Improvement and maintenance of turf demonstration plots for national research and extension

Matthew Roche
The Department of Agriculture, Fisheries and Forestry, QLD

Project Number: TU09002
This report is published by Horticulture Australia Ltd to pass on information concerning horticultural research and development undertaken for the turf industry.

The research contained in this report was funded by Horticulture Australia Ltd with the financial support of the turf industry.

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ISBN 0 7341 2910 6

Published and distributed by:
Horticulture Australia Ltd
Level 7
179 Elizabeth Street
Sydney  NSW  2000
Telephone:  (02) 8295 2300
Fax:  (02) 8295 2399

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Improvement and Maintenance of Turf Demonstration Plots for National Research and Extension

Final Report

Matt Roche et al

Department of Agriculture, Fisheries and Forestry, Queensland (DAFFQ)
Project Number TU09002

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This report provides background information and summarises the process and outcomes of a three year project set around maintaining and upgrading the Redlands turf demonstration plots. The demonstration plots have been growing as a “living library” (reference collection) at Redlands Research Facility since the turf teams inception in 2000.

The project has been funded by Horticulture Australia Limited (HAL) using Turf levy and matched funds from the Australian Government.

Final Report Submitted to Horticulture Australia limited: 14 May 2012

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Acknowledgements

Since the inauguration of the turf research program at Redlands in 2000, turf collections and plots of turf were quickly planted for observational purposes much to the “delight” of former research facility managers. In an attempt to contain the ever growing collection, the concept of “The Turf Demonstration Plots” was conceived and construction/planting commenced five months after the group was formed.

Between the year 2000 and now there has been a growing list of organisations and people I would like to thank for their involvement in establishing, supplying and maintaining the reference collection, or ‘living library’, housed at Redlands Research Facility.

First and foremost I would like to thank former Principal Scientist Dr Donald Loch who was the architect behind establishing the reference collection. Don was instrumental in importing turfgrass varieties from countries like the USA, where universities and breeding programs have a continued focus on developing improved cultivars for ornamental or recreational use. The importation of turf varieties, along with known Australian cultivars, soon grew the library to encompass 22 taxa, providing homeowners, the turf industry, educational institutes and researchers alike with a turfgrass collection never before been seen in the southern hemisphere.

The site currently contains 137 (of 138) unreplicated plots (3 m x 2.5 m) containing warm-season turfgrass varieties, many of which are now grown commercially here in Australia. In an effort to maintain the purity of the turf plots, over the year’s grasses have had to have been chemically removed and returfed due to contamination etc. To assist in this process the Australian turf producers and seed suppliers have been much help in supplying plant material; in particular: Abulk Turf, Australian Lawn Concepts, Clifton Park Turf Supplies, Evergreen Turf, Greenacres Turf Supplies, Jimboomba Turf, Ozbreed, Oz Tuff Turf, ex. Rochedale Turf, StrathAyr, The Bottom Line Landscapes, Turfworld, Turf Force, Twin View Turf, Advanced Seed, Australian Premium Seeds, Heritage Seeds, J.H. Williams & Sons, PGG Wrightson Turf, Progressive Seeds, Selected Seeds and Walsh’s Seeds.

The Redlands Turf Research Team would like to thank Root Barrier who donated sufficient polyethylene Root Barrier® and sodium bentonite in an effort to prevent/limit encroachment of various invasive warm-season grasses (e.g. *Cynodon* spp.) located within the reference collection. The team would also like to thank Globe Pty Ltd and Nuturf Australia for donating supplies of fertiliser when available.

Last by no means least I would like to thank former and current Redlands turf team members who have tirelessly worked to uphold the integrity of the plots, promote the wider benefits of turf and educate the numerous visitors who have come to see the “living library” over the years. Thank you.

Matt Roche
Research Scientist - Turf
Queensland Department of Agriculture, Fisheries and Forestry (DAFFQ)
Media Summary

In 2000, The Queensland Department of Agriculture, Fisheries and Forestry (DAFFQ) (formerly Dept of Employment, Economic Development and Innovation - DEEDI) built a ‘living library’ of overseas and Australian turfgrass selections made up of 138 different warm-season turf cultivars. Back-up material of all plus additional cultivars are also preserved in tubs in an attempt to limit encroachment or contamination and maintain genetic purity of the collection. Between 2000 and 2009 DEEDI was solely responsible for the construction and maintenance of the entire collection. In 2009, a three-year Horticulture Australia (HAL) application (TU09002) was given the support of the turf industry, utilising levy funds, to share costs associated with the maintenance and resources required to maintain the integrity of the collection.

The establishment and continued maintenance of the turf plots has assisted researchers, the wider turfgrass industry, students and homeowners by:

- maintaining a reference point for warm-season turf material. This includes regular visits to inspect the plots by educational groups, members of the public and industry representatives from around Australia and internationally;
- reducing R&D costs by allowing rapid and easy propagation of material for research, Plant Breeder’s Rights (PBR) registrations and demonstration purposes; and
- allowing greater access to new (international) material for R&D purposes.

The collection held at Redlands Research Facility is the largest in the southern hemisphere and is an integral part of the Australian Turfgrass Industry, especially at maintaining a source of true-to-type warm-season grasses available in Australia. Funding made available from the turfgrass levy and HAL provides ongoing security to a reference collection of this kind and ensures the detailed collection will be made available to the wider turfgrass industry and general public for years to come. The ‘living library’ also provides a great living advertisement of the health and environmental benefits of choosing turf.
Technical Summary

In 2000, The Queensland Department of Agriculture, Fisheries and Forestry (DAFFQ) (formerly Dept of Employment, Economic Development and Innovation - DEEDI) built a ‘living library’ of overseas and Australian turfgrass selections made up of 138 different cultivars. Back-up material of all plus additional cultivars are also preserved in tubs in an attempt to limit encroachment or contamination and maintain genetic purity of the collection for R&D or experimental purposes.

One such purpose where it is imperative that quality control of turf material is adhered to is for the purposes of conducting Plant Breeder’s Rights (PBR) experiments. PBR experiments allow researchers to assess the morphological-agronomic characteristics of candidate and comparator varieties and collect data on DUS (Distinctness-Uniformity-Stability) for the purpose of PBR registration. These days, such a process is essential prior to a variety hitting the market to preserve the intellectual property rights of the breeder/turf producer/investor. The registration and introduction of new varieties into the Australian market is essential to meet an ever changing environment.

The long-term strategy in planting and growing out the turf demonstration plots of virtually all the available warm-season turfgrass varieties at Redlands is to develop a more detailed understanding of their growth characteristics, together with their relative strengths and weaknesses under local conditions. Since the establishment of the turf plots in 2000, DAFFQ researchers have been provided an excellent opportunity to see how the 22 species of turfgrass perform and what management practices (e.g. fertility, scarifying, pesticide use) benefit each particular turfgrass varieties.

DAFFQ staff looks forward to preserving the collection, the largest in the southern hemisphere, making material available for future testing across Australia, and to be in a position to continue to educate members of the turf industry, students and general public when visiting Redlands Research Facility.
Introduction

Efforts in procuring, evaluating and maintaining turfgrass germplasm, including publicly assessable collections for future breeding and genetic improvement is paramount (Taliaferro et al., 2004) for the development of the Australian turfgrass industry. Factors such as climate change, increased urbanization, a changing industry, user expectations and consumer demand will all have an influence on the development of future turf varieties and therefore resources must be available to educate and influence change.

In Australia procurement of improved turfgrass began in an informal way in 1956 when Doug Corbett, a teacher of Greenkeeping, visited the New Zealand Turf Research Institute (NZSTI) in Palmerston North and brought back to Australia the three *Cynodon dactylon* x *C. transvaalensis* (*Cynodon* hybrid) cultivars ‘Tiffine’, ‘Tifgreen’ and ‘Tifway’ (McMaugh, 2008). The cultivars all derived from the Tifton strain were housed at the Ryde School of Horticulture, Ryde, New South Wales, which was the later home for the Grass Research Bureau. The 1930 South African *Cynodon* cultivar ‘Royal Cape’ (PI 213387) which was obtained through the Royal Botanic Gardens, Sydney, New South Wales (McMaugh, 2008) was also housed at the Ryde School of Horticulture. These few imported cultivars were the first few to be observed and informally trialled in Australia. Of native origin, the *C. dactylon* cultivar ‘Greenlees Park’ has been referred to as the first single-strain couch grass (McMaugh, 1988), which was planed at the Greenlees Park Bowling Club, New South Wales in late 1969 (Beehag, 2006). The cultivar is still used today; however the purity of the cultivar is debatable. None of the latter collections and/or facilities remains in situ.

In 2000, a turf research program was initiated within Queensland by then DPI (now DAFFQ) to service the wider turfgrass industry and grow what is now a AU$3 billion (Australia, 2008) turf industry. The turf research team under the guidance of former principal scientist Dr Donald S. Loch collected all known Australian cultivars and obtained others from research organisations and universities in the USA. As a result the 66 ha research facility soon boasted a ‘living turfgrass’ library containing 138 different vegetative or seeded warm-season grasses comprising of 22 species. The collection to date has expanded from the meticulous work undertaken by former and current DAFFQ turf research staff. The collection is also housed in segregated containers, to limit contamination and maintain purity, for R&D purposes and to supply material for the purposes of Plant Breeder’s Rights (PBR) testing at Redlands.

Since the construction of the Redlands turf demonstration plots in 2000, little development has taken place within Australia looking at improved warm-season turf varieties on a larger scale. This was until 2006, when an Australian Research Council (ARC) linkage grant was provided to the University of Queensland (UQ) who worked in collaboration with DAFFQ to develop new turf grasses (green couch in particular) with reduced water and nutrient requirements for domestic, sports ground and amenity lawns from genotypes selected from across Australia. Results to date have shown that due to Australia’s endemic potential, varied climatic and geographic conditions, the discovery of naturally occurring clonal plants with desirable traits has been achievable and could assist with future breeding works. The latter genotypes coupled with viable turf selections from the Redlands turf demonstration plots should provide a great source of material for future breeding work should resources be made available. The future looks healthy for turf development and reference collections alike.
Material and Methods

**Location:** The demonstration site (Figure 3) is located at the state departments Queensland Department of Agriculture, Fisheries and Forestry’s (DAFFQ’s) Redlands Research Facility, Cleveland, Queensland (27°32’S, 153°15’E, <25 masl), approximately 35 km east-south-east of the Brisbane CBD.

**Layout:** Vegetative and seeded varieties of warm-season turfgrasses from around the world are established from rooted plugs, sod or seed in unreplicated field plots, each measuring 3 m x 2.5 m. Plot borders were defined by laying 20 cm x 8 cm sleepers onto the red krasnozem soil. The profile within each plot was then built up with 8 cm of greens grade sand. The total demonstration area covers 1,050 m².

The field plan (Figure 1) depicting the plot layout is shown on page 10. The plan shows the name of each cultivar in the centre of its plot, with the number for that plot shown in the top right-hand corner. A six-letter species code (derived from the first three letters of the genus followed by the first three letters of the species name) is shown in the top left-hand corner of each plot located on page 10. A detailed list of species codes can be found below.

**Species Code**

<table>
<thead>
<tr>
<th>Code</th>
<th>Species Name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXOCOM</td>
<td>Axonopus compressus (broadleaf carpetgrass)</td>
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</tr>
<tr>
<td>AXOFIS</td>
<td>Axonopus fissifolius (formerly A. affinis) (narrowleaf carpetgrass)</td>
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</tr>
<tr>
<td>BOTPER</td>
<td>Bothriochloa pertusa (Indian bluegrass)</td>
<td></td>
</tr>
<tr>
<td>BOUDAC</td>
<td>Bouteloua dactyloides (formerly Buchloe) (American buffalograss)</td>
<td></td>
</tr>
<tr>
<td>CYNDAC</td>
<td>Cynodon dactylon (green couch)</td>
<td></td>
</tr>
<tr>
<td>CYNTRA</td>
<td>Cynodon transvaalensis (Transvaal couch)</td>
<td></td>
</tr>
<tr>
<td>CYNHYB</td>
<td>Cynodon hybrid - C. dactylon x C. transvaalensis (hybrid green couch)</td>
<td></td>
</tr>
<tr>
<td>DACAUS</td>
<td>Dactyloctenium australe (sweet smothergrass)</td>
<td></td>
</tr>
<tr>
<td>DIGDID</td>
<td>Digitaria didactyla (blue couch/Swazigrass)</td>
<td></td>
</tr>
<tr>
<td>DISSPI</td>
<td>Distichlis spicata (saltgrass)</td>
<td></td>
</tr>
<tr>
<td>EREOPH</td>
<td>Eremochloa ophiuroides (centipedegrass)</td>
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</tr>
<tr>
<td>PANLAX</td>
<td>Panicum laxum</td>
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<tr>
<td>PASNIC</td>
<td>Paspalum nicorae (Brunswickgrass)</td>
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<tr>
<td>PASNOT</td>
<td>Paspalum notatum (bahiagrass)</td>
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</tr>
<tr>
<td>PASVAG</td>
<td>Paspalum vaginatum (seashore paspalum)</td>
<td></td>
</tr>
<tr>
<td>PENCLA</td>
<td>Pennisetum clandestinum (kikuyugrass)</td>
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</tr>
<tr>
<td>SPOVIR</td>
<td>Sporobolus virginicus (marine couch)*</td>
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</tr>
<tr>
<td>STESEC</td>
<td>Stenotaphrum secundatum (buffalograss/St Augustinegrass)</td>
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</tr>
<tr>
<td>ZOYJAP</td>
<td>Zoysia japonica (Japanese lawngrass)</td>
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<td>ZOYMAC</td>
<td>Zoysia macrantha (dune couch)*</td>
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<tr>
<td>ZOYMAT</td>
<td>Zoysia matrella (Manilagrass)</td>
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</tr>
<tr>
<td>ZOYTEN</td>
<td>Zoysia tenuifolia (Koreangrass)</td>
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</tr>
</tbody>
</table>

* Australian native species
**Management:** All plots are irrigated and receive the same rate of slow release fertiliser at regular intervals of 2-3 months during the growing season. Species and varieties have been arranged in four mowing groups, for which the height of cut (5, 10, 20 or 40 mm twice weekly through the warmer months) is increased moving from south to north through the demonstration site (Figure 1).

Plot integrity has been maintained by routine hand weeding and chemical control depending on the target and host species within the plots. Selective herbicides utilised included DSMA (to control blue couch), fluazifop (blue couch) and fluazifop + triclopyr (*Zoysia*). Any plots that were badly contaminated by other grasses that cannot be selectively controlled with herbicides were physically and or chemically removed and replanted to the original variety using full sod where possible.

Further management activities e.g. pest and disease control, pre-emergence weed control, mechanical treatments, can be seen in the results section and within Table 1 below.

**Table 1.** Devised seasonal turf maintenance calendar for the Redlands turf demonstration plots.

<table>
<thead>
<tr>
<th>Task</th>
<th>Target</th>
<th>Product</th>
<th>Spring</th>
<th>Summer</th>
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</thead>
<tbody>
<tr>
<td>Chemicals</td>
<td>Mites</td>
<td>Abamectin</td>
<td>Sep</td>
<td>Oct</td>
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<tr>
<td>Encroachment</td>
<td>Roundup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germination of weeds</td>
<td>Ronstar-G</td>
<td>App.</td>
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<tr>
<td>Grubs, Armyworm etc</td>
<td>Baythroid Turf</td>
<td>Timing dependent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edging</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mowing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scarification</td>
<td></td>
<td></td>
<td>First Week</td>
<td></td>
</tr>
<tr>
<td>Fertiliser</td>
<td></td>
<td></td>
<td>First Week</td>
<td></td>
</tr>
<tr>
<td>Weeding</td>
<td></td>
<td>Weekly</td>
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<thead>
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<th>Task</th>
<th>Target</th>
<th>Product</th>
<th>Autumn</th>
<th>Winter</th>
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<td>Mar</td>
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<td>Baythroid Turf</td>
<td>Timing dependent</td>
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Figure 1. Field plan and species layout/coding as of 3 May 2012.

**North (Finucane Road)**

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<th>Code</th>
<th>Name</th>
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8
Results

Funding made available through this project has enabled DAFFQ staff to continue ongoing maintenance and upgrading of the Redlands turf demonstration plots. A resource of this kind has and will continue to require significant resources in order to maintain each plot’s integrity (i.e. the maintenance of true-to-type material, the exclusion of weeds and the implementation of appropriate management for each particular plot such as irrigation, fertilisation and mowing regime) and keep the demonstration area in a showcase condition.

Between 2009 and 2012 routine comprehensive assessments of the plots were conducted by DAFFQ turf team members. During each audit, their condition and an action plan for regular maintenance, remediation, upgrading or replacement was developed. Following contains an overview of the processes undertaken.

Pesticides

- Regular application of Ronstar® (active constituent 9.5 g/kg oxadiazon) applied to all plots as a pre-emergent control
- Starane (active constituent 200g/L Fluroxypyr) applied to all plots to remove broadleaf weeds
- Zoysia matrella and Z. japonica sprayed with Fusilade® (active constituent 212g/L Fluazifop) to remove green couch (C. dactylon) contamination
- DSMA Clear (active constituent 220g/L DSMA) used to remove blue couch (Digitaria didactyla) from green couch varieties
- Control of mites (Eriophyes spp.) using Gremlin™ or Vertimec® (both have an active constituent of 18g/L abamectin) and Supracide® (active constituent 400g/L methidathion)
- Spraying out badly contaminated areas with Roundup® (active constituent 360g/L Glyphosate) or other formulations depending on the target and host species and turf cultivars.

Physical maintenance

- Plots routinely edged and mowed
- Scarification of plots over the summer
- Topdressing and fertilising
- Solid and hollow tining of plots
- Hand weeding of individual plots
- Turf removal using the sod cutter

Plot/Area maintenance

- Replacement of worn irrigation equipment, sprinkler cleaning and distribution uniformity checks (e.g. Plate 7 and Figure 2)
- Worn and damaged wooden plot borders replaced
- Installation of Root Barrier® within the Cynodon dactylon plots (Plates 5 and 6).
- Individual nameplates designed and installed providing information regarding species, common and trade names for each of the plots (Plate 1).
- Wood chip mulch positioned down the eastern side of the turf block, beneath the fence divider.
Turf replacement or new introduction

- Nara™ (MAC03) – Zoysia macrantha (18/11/2010)
- PristineFlora™ (BA-305) – Zoysia hybrid (8/07/2010)
- UltimateFlora™ (BA-109) – Zoysia japonica (8/07/2010)
- CynoMax™ (LEG13A) – Cynodon dactylon (30/11/2010)
- CynoSport™ (WGP3) – Cynodon dactylon (30/11/2010)
- ‘Spence’ – Paspalum vaginatum (30/11/2010)
- Aloha™ – Paspalum vaginatum (26/08/2010)
- Variegated Stenotaphrum – Stenotaphrum secundatum (14/10/2010)
- ‘Greenlees Park’ – Cynodon dactylon (13/09/2011)
- ‘Plateau’ – Cynodon dactylon (14/09/2011)
- ‘Bermuda Triangle’ – Cynodon dactylon (12/10/2011)
- ‘TransContinental’ – Cynodon dactylon (12/10/2011)
- ‘Grand Prix’ – Cynodon dactylon (2/11/2011)
- ‘CT-2’ – Cynodon dactylon (2/11/2011)
- ‘Wintergreen’ – Cynodon dactylon (2/11/2011)
- ‘MS-Pride’ – Cynodon dactylon (28/09/2011)
- ‘Princess’ – Cynodon dactylon (8/11/2011)
- ‘Mohawk’ – Cynodon dactylon (8/11/2011)
- ‘Velvet’ – Stenotaphrum secundatum (3/05/12)
- ‘Discovery’ – Cynodon dactylon (2/05/12)
- Routine replugging of previously sprayed out (contaminated) areas were also undertaken (e.g. Plate 3).

Vegetative material growing in the turf plots and or turf tubs (Plate 2) were used to propagate cultivars for testing within the following recent (2008-2012) projects

- Adaptation of Warm-Season Turfgrasses for Tropical Environments (TU09001). For trials to be established in Mackay, Darwin and Singapore.
- Traffic Tolerance of Warm-Season Turfgrasses under Community Sportsfields Conditions (TU08018). For trials established at Redlands Research Facility, in particular the mowing cost benefit study.
- Plant Breeder’s Rights (PBR) studies at Redlands Research Facility.
Discussion

Like most horticultural studies or landscapes, they are vulnerable to Mother Nature and the reference collection located at Redlands was no exception. With the drought breaking in 2010, the frequent heavy rainfall events commenced and at the time of writing this report, the La Niña prediction was in full swing. The increased wetter conditions played havoc with turf quality due to sunlight availability, in particular photosynthetically active radiation (PAR) light, water logging and increased weed presence due to optimum germination conditions. For example, in September 2010, a problematic weed (Plate 4) was observed growing within the turf plots. The weed, which had never been seen before within the turf demonstration plots, was identified by the Queensland Herbarium as pearlwort (*Sagina procumbens*). Pearlwort is known to be favourable to moist soil conditions and establishes readily by seed. Maintenance activities (e.g. irrigation scheduling and the use of selective herbicides) were used to keep the non-native species of weed under control. However, DAFFQ staff have not been able to eradicate the weed even with a tailored chemical control program in place.

Chemical applications being applied over a diverse range of 22 species of turfgrass inevitably leaves a possibility for operator error to occur. On one such occasion in 2011, several varieties of green couch (*Cynodon* spp.) received a phytotoxic damage rating between 1 (negligible damage) and 10 (complete loss of plant) (AWC, 1079) due to repeat selective herbicide applications being applied in a short time frame. This resulted in the need for the removal and returfing of a number of varieties that did not show sufficient signs of recovery.

In July 2010 new turf identification labels (Plate 1) were installed to each plot. By doing so made each variety easily identifiable by visitors to the plots, but also saved people having to walk around with a field map feeling overwhelmed. The turf identification labels which were gravoply lasered into an acrylic core lasted 2 years in the field. However, the Queensland sun and regular traffic from mowers and pedestrians meant that the acrylic material was only going to last so long before becoming brittle. In May 2012, a new order was placed to purchase stainless steel identification plates with the variety names laser marked into the labels to provide a longer life span for the plot identification system.

Routine irrigation maintenance, including filter cleaning and sprinkler head replacements, along with annual irrigation distribution uniformity (DU) testing were carried out by DAFFQ staff. However, with an aging irrigation system and a design that was initially installed to service a smaller demonstration area, the current system is considered inadequate as clearly demonstrated by the DU check shown in Figure 2. It is the intention of DAFFQ staff that major works be undertaken of the irrigation setup within the turf demonstration plots in 2012 to assist with uniformity and turfgrass improvement. The best time to carry out this task will be when the plot borders (timber sleepers) are to be replaced also. The some 340 hardwood sleepers have been in the ground for 12 years and are showing significant signs of wear and tear. It is thought it would be best to replace the sleepers and at the same time carry out a major revamp of the irrigation system which is supplying water to the reference collection.
Since the turf team’s inception in 2000, the development of the reference collection was largely due to the work conducted by Dr Don Loch through importing new and improved turfgrasses into Australia from the USA. Today however, a number of leading turf producers are importing varieties they are seeing first hand or have heard promising reviews about in the US. This has taken the onus of the Queensland State department being involved in the importation process; but ultimately, if the grower likes what they are seeing during the observational period, further PBR work and R&D testing is warranted to trial the grass against known or comparator varieties. So, sooner or later the new variety ends up within the Redlands turf plot collection. This can only be a good thing and it means that Australia, through the efforts of the entrepreneurial turf producers, we will continue to see new, hopefully improved varieties made available to the Australian market.

**Technology Transfer**

**Publications**

An article alerting the industry to the commencement of the project was published in the January/February edition of the Australian Turfgrass Management Journal. An update was also provided in the XX edition of the same magazine. They were:


**Web Site**

Turfgrass descriptors of the cultivars being grown in the turf demonstration plots have been progressively added to the DAFFQ web site. To date the following cultivars have been updated by Cynthia Carson, DAFFQ Senior Extension Officer (date shown in parentheses indicates when the content was added to the web):

- **Bahia Grass** (*Paspalum notatum*)
  - Common (24/05/2010)
- **Blue Couch** (*Digitaria didactyla*)
  - ‘Aussiblue’ (19/05/2010)
  - ‘Queensland Blue Couch’ (24/05/2010)
  - ‘Tropika’ (24/05/2010)
- **Broadleaf Carpetgrass** (*Axonopus compressus*)
  - Common (24/05/2010)
- **Buffalo Grass** (*Stenotaphrum secundatum*)
  - ‘Palmetto’ (24/05/2010)
  - ‘Sapphire’ (29/03/2010)
  - ‘Sir Walter’ (30/03/2010)
  - ‘Sir James’ (24/05/2010)
Centipede Grass (*Eremochloa ophiuroides*)
- Common (24/05/2010)

Green Couch (*Cynodon dactylon*)
- ‘OZ TUFF’ (28/10/2010)
- ‘Greenlees Park’ (3/10/2010)
- ‘Wintergreen’ (24/05/2010)
- ‘Winter Gem’ (24/05/2010)
- ‘Windsor Green’ (24/05/2010)
- ‘Grand Prix’ (24/05/2010)
- ‘Hatfield’ (24/05/2010)
- ‘Princess 77’ (24/05/2010)
- ‘CT-2’ (24/05/2010)
- ‘FLoraTeX’ (24/05/2010)
- ‘Plateau’ (22/09/2009)
- ‘Yukon’ (24/05/2010)

Green Couch Hybrids (*Cynodon dactylon x Cynodon transvaalensis*)
- ‘TifEagle’ (26/05/2010)
- ‘Santa Ana’ (5/08/2010)
- ‘Novotek’ (26/05/2010)
- ‘Champion Dwarf’ (26/05/2010)
- ‘TifSport’ (14/05/2010)

Indian Bluegrass (*Bothriochloa pertusa*)
- ‘Dawson’ (1/06/2010)

Kikuyu Grass (*Pennisetum clandestinum*)
- ‘Common’ (6/01/2012)
- ‘Whittet’ (7/04/2009)

Narrowleaf Carpetgrass (*Axonopus fissifolius*, formerly *A. affinis*)
- Common (26/05/2010)

Seashore Paspalum (*Paspalum vaginatum*)
- ‘Sealsle 1’ (26/05/2010)
- ‘Sea Isle 2000’ (26/05/2010)
- ‘Velvetene’ (26/05/2010)
- ‘Sea Spray’ (21/12/2009)

Sweet Smother Grass (*Dactyloctenium australae*)
- Common (26/05/2010)

Zoysia Grasses (*Zoysia* spp.)
- Palisades – *Z. japonica* (26/05/2010)
- Temple Grass – *Z. tenuifolia* (26/05/2010)

Industry Visits

Regular visits by members of the turf industry, general public and international delegates take place at the Redlands Research Facility to inspect the turf trials and turf demonstration plots. Throughout the duration of the project the following visitors were noted to have visited the site and inspected the turf demonstration plots; however, many others went unrecorded through informal visits.

The Redlands turf demonstration plots were inspected by a diverse range of turf professionals and students including members from the University of Queensland Centre for Native Floriculture; a delegation of horticulturists from China; Indonesian PhD Students; Staff from the Nursery and Garden Industry Queensland and visiting Guests from the University of California (Davis); DAFFQ Senior Management; Lucy Keatinge, Former Turf Portfolio Manager. HAL; Greg McPhee, former IDM Turf Australia and several groups of TAFE students including some from China and India; Legend® Growers during their annual meeting (24 Aug. 2010); the Turf Industry Advisory Committee (7 Dec. 2010); several groups of TAFE students from Moreton and Bremer Institute of TAFE; Dr Bill Anderson, University of Georgia, USA (17 Mar. 2010), members from Ballina Golf Club (29 Mar. 2011), Greg Smith from Advanced Seed (6 Apr. 2011), students from Bremer TAFE (6 Apr. and 20 Apr. 2011), Dr Micah Woods from the Asian Turfgrass Centre (11 Jun. 2011), apprentices from Wollongbar TAFE (2 Jun. 2011), The Honorable Minister Tim Mulherin (Minister for Agriculture, Food and Regional Economies, State Member for Capalaba Michael Choi and members of the Centre for Lifestyle Horticulture (CLH) (6 Jul. 2011); staff from New Zealand City Council (7 Jul. 2011) and staff from Moreton Bay Regional Council (8 Jul. 2011); TAFE students from Moreton Institute of TAFE and turf industry members from Darwin (10 Aug. 2011); Mr Macallum a sportsfield constructor who wanted to choose a turf for 6 new sportsfields in Gosford, NSW (11 Aug. 2011); Brett Morris from The Brisbane Golf Club (19 Sep. 2011); Wendy Weir and Stewart from Brisbane Airport Corporation (BAC) (3 Oct. 2011); Turf Industry Advisory Committee (11 Nov. 2011); Warren Braybon and Peter Howat from Turf Culture (15 Dec. 2011); and a turf producer from the UK who was shown around by Matt Holmes, IDM Turf Australia (6 Jan. 2012); Mark Walker from Sygenta (18 Jan. 2012); Mark Stidwill, PGG Wrightsons Turf and Tim Bowyer, Patten Seed Company, USA (7 Feb. 2012); Mark Godfrey, Director of Sports Turf Research Institute (STRI) Global, UK (13 Apr. 2012); and Richard Hayden, Director of Operations, (STRI) Global, UK (7 May 2012).

General Project Conclusion and Recommendations

Since the establishment of the Redlands turf demonstration plots in 2000, the living library has positively impacted the growth and development of the Australian turfgrass industry. Through numerous field days, industry tours and walk-in visits, the wider turfgrass industry, students and the general public has gained a greater appreciation and understanding that turfgrass is more than a just a grass. Walking over the ever-changing reference collection in its entirety is a truly awe-inspiring experience and one, many turf professionals will never forget.
The detailed collection encompassing 22 species of turfgrass and some 138 different varieties highlights the fact that not one turf variety is capable of doing everything, a silver bullet if you will, and that different turf varieties possess particular characteristics and traits that make them better suited to an environment over another.

The resources needed to grow and maintain the living library at Redlands are continually being assessed. The need for qualified greenkeeping staff that possesses the skills to correctly identify between turf species, let alone turf varieties is necessary to maintain the integrity of the collection. So often in Australia’s short turfgrass history has reference collections suffered their ill-fated demise because of insufficient resources being made available. It is hoped that the facility and the turf plots continues to provide benefit to the Australian turfgrass industry and wider community, therefore making it worthy to receive funding and support.

Since 2009, funding from Horticulture Australia (HAL) and monies from the Turfgrass Levy has enabled resources to be allocated to the upkeep of the Redlands turf demonstration plots. Funding to extend the improvement and maintenance of turf demonstration plots project at Redlands has been endorsed once again (project code TU12001) by HAL and the Turf Industry Advisory Committee (IAC), this time for the 2012-2015 period. DAFFQ staff are grateful for the turf industries commitment to the project.

**Bibliography**


Appendix

Plate 1. Individual nameplates for each of the 138 cultivars were installed adjacent to each plot for ease of identification e.g. the buffalograss cv. ‘Sir Walter’ shown below.

Plate 2. Turf tubs being grown at RRS containing back up vegetative material of turf varieties located in the Turf Demonstration Plots.
Plate 3. The growing in of buffalograss cultivars following plugging (photo: 1 Dec. 2010).

Plate 4. The invasive and persistent pearlwort (*Sagina procumbens*) weed which became a problem within the turf demonstration plots.
Plate 5. Removal of krasnozem soil around the perimeter of the plot to allow the installation of Root Barrier® and sodium bentonite (photo: 8 Jun. 2010).

Plate 6. Following the installation of Root Barrier® and sodium bentonite, but prior to the barrier being sealed (as best possible) to the timber (photo: 8 Jun. 2010).
Figure 2. Irrigation distribution uniformity test conducted of the Redlands Turf Demonstration plots 9 May 2012. High levels of variation can be seen, particularly around the 20-30 millilitre indicators. Note: A catch cup was positioned in the centre of each plot (Figure 1 and Plate 7). A total of 138 catch cups were used. The irrigation system ran for a period of 10 minutes. Minimum breeze was observed (<5 knots) during testing.

The irrigation system which was installed in 2000 is grossly insufficient to provide reliable irrigation to the turf plots. As shown above, only 24 irrigation sprinklers are positioned across the 1,050m² facility; even then they are not evenly distributed.
Plate 7. An example of the catch can setup across the Redlands turf demonstration plots (photo taken 9 May 2012).

Figure 3. An aerial view of the turf Redlands turf demonstration plots on 7 January 2012 (source NearMaps). The turf demonstration area is highlighted red.

Plate 9. Photo taken of the turf plots looking north 4 January 2012.