RE-SEEDING AND SPRING RECOVERY
from winter injuries

Introduction

Winter injuries may occur on all parts of the playing surface on a golf course, but generally the low-cut turf is the most vulnerable. This article is therefore about winter injuries on greens, and we let the readers adapt the information to tees, fairways and even roughs.

The re-establishing strategy should be chosen based on the local and actual situation. A dead annual meadow grass (Poa annua) green, hereafter called a Poa green, can be restored without seeding if the seed bank is big and evenly distributed. This calls for a very different strategy compared to greens where either creeping bent (Agrostis stolonifera) or red fescue (Festuca rubra) were the dominating species.

We will try to explain how differences between grass species, soil conditions and the character of the injury should lead to different re-establishing methods. At the end there is no easy quick-fix of winter injuries. Even re-sodding can be challenging.

Summary

Turf grass winter injuries are difficult to repair, especially if only parts of the greens are dead.

An early overview of the situation makes it easier to order good seed and plan for the high amount of labour needed for spring recovery. Spot treatment with nutrients and irrigation water is often preferable, and manual work can be beneficial even in countries with high labour costs.

Seed germination and seedling growth are slow when soil temperatures are low. The most competitive species under these conditions is annual meadow grass.
How comprehensive are the injuries?

Some greenkeepers are familiar with winter damaged turf and able to determine whether the grass crown is dead or only the leaves are injured.

A useful action is to collect grass samples from different parts of the golf course in spring and grow them in pots as soon as sampling is possible. If possible, use a concrete core drill, followed by hammer and chisel to pull out plugs even from deeply frozen greens. Early diagnosis of the turf’s condition makes it easier to buy high quality seed.

After a severe winter, seed of the best varieties can be sold out if you are too late. You will also have to hire staff and plan for a lot of extra work if the course is severely damaged.

We have seen that golf course superintendents that experience winter injuries for the first time tend to wait too long, hoping for the grass to recover by itself. It does not.

Left: Is this green dead or alive? Is re-seeding necessary? Advice from experienced golf course superintendents is most welcome.

Above: Samples from the greens taken immediately after snow melt can help mapping the situation.

Re-establishing challenges in northern Scandinavia. The photo is taken in the mid of August.
Different scenarios

Completely dead greens are the easiest to handle. If this is an old Poa green, it can be restored solely by brutal scarification, use of covers to retain moisture for germination, and plenty of fertilizer and water when the seedlings are visible. Other grass species must be seeded, but even then it is easier to grow in a completely dead green than a partly dead green. When starting ‘from scratch’, there is no need to consider any “old” turf that needs regular mowing and has a lower requirement for fertilizer and irrigation.

In districts where winter injuries occur regularly, Poa is normally considered a weed because of the low winter stress tolerance. The characters which make Poa very successful as an invasive species are demonstrated upon re-seeding. Poa’s ability to germinate from the soil’s seed bank and grow under low temperature and suboptimal conditions gives it a head start. High fertility and soil moisture suit Poa very well because it has higher growth potential than bent grasses and fescues.

The soil conditions also differ in greens. Thatch is not the optimal media for seed germination, and the degradation of thatch in dead spots may increase the risk of localized dry spots. These conditions are to be considered when sowing techniques and dressing material are chosen.

Sowing

Successful seed germination is dependent on lasting moist and aerobic conditions. A temporary drought may kill seedlings and this is probably one of the reasons why “nothing happens”. Low temperatures slow the germination considerably and extend the period where moisture control is critical.

Machines

Good contact between seed and soil and a proper seed depth can be provided by sowing machines. Some species, like creeping bent, can grow laterally, but this takes time. Cross-seeding several times may improve the seedling density. If sowing machines are not available, drop seeding can be done after scarifying, but before dressing and rolling.

Multiple spiking to 2-3 cm depth can be performed to create good contact between seed and soil.

When winter injuries occur in smaller patches, often caused by snow moulds, seeding by hand can be cost effective and provide the best result.
Spring covers

We do recommend covering the green with a textile to keep the soil moist until the new plants are 1 cm high. Depending on the colour of the tarp and the radiation, the soil temperature will be elevated under the tarp and this speeds up the germination. On partly dead greens the tarp will also speed up the growth of the “old” grass plants and they will adapt their leaf and cell structure to a life in a humid and shaded environment. We therefore often find that turf relapse when the cover is removed, especially if the greens are opened for play shortly after removal.

An additional effect of covers is that golfers understand that the greens are closed for play. The growth rate under cover increases, and hence the mowing frequency. Removing tarps for mowing of “old” growing grass makes the use of covers extra expensive.

Irrigation

Frequent irrigation is necessary, especially when the re-seeded greens are uncovered. A light shower every second hour can be necessary under dry conditions. Unfortunately the droplets from popup sprinklers are often too big and may wash away the dressing sand and the seed. This is an extra argument for using covers, but also a rational for irrigation by hand with hose and a misty sprayer. This seems extremely expensive, but if “bad greens until August” is the alternative, it will be a good investment.

Remember that frequent irrigation also implies a risk for nitrogen leakage. The average amount of water at each of the multiple irrigations during a day should therefore not exceed 1-2 mm, but this requires high uniformity of the irrigation system and is almost impossible to achieve on windy days. In other words – another argument for hand-watering.

Fertilization

Recommended fertilization rate for establishing greens are much higher than the rates used for maintaining turf. This causes a dilemma on partly dead greens because the old turf will respond with excessive growth if fertilization is adjusted to the new seedlings. If we, on the other hand, adapt the fertility to the old turf, re-establishment will take time.

Spot treatments with organic fertilizers with low salt index before sowing are recommended because the organic material holds water. Slow release mineral fertilizer could also be applied to the dead spots, but the effects of these products depend on temperature. This means that they are less efficient in the spring compared to summer. A small sprayer with a nutrient suspension is very useful for frequent (at least weekly) spot treatment of the small seedlings. Be aware that they are much more susceptible to salinity damage than mature turf. Apply a low concentration fertilizer. Not only nitrogen but also phosphorus and other nutrients are easily washed out from sand based greens. Use a complete, balanced fertilizer in the spring – as well as the rest of the season.
Seeding or sodding?

Sod of green quality is not easy to find. Some golf courses that regularly experience winter injuries have nursery greens, or they have a standing order of sod as a yearly delivery from a sod farm further south. Their staffs have excellent skills at sodding greens and the greens can be opened for play some weeks earlier. They have found that this practice pays back.

But sodding does bring some extra challenges. Rooting is not always easy, especially if the original green root zone material holds less water than the sod. Root zone layering may cause future problems, and we often see more localized dry spots on sodded parts of the greens. You should include some of these experiences when you calculate the costs of sodding. Sod always has to be properly installed and then removed again by hollow-coring or scarification during the next two years.

Bad rooting of green sod probably because of the moist thatch limited gas diffusion and root respiration.

Excellent sodding made the greens playable in May, but hydrophobic conditions occurred later in the summer.
Germination, root development and uptake of nutrients depend on temperature. Most germination tests have been performed under relatively high temperatures, and the seed’s ability to establish under spring conditions can be very different.

Our tests showed that tiny bent grass seed germinated very quickly at high temperatures (25/15 °C) while red fescue seed was slower. Seed of annual meadow grass was somewhere in between (Figure 1).

Comparing the same species at spring temperatures (day/night = 15 / 5 °C) gave a different result.

Colonial bent (A. capillaris) had the fastest germination, while velvet bent and especially creeping bent were retarded under cold conditions. Annual meadow grass germinated relatively quickly, but red fescue was very slow at spring temperature. Re-seeding a red fescue green after winter injuries therefore requires a lot of patience (which golfers rarely have).

When comparing root growth we found that annual meadow grass produced longer seminal roots than the others under spring temperatures. See figure 2.

Temporary grasses

Some Nordic golf course managers use either perennial ryegrass (Lolium perenne) or rough stalked meadow grass (Poa trivialis) in the seed mixture to speed up the re-establishment rate. These species are temporary solutions because they are expected to die the following winter. Especially on Poa dominated greens with insufficient dormant seed in the root zone, either species may be an option because there are no winter hardy grasses to cultivate.

In our SCANGREEN variety testing with pure species (not mixtures) the new and fine-leaved varieties of perennial ryegrass have usually established faster and produced higher scores than rough stalked meadow grass, but still the meadow grass has become more popular among Swedish greenkeepers.
A black layer of cyano-bacteria often occurs in spots where grass seed do not germinate. We don’t know if this is a result of poor grass growth or if the bacteria harm the seedlings. This could be a topic for new research projects.

Special challenges

Re-establishing dead greens after winter damage is difficult, and especially after ice injuries with anaerobic soil conditions.

Bad smelling chemicals like butyric acid or hydrogen sulphide may have a negative effect on seed germination. We have extracted soil water from ice covered turf, but could not confirm that this water retarded seed germination. There are, however, some reports that residue from decomposed thatch do reduce seed germination. Early re-seeding, when the soil temperature is low, makes it more likely to see the negative effects of these growth inhibiting chemicals.

Degradation of organic matter will also increase the risk for soil hydrophobicity. There is probably a complex relation between dry spots, biotic winter damages (snow moulds) and difficult re-establishment of dead greens. Surfactants that retain water and improve the top soil moisture content are recommended in these situations.