECTED SITES

There is considerable variation in the water use requirements of different turfgrass species and cultivars of the same species. A number of characteristics are important including:

- Water use rate
- Drought resistance
- Drought survival
- Drought recovery

The combination of a turfgrass' water use rate and drought resistance mechanisms determine its ability to provide an acceptable turf quality under a specific soil moisture regime.

WATER USE RATE

This is the total amount of water used by a turfgrass surface or sward through evaporation and transpiration. It is usually expressed as ET (evapotranspiration) in millimetres per day (see table 1).

There is considerable variation in the relative drought tolerances of different grass species (see table 2) and there can also be a significant difference in the drought tolerance of different cultivars.

Relative ranking	ET rate (mm/day)	Turfgrass	
		Cool season	Warm season
Very low	6 - 7		Cynodon sp.
Medium	7 - 8.5	Hard fescue Chewing's fescue Red fescue	Buffalograss
High	8.5 - 10	Perennial ryegrass	
Very high	> 10	Tall fescue Bentgrasses Kentucky bluegrass Annual meadowgrass	

Table 1: Relative ranking of evapotranspiration rates (ET) for common turfgrasses (adapted from Beard & Kim, 1988).

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DROUGHT RESISTANCE

Drought resistance is the plant's ability to avoid tissue damage when subjected to water stress. Plant characteristics that affect plant drought resistance are:

- Depth of the root system
- Whether the leaf blades are rolled or not
- Thickness of the leaf cuticle
- Size of the leaf area
- Rate of leaf extension
- Leaf orientation and densities that increase canopy resistance to loss of water.

So, how do the grasses available to the British greenkeepers compare?

EXCELLENT	Common Bermudagrass Kikuyu
VERY GOOD	Fine fescue Tall fescue
GOOD	Hybrid Bermudagrass Kentucky bluegrass
FAIR	Perennial ryegrass
POOR	Annual ryegrass Browntop bentgrass Creeping bentgrass Annual meadowgrass

Table 2: Drought resistance characteristics of some common turfgrass species (adapted from Emmons, 1995).

DROUGHT SURVIVAL

Drought survival is the ability of plants to endure low tissue water levels caused by drought. Survival is achieved either through dormancy or tolerance of low tissue water levels.

Bentgrasses and fine fescues are able to survive drought through dormancy mechanisms even if they do not always provide an acceptable turf quality for most situations in this state.

DROUGHT RECOVERY

Drought recovery is the ability of plants to recover from prolonged drought. Tall fescue and fine fescues can recover rapidly following prolonged drought. Bentgrass will be slower to recover, and species such as ryegrass and annual meadowgrass are unlikely to recover at all. The 2006 Open Championship illustrated simply how effective fine fescues can be in a drought situation. The parched fairways that were screened globally recovered within weeks of the conclusion of the tournament after the welcome August rains arrived.



Fine fescue fairway at the 2006 Open Championship

DECISION TIME

So how do the grasses available to British Greenkeepers compare?

If you are managing a golf course on a drought-affected site it is highly likely that you have already done some research on which grasses to select. For each given situation (greens, tees, fairway, rough etc) select the suitable species with the best drought resistance characteristics. In some regions this will require a move away from traditional species to utilise species with better water use characteristics and drought tolerance, e.g. using fine fescue in place of ryegrass. In other areas, the decision may simply revolve around selecting the most drought tolerant cultivar available within a certain quality grouping or using high-endophyte seed lines.

For assistance in selecting the right grass for you the local starting point is the Turfgrass Seed 2006 Booklet (Published by the British Society of Plant Breeders Limited in conjunction with the STRI).

Be aware of the water use rate, drought resistance and survival characteristics of the turf species managed and irrigate accordingly. Carefully manage the grass to ensure that its drought resistance characteristics are fully utilised. There is no point in planting a low-water use plant, if it is over-irrigated.

There is little doubt that the fine fescues are the superior grass for drought-affected sites in the UK. Most clubs struggle to provide a pure sward of fine fescue in their greens and we tend to see a blend of the fescues with bentgrass or annual meadowgrass. Maximising the fine fescue content in the sward will help to reduce the water requirements of your course without compromising turf quality. The R&A have embarked on a three year study to assess the ideal method of converting annual meadowgrass greens to the finer, more drought-tolerant grasses. Further information can be found at: www.bestcourseforgolf.org.

LOOKING AHEAD

There is a high probability that some golf courses will be using recycled effluent water or non-potable water for irrigation purposes within the next decade. General water availability is likely to reduce. If you are located in a drought-prone area and are managing a grass that has a high water requirement, chances are that it is going to become more difficult to access water in the future. Grass selection has long-lasting consequences on all golf courses and it is important to plan ahead, so start thinking about tomorrow, today.

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