Monitoring Drainage on a Putting Green

Water is critical for turfgrass growth and turfgrass managers should strive to improve the efficient use of water. One of the most frequently occurring events on a putting green is its irrigation, however exactly where the applied water goes below the surface is unclear to many green keepers. Through drainage of water below the effective root zone is a major loss of applied water and associated fertilizer and thus can have large implications on greenkeeping costs.

The reason for this trial was on the bottom of the green the bent grass was dying and it was reasoned that it was drainage downslope of the green causing the bent grass to be waterlogged for excessive periods.

The aim of this article is to demonstrate it is possible to monitor water movement through the soil profile both vertically and laterally following an irrigation. This has important implications for green construction and irrigation scheduling.

Trial Layout

Neutron probe tubes were installed on a putting green and soil moisture readings were taken with a neutron probe at 10, 20, 30, 40, 50 and 60cm below the surface.

Figure 1 shows a cross section of the bent grass green and tube placement. The green slopes from back to front and is constructed of 30-40cm of coarse sand which overlays a heavy clay soil which is the predominant soil type of the area.

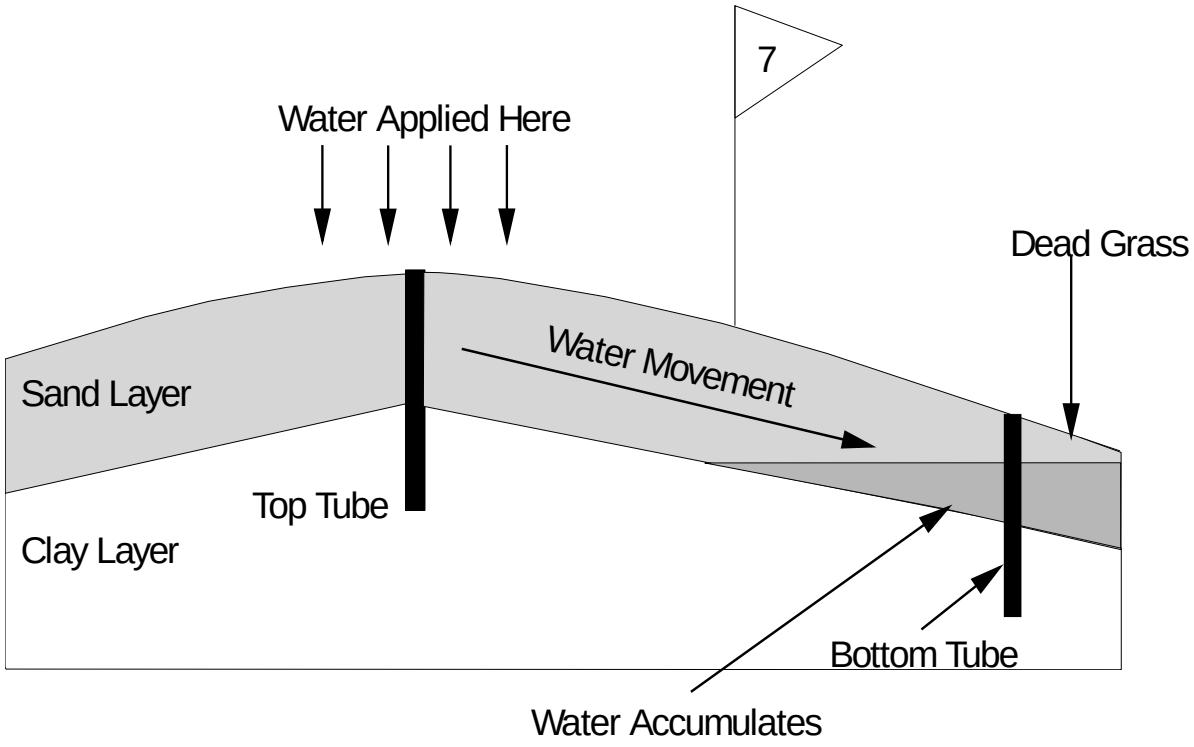

Figure 1. Cross section of Green

The coarse sand has a low water holding capacity which makes it necessary for the green to be watered daily during the very hot summer months. For this trial only the area on top of the green was watered around the top tube (Figure 1) avoiding an area within a five metre radius around the bottom tube.

The objectives of the trial were to find out...

1. How long does the water take to drain through the sand ?
2. Is there any lateral movement of water down the slope ?

Results - the Top Tube

Figure 2 shows for the tube on top of the green between 7.30am and 2.30pm 1 mm of water has been extracted from the soil profile at 10 and 20cm indicating root activity to 20cm. At 2.30pm watering commenced on top of the green only.

One hour after watering commenced 3 mm of water had been added which Figure 2 shows has infiltrated to 40cm as the 3.30pm reading is wetter at 10, 20, 30 and 40cm. At 4.30pm watering ceased and a 5.30pm reading shows the profile has got even wetter at 10 and 20cm because of infiltration of irrigation from the green surface.

By 7.30pm the reading shows the profile has drained as the reading is drier at 10 and 20cm. There has been no increase in the soil moisture status below this at 40, 50 and 60cm hence the water must be going downslope above the clay layer at 40cm.

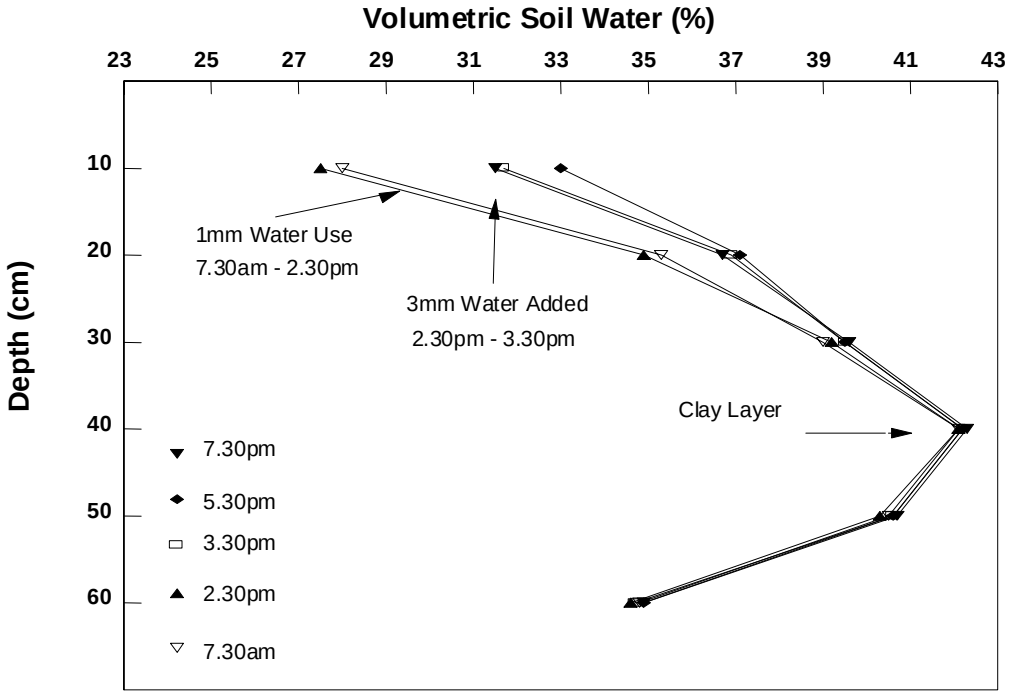

Figure 2. Tube at top of Green

The Bottom Tube

Figure 3 shows no water was applied within five metres of the tube at the bottom of the green. One mm of water was extracted at 10 and 20cm between 7.30am and 3.30pm which is similar to the top tube prior to the irrigation. At 5.30pm the reading shows the profile is now wetter at 10, 20, and 30cm. A total increase of 3 mm of water. By 7.30pm the profile had drained at 10, 20, and 30cm to pond at 40cm where the 7.30pm reading is wetter than 5.30pm.

Summary

Prior to the irrigation both tubes showed 1mm of water extraction to 20cm. Following the irrigation on top of the green 3mm of water drained through the profile to 30cm after one hour. After another hours watering the profile became wetter and then drained down slope and accumulated on top of the clay layer at the bottom tube, thus creating a waterlogged environment for the grass roots. This is killing the grass at the bottom of the green.

This trial demonstrates it is possible to easily monitor through drainage of water in soil profiles. Careful monitoring has enabled the green keeper to know exactly the quantity, when and where water has moved below the soil surface. Soil moisture monitoring eliminates the guess-work for correct irrigation management.

In this trial the neutron probe was used to demonstrate soil moisture monitoring principles. However there are a number of tools including the very latest technology Time Domain Reflectometry (TDR) which is ideally suited to turfgrass applications and will be the subject of the next article. Further reading is available upon request.

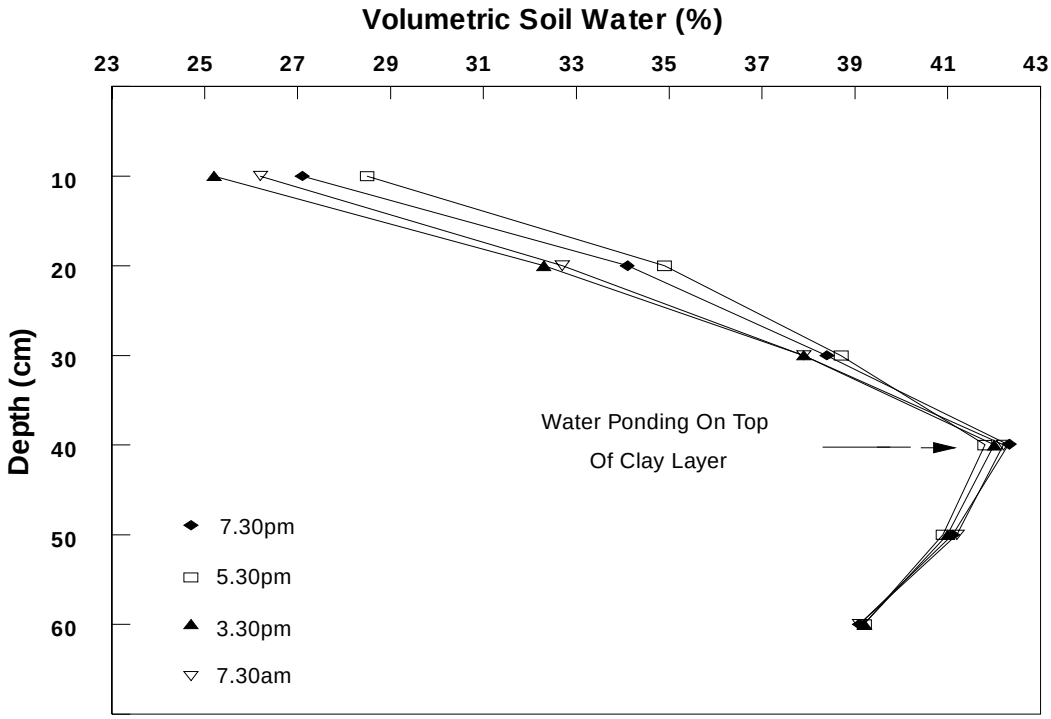

Figure 3. Tube at bottom of Green

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