

Article for TMJ

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Brief:

1500 words

“Irrigation management to use water efficiently”

Topics to cover: Over-watering, unevenness, shortage, importance of even distribution for turf quality and not wasting water

TEXT

One of the keys to maintaining top-quality turf lies in using the right amount of water. This may seem like a given; but what constitutes the “right amount” of water, in any particular situation, is dictated by a raft of other considerations. Soil type, grass type, prevailing weather and local climate conditions, the desired end use of the turf in question, and other elements of turf management, including the chosen fertiliser regime, and other aspects of soil treatments such as aeration, must be taken into account.

Optimum growth conditions typically factor in plants having access to half the available water holding capacity of the soil they are growing in. Too much water can be as counterproductive as too little – even when you’re growing rice.

The water holding capacity of soil is determined by its physical makeup and chemical composition, which also dictates the degree to which water is available to plant root systems, and the relative ability of nutrients to be taken up and translocated by plants.

Available water holding capacity lies between the extremes of field capacity, being the amount of water the soil retains after complete saturation, and permanent wilting point, which is the stage prior to chemical dryness at which plants will not recover from lack of water even when more is added after a period of drying.

Fine textured soils (loam, silt loam, clay loam, clay) hold more water in storage than coarse soils (sand, sandy loam).

The driving force for evapotranspiration water loss from irrigated turf, maintained under non-limiting soil moisture conditions (ie not dependent on the weather), is the evaporative demand properties of the atmosphere. This integrates solar radiation, temperature, and relative humidity. Evaporative demand (and ET) increases with increasing solar radiation, high temperatures, and decreasing relative humidity.

The meaning of ‘efficiency’ as a term in water usage has altered over time, and many people now believe it to refer to the use of as little water as possible. This can be somewhat misleading, resulting in some turf managers using too little water, through a desire to ‘save’ or ‘conserve’ what is rightly seen as a precious resource. The original concept of efficiency had more to do with optimum usage than with minimal usage; and it is the optimal application of water, relative to all other parameters,

that will ensure turf quality is maintained throughout the growing season and when the turf is being subjected to use.

Maintaining soil moisture requires managers to not only put on the right amount of water, but to put it on in the right way and at the right time. Fine turf of necessity demands the fine and even application of water. Both the overall design of the irrigation system, and the choice of hardware used to distribute water, are critical to this process.

Managers in New Zealand are fortunate in having access to a number of quality offerings from industry in terms of the types of sprinklers available. Golf sprinklers, and others intended for use where turf quality is paramount, are supplied and serviced by a number of firms, providing distribution uniformities that exceed the parameters required by best practice, and indeed beyond those necessary in, for example, many agricultural applications.

Good design is also essential, and again, industry has a wealth of accumulated knowledge and skill that can be of great value and assistance to managers in determining and planning their irrigation requirements.

Good design begins with good information, and designers will typically start by determining the requirements of end use, and the actual availability of water, and progress their designs to the place where these two parameters converge. Often one of the first questions asked is whether or not the water available from a bore or piped supply will be sufficient to meet maximum demand, or whether a pond or other reservoir will be needed to buffer any shortfall in this regard.

Designers will also need to know what soil types prevail across the area to be irrigated. In some applications, such as golf greens and sports fields, this can be and generally is modified to achieve an engineered consistency. Outside of areas where the soil has been deliberately modified to achieve a known consistency, soil types can and do vary dramatically even across relatively small areas. The geological processes that create landforms over very great periods of time have bequeathed us what can be a veritable chocolate box of soil variations in any given location. Today's golf course may well be sited on top of yesteryear's old riverbed, and a 21<sup>st</sup>-century sports stadium might occupy a place that the 15<sup>th</sup> century knew as a swamp. The upshot could well be a mix of sand, gravel, clay, and any other soil type, all in close proximity, and none of them with defined edges or laid out in predictable straight lines.

When all other things are equal, in the above case that being in terms of consistent soil type and mix of grasses, it is the evenness of water application that determines even consistent growth, allowing greenkeepers and other turf managers to maintain the fine playing surfaces that our discerning clientele demand. Ensuring this requires making sure that the delivery of water is not compromised, by maintaining intakes, pumps, valves, and filters to avoid blockages building up, or prevent delivery from being otherwise restricted. Nozzles wear over time, and should be inspected regularly, and replaced if their physical breakdown is beginning to degrade the clean formation of the desired droplet distribution pattern.

The inclusion of soil moisture monitoring is an essential element in the design and installation of good turf irrigation systems. Knowing how much moisture is in the ground and available to plants allows managers to regulate their irrigation regimes irrespective of temporary weather conditions, which can and do sometimes lead to erroneous presumptions as to conditions underground. Uninitiated observers may, for example, wonder why we sometimes continue to water during rain, being perhaps unaware that what is happening in the root zone does not necessarily reflect what might be going on above ground. As alluded to above, the placement of soil moisture sensors needs

to account for known variations in soil type, and hence it is important to properly survey the ground before any irrigation system is installed.

By the same token, lush green growth at the surface may not necessarily indicate a good ongoing reservoir of soil moisture in the root zone, and managers need to remain mindful that drying conditions can be creeping up even before the outward signs start pointing to them – and by the time growth begins to slow, it may be too late to restore optimal available water levels in time to save the turf. Vigilance in monitoring, and responding to changes before problems appear, is the way to avoid such potential issues.

Good modern irrigation control systems are increasingly able to communicate with and take inputs from localised weather stations, further enhancing the ability of managers to fine-tune their irrigation regimes in an informed manner.

Over-watering can lead to a raft of problems that are every bit as potentially damaging as under-watering. Firstly it is wasteful; water is, and is seen as, a precious resource, and pouring it down the drain is frowned upon nowadays, in a way that was not the case in years gone by. Water can also be expensive, both when supplies are metered and charged, either by local authorities or by private commercial irrigation schemes, and in terms of the cost of pumping.

Over-watering can also be a cause of soil degradation, in two ways. Prepared turf subsurfaces can be washed out resulting in physical damage to greens and other playing surfaces, and nutrients can also be stripped through excessive watering, degrading the cation exchange capacity of the soil, which dictates the ability of plants to take up nutrients, and in extreme cases, causing reverse osmosis resulting in plant roots leeching moisture and essential minerals back into their surroundings, which might be good for the surroundings, but definitely isn't good for the plant.

In short, there is no “one size fits all” solution to managing irrigation and water use in the maintenance of fine turf. Managers must have a comprehensive understanding of the grass types they are working with, their growth habits and water and nutrient requirements, and the nature of the soil in which those grasses are growing. They need to be mindful of the weather as it is and as it is likely to be, and to have access to good information regarding this, as well as as much data as technology is able to provide, regarding what is going on below the surface.

Not too much water, or too little, applied neither too early nor too late; delivered consistently and gently, intending and achieving balance in terms of smooth green grass and happy customers. If your turf is dead, you're probably not using enough water, and if it's running off down the kerb you're almost certainly using too much. But the sweet spot is a long way from either of those extremes, and finding it is all about knowledge and understanding.

If in doubt, talk to your irrigation company rep. We're on your side, and we're here to help.

Richard Prosser

ENDS