With a combination of unrealistic hours of use, dormant grasses and wet weather, managing wear on winter sportsfields is enough to give any curator a serious headache

Winter woes

Managing sportsfields through the demands of winter is without doubt one of the most challenging tasks in turf management. In this instalment of AGCSATech update John Neylan looks at strategies for preparing and managing wear on winter sports surfaces.

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Winters in southern Australia are generally cool and relatively wet and this coincides with the major football codes of rugby, rugby league, soccer and Australian Rules. These sports all impose a high level of wear and turf damage at a time when grass growth is slow. Municipal sportsfields are used most days of the week for training and competition, with the former causing the greatest amount of turf damage.

Following many years of low rainfall winters, the winter of 2010 saw back to normal rainfall patterns with 2011 looking similar. A combination of traffic and wet soils can cause a dramatic deterioration in the quality of turf surfaces. As soils become wet there is a redistribution of the silt and clay particles which clog the larger pore spaces which in turn reduces the infiltration rate and aeration porosity.

When soils become saturated and muddy the turfgrass becomes coated with soil and partially buried, which accelerates the deterioration process. Concentrated traffic is experienced during training and on wet soils significant and irreparable damage can be caused in a very short time period.

How can wear and the damage it causes be managed at a time when growth is slow and soils are wet? Minimising turf damage involves a combination of factors including good soil permeability and drainage, a strong turf sward going into winter, good fertility, a programme of regular aeration and managing traffic.

CONSTRUCTION

There is no substitute for having a well-constructed field using sandy soils with a good drainage rate. Good drainage ensures that excess water drains quickly out of the rootzone and will have little adverse effect on turf health. Sportsfields constructed from poor draining soils quickly become saturated and compacted resulting in accelerated turf deterioration.

SOIL MANAGEMENT

All soils will suffer from some form of compaction. As the silt and clay fractions increase the more the soil becomes compacted, reducing the drainage rate and aeration porosity. The effects of compaction must be alleviated through deep tine aeration, hollow coring and slicing. While fine textured soils are the most prone to compaction, sandy soils can also become compacted at or near the surface and sand profiles will benefit from a programme of regular aeration.

Aldous et.al. (2002) evaluated the performance of the Vertidrain 7117 Mustang subsurface aeration machine. The trial was conducted on two sportsfields – a medium-fine sand profile and a duplex red friable clay profile. The study incorporated treatments at different tine spacings (55x75mm, 55x55mm and 55x35mm), tine diameters (5mm and 8mm) and degrees of kick (5 and 10 degrees) applied weekly.

Results showed that subsurface aeration using the 8mm tine can reduce surface hardness and soil strength, improve infiltration rate, root dry weight and turfgrass quality. In sand profiles, the larger needle diameter (8mm) can advance measurable reductions in surface hardness to one month, whereas the effects of narrow diameter needles (5mm) were not observed for two to three months.

Penetrometer resistance could be reduced, while infiltration rate increased within one month using treatments of either 5mm or 8mm needles on sand profiles and 8mm diameter needles on clay loam profiles. Increasing needle diameter significantly increased root dry weight in the sand profile.

THATCH MANAGEMENT

The quality of turf playing surfaces is dependent on the quality of its foundation (the soil conditions) and how it is managed from year to year. Turfgrasses by their nature produce organic matter through the production and die back of stems and leaves. Depending on the grass species, cultivar and growing conditions, large amounts of organic matter can be produced in a growing season which has a profound effect on the characteristics of the playing surface.

Excessive thatch accumulation can cause the following problems;

- Restricts water and air movement into the soil;
- Results in reduced root growth and more frequent irrigation;
- Creates an ideal environment for turf insects and disease organisms;
- Makes mowing difficult because the turf becomes spongy;
- Raises the growing points that are then exposed to greater extremes in temperature; and
- Restricts downward movement of pesticides and fertilisers in the soil.

Excessive thatch during the winter months can retain excess water at the surface which aggravates the impact of traffic by accelerating wear and turf deterioration. On sportsfields, excessive organic matter will also result in excessively soft surfaces of poor playability.

In preparation for winter play, an effective thatch management programme is essential. Scarifying and hollow tining in the spring is a critical process in effective thatch control with additional corings as a preparation for wet weather.

GRASS TYPE AND WEAR CHARACTERISTICS

Turfgrasses vary in their ability to tolerate wear. Roche et.al. (2009) studied the effects of traffic on the wear tolerance of eight warm-season grasses (Table 1).

There were substantial differences in wear tolerance among the eight cultivars investigated and the rankings of some cultivars changed between years. Wear tolerance was associated with high shoot density and a dense stolon mat strongly rooted to the ground surface. Wear tolerance was also affected by turf age, planting sod quality and wet weather.

In other research being undertaken by Roche (2011) results to date indicate that there are considerable wear tolerance (e.g.: 87 per cent) and wear recovery differences between *Cynodon*, kikuyu and *Digitaria* species and cultivars. As these cultivars are commonly used for sports and recreational purposes, this means that if a less suitable cultivar is chosen, a sportsfield could be closed up to 85 per cent more often than is necessary, as it is unfit for play.

TABLE 1: CYNODON CULTIVAR TURF QUALITY RATINGS[1]

	2006				2007			
Cultivar	**Control (no wear)**	**7-day wear**	**14-day wear**	**Wear tolerance ranking***	**Control (no wear)**	**7-day wear**	**14-day wear**	**Wear tolerance ranking***
Group 1 (2006)								
Tifsport	8.5 (0)	3.8 (35)	4.6 (16)	=1	8.3 (0)	4.0 (33)	5.8 (6)	4
Grand Prix	8.5 (0)	3.0 (40)	4.4 (23)	=1	8.2 (0)	5.3 (13)	6.5 (3)	1
Legend	7.5 (0)	3.4 (43)	3.8 (26)	3	6.9 (0)	3.8 (41)	5.6 (12)	=5
Conquest	7.5 (0)	3.1 (48)	3.9 (31)	4	7.1 (0)	4.8 (20)	5.9 (5)	3
Group 2								
Wintergreen	7.6 (0)	1.1 (89)	2.3 (65)	5	7.6 (0)	3.8 (44)	6.4 (2)	=5
Princess 77	8.3 (0)	0.5 (95)	1.4 (84)	6	7.9 (0)	2.0 (77)	5.8 (8)	7
Hatfield	7.9 (0)	0.5 (95)	1.4 (78)	7	7.9 (0)	4.9 (21)	6.9 (0)	2
Harditurf	6.8 (0)	0.3 (98)	0.8 (93)	8	7.3 (0)	1.9 (81)	4.7 (15)	8
LSD (P=0.05)	**0.4 (-)**	**0.6 (10)**	**1.0 (20)**	**-**	**0.4 (-)**	**1.0 (21)**	**1.0 (19)**	**-**

[1] Turf quality ratings (with percentages of bare ground shown in brackets) for individual *Cynodon* cultivars at the end of the winter-spring wear period in 2006 and 2007 (trials 1 and 3). In both years, there was no bare ground in the control (no wear) treatment. Source: Roche et.al. (2009)

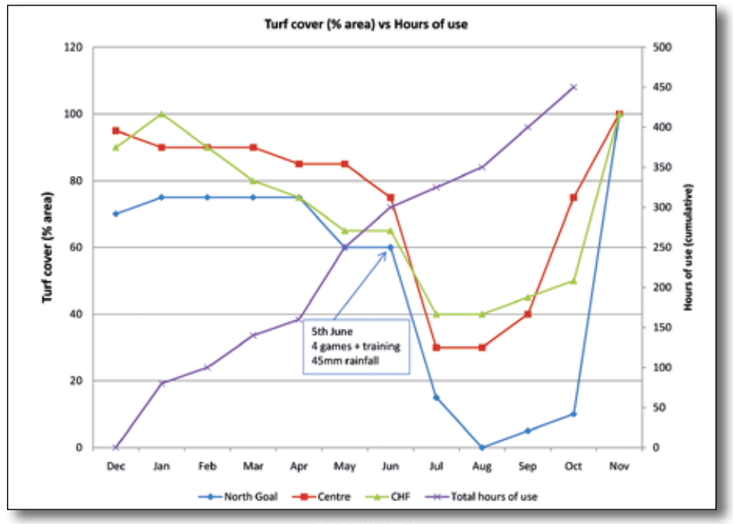

Figure 1: Turf cover on an AFL ground as affected by hours of use and rainfall

FERTILITY

Couchgrass begins to go dormant when day lengths get shorter and air temperatures drop below 10-15°C. The majority of the fertiliser should be applied in the summer when the couchgrass is actively growing. The purpose is to build up a strong and healthy turf mat with the aim of providing improved wear tolerance over winter. A fertiliser high in phosphorus and potassium and moderate in nitrogen in early autumn will provide improved root, stolon and rhizome strength before going into dormancy.

On sportsfields with limited or no irrigation, an important strategy is to be flexible in the turf management programme where fertiliser can be applied when summer rain is forecast. If there is some water available, strategic irrigations in conjunction with fertiliser applications will optimise growth and turf strength prior to winter dormancy.

In developing a fertility programme it must be:

- Based on soil test results. It is especially important to have optimum levels of potassium prior to winter dormancy;
- Reduce, but do not eliminate, nitrogen applications in the autumn. Excessive amounts of nitrogen can lead to leaching because plant growth and nitrogen uptake is slowed in the cooler autumn weather;
- On areas prone to spring dead spot, reduce nitrogen rates and increase phosphorus and potassium in the autumn;
- In frost prone areas make final nitrogen application 30 days prior to the first expected frost; and
- Consider foliar-applied iron and magnesium to help maintain green colour without a flush of growth late in the season.

PEST CONTROL

Insect pests can cause extensive damage to turf which weakens it and reduces its ability to tolerate wear during the dormant months. Scarab beetle larvae and Argentine scarabs can cause degradation to the root systems which reduces surface stability and traction. An insect-infested field, subjected to moderate to heavy traffic, will result in extensive surface disruption and poor playability.

Couch mites can also significantly reduce the growth and vigour of couchgrass. Most mite damage occurs in the spring/summer and can reduce the recovery from winter wear.

If insect pests are a regular occurrence it is important to have a strategy in place where they are preventatively controlled. If irrigation is limited, as with the fertility programme, it is important to undertake pest control either when rainfall is imminent or to use what water is available to irrigate after a pesticide application.

As with any successful pest control programme you must understand the pest and its lifecycle, the most appropriate control measures and the optimum timing for pesticide applications.

TRAFFIC MANAGEMENT

Managing sportsfields requires a great deal of coordination among administrators, coaches and turf managers. The first step in controlling traffic on a sportsfield is to educate the facility users about the advantages of distributing wear rather than concentrating it – especially in late autumn and early winter when turfgrass growth is reduced.

Even when employing the strategies detailed here, the ideal programme for protecting and/or restoring desirable field playing conditions is to control traffic and to maintain acceptable turf density. Ideally there would be fields dedicated to training and fields dedicated to match day!

As a general rule, the industry standard for hours of use for a natural turf field is between 14 and 18 hours per week, but only where the field is a well-drained sand-based construction that is well maintained and in good condition (MCC, 2010). Winter use is the most damaging, particularly when there is wet weather and growth and recovery is relatively slow. During the winter sports season we observe fields that average up to about 18 hours per week of scheduled use, peaking at 26 hours per week in mid-winter.

Work that has been done by the Sports Turf Research Institute in the UK has given the best insight to construction type and the expected hours of use (Table 2). The studies undertaken were based on assessing how long the turf cover persisted on key sections of the field during a soccer field. While the data comes out of the UK, it provides an indication of the level of wear that can be expected for different sportsfield construction types.

In a study on an AFL field used for both training and matches, the use and wear was monitored over a 24-week period and the results are detailed in Figure 1. The most compelling outcome of the study was the rapid deterioration of the surface with a combination of high use and high rainfall.

A few practical notes to be aware of in terms of managing wear include:

- Rotate training activities;
- Do not train in the high wear areas (e.g.: goal mouths and centre);
- Intensive and repetitive drills should be confined to an 'out of play' area;
- If a hole begins to develop, fix it. Allowing holes to remain unattended will result in a much larger area to repair at the end of the season and increases the risk of injury;
- If the field is wet, avoid using heavy machinery even if mowing is scheduled;
- At the end of the winter replace heavily worn areas with turf. Trying to grow grass back in rarely works; and
- Maintain a programme of regular aeration to relieve compaction and to improve drainage.

BE PREPARED

Managing wear on winter sportsfields is potentially the most challenging task in turf management. With a combination of unrealistic hours of use, dormant grasses and wet weather, turf damage is inevitable.

Planning out a 12 month maintenance programme around the schedule of field use is critical. Look for extended periods of little or no play and perform the most disruptive cultural practices, such as aerification, during this time. Flexibility is very important and be ready to adapt the plan if needed. Weather conditions, changes in schedules and make-up games can alter the plan; always have a back-up plan and don't skip part of the programme. Be sure to have all equipment, pesticides and fertilisers on hand before they are needed.

Managing wear involves a number of strategies over the entire 12 months including;

- Optimising plant health through good fertility and pest control;
- Controlling soil compaction and surface sealing through regular aeration including hollow coring, verti-draining and slicing. During the winter months some form of aeration should be undertaken every 2-4 weeks;
- Spring renovations including scarifying, hollow coring and topdressing.
- Autumn aeration and fertilising;
- Repair damaged areas before they become too large; and
- At the end of winter, repair the high wear areas such as goal mouths and the centre of the field with solid turf.

Managing sportsfields requires a great deal of coordination among administrators, coaches and turf managers. The first is to educate users about the advantages of distributing wear rather than concentrating it

TABLE 2: SPORTSFIELD USE AS AFFECTED BY CONSTRUCTION TYPE

Construction	Use (hours/week)	Total hours/season
Soil field ± drainage	2 – 3.7	105
Sand profile with drainage	5.3 – 11 (7.8 hrs/week over 35 week soccer season)	273
AFL sand fields	12 - 13	440

Source: Baker and Gibbs (1989)