

The Farmers Club

Bursary Report

By

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An overview of Transitional Zone Turf Grass Management Techniques in North Carolina, turf grass extension activities of North Carolina State University/Guelph University and Cosmetic Pesticide bans in Canada



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Bursary Aims/Introduction

To visit North Carolina State University (NCSU), United States of America and Guelph University (GU), Ontario, Canada.

The main objectives include:

1. To gain an understanding of transitional zone management techniques for cool and warm season grasses and improve knowledge of warm season grasses.
2. To investigate how the province of Ontario is moving towards sustainability and the effects of new legislation introducing pesticide bans for the amenity sector and what lessons we can learn in the UK pre 2010 European Union Thematic pesticide legislation.
3. To investigate the role of “Extension Departments” and how NCSU & GU liaise with industry.
4. To share my experience of cool season management across a wide range of surfaces with faculty and students at both NCSU & GU.
5. To see and experience different teaching strategies in the delivery of turf programs at both institutions.

For the purpose of this report, I am going to focus on objectives 1, 2 and 3

North Carolina State University

Hosts: Professor Art Bruneau, Dr Charles Peacock, Professor Grady Miller,

Commencement Date: 31-08-09

Departure Date: 08-09-09

Itinerary

During my time in North Carolina, I presented a series of lectures to Dr Charles Peacock's sports turf students on the 4 year program. Attended lectures by Art Bruneau on the subject of warm season grass identification. Spent time with turf students from 2nd year program and re-affirmed acquaintances with students who joined Reaseheath College, Washington State University for a study tour of the UK during 2008.

I was also fortunate to join Professor Art Bruneau and colleagues on advisory visits to sports turf facilities in the locality, these included Soccer, American football, Baseball and Golf and also admire the extensive research facilities at Lake Wheeler and the ongoing research at the university.

Information on North Carolina State University can be found at www.ncsu.edu

Guelph University

Hosts: Director of Turf Program Mr Rob Witherspoon, Dr Eric Lyons, Cheryl Fitz Gibbon, Dr Tom Hsiang, Pam Charbonneau, Sean Jordan and Dr Katerina Jordon

Commencement Date: 09-09-09

Departure Date: 17-09-09

Itinerary

During my time at Guelph University I presented a series of lectures to DR Eric Lyons' turf students on the two year program. I was able to meet many members of faculty to discuss my objectives for my visit and attended five lectures by faculty staff. Some lectures were held at the university and others were located at the Guelph Turf grass Institute.

Mr Rob Witherspoon kindly organised several visits to various sports facilities in the province, these included Cricket, Soccer, Golf and Bowls. The Golf course superintendant at Caledon Woods, Bolton is an ex-Reaseheath Student!

Information on Guelph University can be found at www.uoguelph.ca

Benefits to Reaseheath College

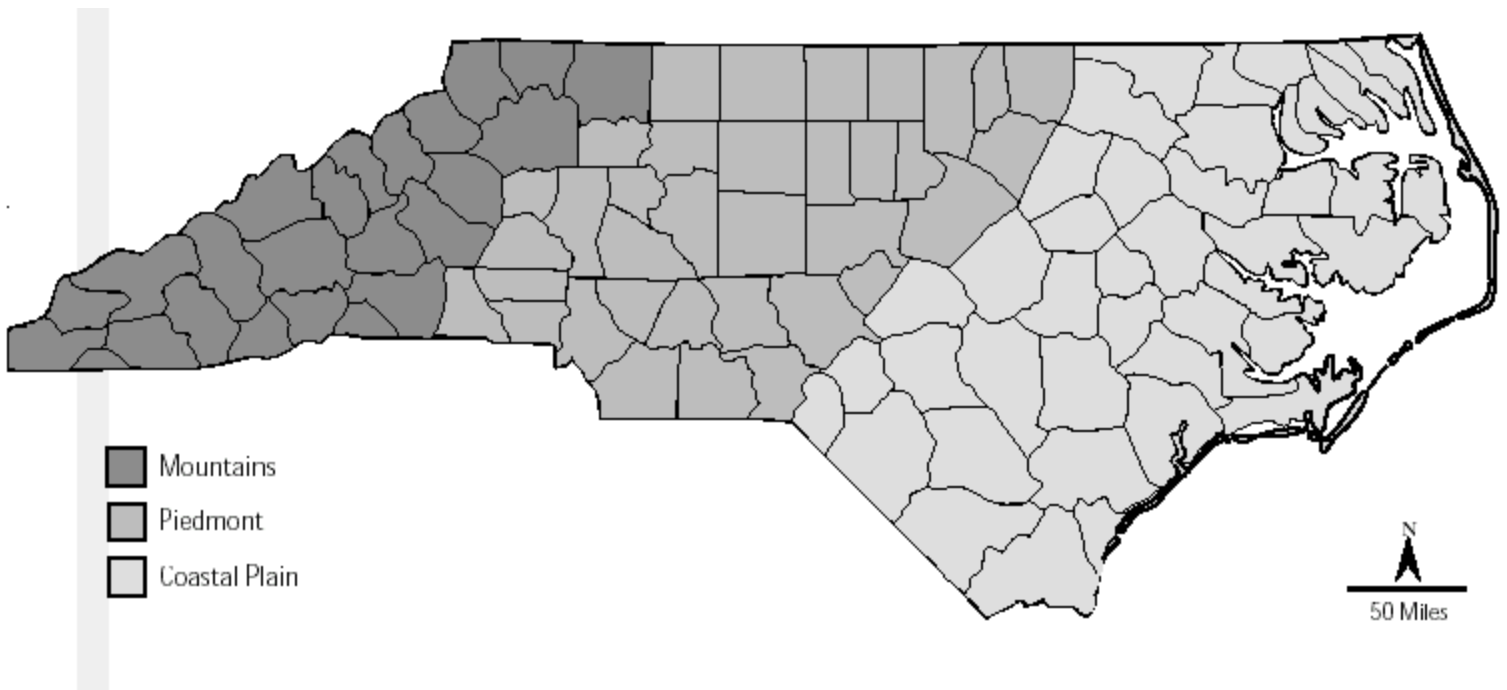
1. Raise the profile of Reaseheath College.
2. Improved knowledge of the turf grass industry in the USA and Canada, including an understanding of warm season grasses, management techniques and equipment all of which will be beneficial to students across a range of programs.
3. To see how NCSU/GU interacts with industry and how they obtain industry support and how they help meet the needs of the industry and adopt best practice at Reaseheath College.
4. The Turf grass/Horticultural extension department at NCSU provide public advice and unbiased research to benefit the general public. Adopt appropriate best practice into advice given at Reaseheath College.
5. To see and experience new teaching and advising methods and policies and adopt best practice at Reaseheath College.
6. By visiting the one of the top 5-turf grass programs in the states and Guelph University in Canada to explore the possibility of student/ lecturer exchanges would be another positive step forward for higher education programs at Reaseheath College.

Personal Benefits

1. Increased knowledge/experience of warm season grass management.
2. Increased knowledge/experience of cool season grass management in different climates from the UK.
3. The benefits of investigating Ontario's pesticide ban and disseminating best practice in the UK.
4. Confirmation and encouragement that my knowledge and experience has been able to assist other sports turf managers in the United States and Canada.
5. Increased confidence through undertaking this experience and receiving positive feedback to my time spent in the United States and Canada.
6. Promotion of my personal profile both home and abroad.
7. The confidence to undertake things I have never experienced before e.g. navigating around Ontario by myself.
8. Time spent sight seeing e.g. Niagara Falls, Toronto etc

North Carolina an Introduction to the “Tar heel” State

North Carolina is approximately 560 miles wide, making it the widest state east of the Mississippi. NC State is bordered by the Atlantic Ocean on the east, Tennessee on the west, Virginia to the north, and South Carolina and Georgia to the south, North Carolina is divided into three distinct geographic areas: the mountains in the west, the Piedmont in the centre and the coastal Plain in the east.



Source: <http://www.secretary.state.nc.us/kidspg/geog.htm>

The Mountains

The western part of North Carolina's mountains are part of the Appalachian range, these mountains include numerous national and state parks.

The Piedmont

Everyone knows what mountainous and coastal areas look like but what about the bit in between? In North Carolina, it's called the Piedmont (Piedmont is a French word meaning "foot of the mountain," and North Carolina's Piedmont region is sometimes referred to as "the

foothills.") And is an area of undulating hills that rolls from the foot of the Appalachians in the west to the edge of the coastal plain in the east. The Piedmont covers nearly one half of North Carolina in the central part of the state; you will find the renowned research University in the States Capital, Raleigh. The American home of golf at Pinehurst is only a short drive from the capital.

The Coast

The low, flat land of North Carolina's eastern region stretches from the sandy farmland of the Inner Coastal Plain to the state's Outer Banks, a string of barrier islands separated from the mainland by sounds or inlets. The Outer Banks has three capes -- Cape Hatteras, Cape Lookout, and Cape Fear.



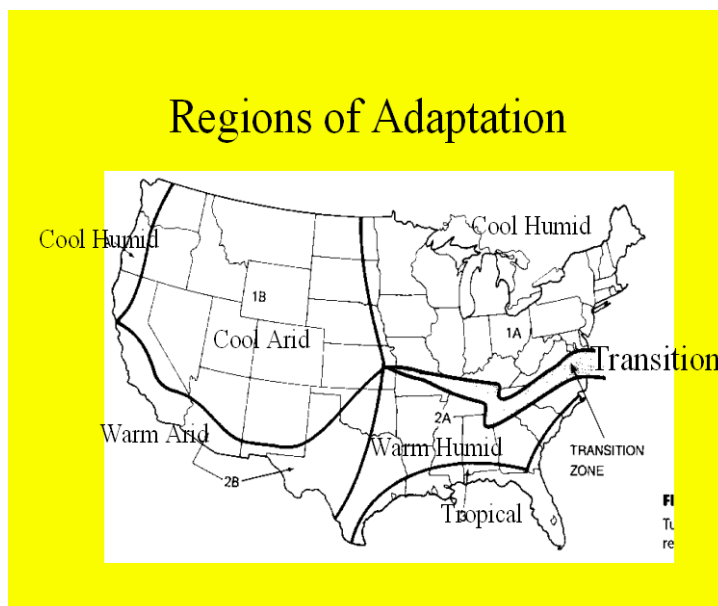
Down town Raleigh as viewed from Lonnie Poole Golf Club

To gain an understanding of transitional zone management techniques for cool and warm season grasses and improve knowledge of warm season grasses.

You can have good grass growth for 9 months of the year in NC

It all depends on which 9 months you want!

The logic behind this statement is that, the summers are too hot for cool season grasses and the winters are too cold for most warm season grasses. North Carolina sits in a transition zone. There is a “transition zone” (see diagram below “Regions of Adaption”) between northern and southern turf regions, which follows the lower elevations of Virginia and North Carolina west through West Virginia, Kentucky, Tennessee and Arkansas and includes southern Ohio, Indiana, Illinois, Missouri and Kansas. In this transition zone, neither warm nor cool season grasses are uniformly successful. So management of both cool and warm season grasses is practiced.



So what are warm/cool season grasses?

Warm season turf grasses are those, which have a temperature optimum of 80 to 90 degrees Fahrenheit. (Beard J.1973) These grasses are widely found throughout the warm humid, warm sub humid and warm semi arid climates. By contrast cool season grasses (Hartley,W.1950) have a temperature optimum of 60 to 75 degrees Fahrenheit and are widely distributed throughout the cool humid, cool sub humid and cool semiarid climates and also extend into transitional zones.

Cool Season Grasses (CSGs) start their growth early in the spring and continue growth for as long as rains and cool temperatures prevail. They go dormant during hot, dry months of summer and start growth again in the cool months of fall if moisture is adequate. Most CSGs turn brown during extremely hot and dry conditions. Most native CSGs can withstand this dormancy, but many introduced species may die.

Warm season grasses (WSGs) break dormancy in mid-spring and make their growth during the hot summer months. Because of their extensive root system, these plants are conservers of water and nutrients. Because of their low water requirement, WSGs are very drought tolerant, which keeps them green and growing even during dry conditions. WSGs go dormant in the fall after a freeze, See diagrams below to show warm and cool season growth patterns.

Diagrams to show growth patterns of Cool and Warm Season Grasses



Source <http://www.american-lawns.com/grasses/grasses.html>



How do warm season and cool season grasses differ?

(Jones, C.A. 1985) suggests the following differences "The easiest way to discriminate between the cool and warm-season grasses is to classify them by their photosynthetic efficiency. Warm-

season grasses begin the process of carbohydrate production with a four-carbon compound, whereas the cool-season grasses use a three-carbon compound. This is why we call warm-season grasses C4 (carbon-4) grasses and cool-season grasses C3 (carbon-3) grasses. Other major differences are;

- **Rooting**, warm-season grasses usually have a deeper root system (which will survive and grow even in very hot conditions).
- **Water use**, Cool-season grasses have a higher water requirement than warm-season grasses. In warm weather the cool-season grasses must leave their stomata's open longer than warm season grasses to capture CO₂ (which results in water being lost more readily).
- **Shade tolerance**, Warm season grasses generally require full sun light in order to photosynthesise, whereas some cool season grasses require only ¼ to ½ full sun light to photosynthesise.
- **Cold tolerance**, Warm season grasses will go dormant or even die in cool conditions. The warm season grasses vary in their susceptibility to the cold, so cold tolerance is an important selection factor in many situations, particularly transition zones.
- Most warm season grasses can be established by vegetative means whereas cool season can be established by seed or sod.

See appendix A, Page 46, Table 2 Characteristics of principal lawn grasses grown in North Carolina.

Warm season grasses utilised in North Carolina

Bermuda grass/ Cynodon dactylon

- Bermuda grass is one of the most widely adapted and important warm season turf grass.
- Bermuda is a perennial (Long lived)
- Bermuda has excellent heat and drought hardiness
- During the fall discolouration occurs at 50 deg/Fahrenheit and persists until the soil temperature rises above this level in the spring
- Bermuda prefers well-drained, fertile soil of fine texture.
- Bermuda prefers the pH range of 5.5 to 7.5
- Bermuda forms a very dense sward and uniform sward of high quality.
- Bermuda is prone to thatching because of its vigorous grow

Image below showing dormant Bermuda grass (WSG) with Perennial Rye (CSG) Grass ingress



Image below showing Professor Bruneau and Dr Michael Paesler observing frosted Bermuda grass (WSC) at Lonnie Poole Golf Club



(The phenomenon is due to convection currents coming up through the grass canopy. This affect usually occurs at the first frost)

Bermuda grass

Plant description

Vernation	Folded
Sheaths	Flattened to round, loose, split with over lapping edges, sparsely hairy
Ligule	A fringe of white 1-3mm long
Auricle	Absent
Blades	Tapers to a point, sparsely hairy, edges rough
Collar	Continuous, narrow
Stems	Compressed, erect or ascending from a prostrate base, with strong flat stolons and/or stout rhizomes
Inflorescence	4 or 5 digitate spikes, Spikelets sessile



Inflorescence



Sheath hairs

Centipede grass/ Eremochloa ophiuroides

- Has also been called “ Chinese lawn grass”
- Centipede grass is a medium/coarse textured slow growing species
- Centipede grass spreads by stolons
- Centipede grass can be propagated vegetatively or by seed
- Establishment and recuperation is slow compared to other warm season species.
- Centipede grass is adapted to a wide range of soils
- Centipede grass prefers a pH range of 4.5 to 5.5
- The growth habit can be described as It sleeps, It creeps, It leaps
- Centipede grass has a low nutrient requirement
- Centipede grass is prone to Brown patch, Dollar spot.

Image below showing Brown patch disease on Centipede grass trial plots at NCSU trial ground



Centipede grass

Plant description

Vernation	Folded
Sheaths	Greyish tufts of hairs at throat, very flattened, edges overlapping
Ligule	Short, membranous with fine hairs
Auricle	Absent
Blades	Flattened, short, sharply creased, hairs along edge at the base
Collar	Continuous, broad
Stems	Erect to ascending, compressed with thick leafy, short noded, opposite branched stolons
Inflorescence	Consists of spike-like racemes, glabrous



Centipede stolons



Sheath

Zoysia grass/ Zoysia japonica

- Also called “Japanese lawn grass
- Native to tropical eastern Asia
- Zoysia grass forms a uniform, dense, low growing and high quality sward.
- The stems and leaves are very tough and result in difficulties in mowing
- Zoysia grass has a prostrate growing habit
- Zoysia grass spreads by stolons and rhizomes
- Zoysia grass has superior resistance to weed invasion due to its tight dense coverage.
- Zoysia grass can be propagated by sprigs
- Zoysia grass has excellent heat and drought hardiness
- Zoysia grass grows best on well drained, fertile, light textured soils
- Zoysia grass prefers a soil pH range of 6 to 7
- Used in lawns, fairways, athletic fields

Image below of zoysia grass in early spring



Zoysia grass

Plant description

Vernation	Rolled
Sheaths	Round to slightly flattened, split with over lapping edges, may have tufts of hairs at throat
Ligule	Fringe of hairs 0.2mm long
Auricle	Absent
Blades	Flat 2-4mm wide, hairy above with a few long hairs near the base
Collar	Continuous, broad, edges hairy
Stems	Round erect ascending from a decumbent base. Rhizomatous and stoloniferous
Inflorescence	Short terminal and spike-like, Spikelets laterally compressed.



Sheath margin



Ligule

Bahia grass/ Paspalum notatum Flugge

- Bahia grass is outstanding under low cultural regimes
- Bahia grass forms a very coarse textured, fairly open, erect growing sward.
- Propagation is by seed
- Bahia grass is a perennial
- Bahia grass adapts to a wide range of soil conditions particularly coastal droughty, infertile coarse textured sands
- Slightly acidic soils are preferred with a pH range of 6.5 to 7
- Bahia grass is suitable for no use turf areas, road sides, airfields

Image below showing short, stout, flattened rhizomes/stools of Bahia grass



Bahia grass

Plant description

Vernation	Rolled
Sheaths	Flattened, sharply creased, rather glossy, usually not hairy
Ligule	Membranous dense whitish hairs on the back, 1mm long
Auricle	Absent
Blades	Usually sparsely hairy along edge towards base, 4-8mm wide
Collar	Broad
Stems	Erect to ascending with short, stout flattened rhizomes and stolons.
Inflorescence	2-3 sub erect racemes



Inflorescence



Bahia grass vernation

Buffalo grass/ Buchloe dactyloides

- Buffalo grass forms a fine textured sward
- Curling of the leaf blades is a characteristic of Buffalo grass
- Buffalo grass spreads via stolons
- Propagation may be from seed or vegetative means
- Buffalo grass is dioecious with male and female flowers occurring on separate plants
- Buffalo grass is a perennial
- It is hardy to high temperatures
- Buffalo grass has the ability to go dormant during drought and to initiate new growth after the period of moisture stress
- Buffalo grass is fairly tolerant of alkaline soils
- Buffalo grass can be used in athletic fields, non irrigated lawns, airfields, parks etc

Image below showing lawn planted with Buffalo grass



Buffalo grass

Plant description

Vernation	Rolled
Sheaths	Round, open
Ligule	Fringe of hairs 0.5 to 1mm long
Auricle	Absent
Blades	Flat 1-3mm wide, sparsely hairy, bluish grey
Collar	Broad continuous and hairy
Stems	Erect, round with well-developed stolons.
Inflorescence	Male and female flowers on separate plants. Spikelets are in clusters of 4,5 that occur in sessile heads



Hairy Collar



Ligule

St Augustine grass/ Stenotaphrum secundatum

- St Augustine grass is a versatile, sod forming warm season grass.
- St Augustine grass native to the West Indies.
- Naturalizes most readily in seashore environments.
- St Augustine grass forms an attractive blue-green, low growing turf of medium density and has a very coarse leaf texture.
- St Augustine grass is a very aggressive species that spreads by means of long thick stolons.
- St Augustine grass is a perennial plant.
- It is inferior to Bermuda and Zoysia in fall colour retention and spring green up rate.
- Best growth is achieved on soils that are moist, well drained, fertile, sandy loams with a pH of 6.5
- St Augustine grass is used on sites where a fine leaf texture is not required.
- St Augustine grass is one of the main warm seasons grasses used for sod production.

Image below showing St Augustine grass



St Augustine grass

Plant description

Vernation	Folded
Sheaths	Compressed, keeled, loose
Ligule	Inconspicuous fringe of hairs about 0.3mm long
Auricle	Absent
Blades	Usually flat, petioled 4-10mm wide, glabrous, flexuous, bluntly acute apex
Collar	Continuous, extending through a petioled area, broad, glabrous
Stems	Compressed and branching with extremely long, stout, creeping stolons having swollen nodes and short internodes
Inflorescence	Short flower Culm bearing terminal and auxiliary racemes



Leaf Arrangement



Stolon

Transitional Zone Management Practices

Turf grass cultural practices are generally the same where ever turf grass is maintained. Cultural practices not only concern the desired quality and type of turf surface to be maintained for a particular use but also managing the micro-environment of the turf grass plant to ensure the best possible growing conditions.

Essential cultural practices include Mowing, Scarification, Aeration, Fertilisation, and Irrigation, cultivation, Establishment, Pest, Disease and Weed control. It is not the intention of this report to discuss the basic principles of cultural practices but look at practices undertaken to manage grasses in North Carolina that differ from UK management strategy.

Syringing

With the daily maximum temperatures at mid summer exceeding 92 degrees Fahrenheit in North Carolina turf grasses utilised in fine turf struggle to survive during the hot, humid summers of the U.S. transition zone. (Peacock, C.H. 1996) states that stress factors on this turf include close, frequent mowing, shallow rooting, high potential evapo-transpiration rates, and high air and soil temperatures. (See appendix 3A, page 48)

Syringing is the light application of water to the turf to prevent wilt and reduce the canopy temperature. (Beard. J.1973) suggests that syringing should only be utilised as and when necessary rather than on a daily basis. Water is applied via a hose pipe using a fine rose type nozzle and application should take place during the hottest part of the day e.g. 11am to 3pm. There is no exact amount of water to be applied during syringing that defines this practice. However research has shown that supplemental irrigation enables fine turf grasses to respond physiologically to water stress during summer in the transition zone.

Supplementary irrigation practices have their part to play in maintaining turf grass health and wilt prevention, the cooling of the turf canopy by fans located around fine turf areas e.g. golf greens can assist with temperature reduction and reduced stress. Research undertaken by (Guertal. E.A, Van Santen. E. and Han. D.Y. 2001). Fan and syringe application for cooling Bent grass greens) showed that the combined use of fans and syringing reduced soil temperatures in a native soil putting green.

Image below showing the use of fans to cool turf surface



Image below showing syringing of turf



Management of cool season grasses in a warm season stand

Winter dormancy practices

In North Carolina a combination of warm-season and cool-season perennial grasses are grown. The growing season of warm-season perennial grasses is from the last killing frost in early spring to the first killing frost in late autumn, with the peak growing period in May and June.

The general guideline is to over seed cool-season grasses such as Perennial Rye from 4 to 6 weeks before the average first killing frost date. By over seeding Perennial Ryegrass in late September/early October before the first frost will combat the problem of straw-coloured turf. Over seeding increases the need for daily watering and routine mowing, and can also cause significant thinning of the base Bermuda grass during the spring transition. Whilst the Bermuda is still dormant the Perennial Rye grass can be removed from the sward by use of herbicides. Timing is crucial as you want the Bermuda to “Pop” before the Rye show signs of desiccation. Again this avoids the problem of straw coloured turf!

I was fortunate to visit Wakemed Soccer Park in Cary, NC State; the park has six soccer pitches set in well maintained parkland. The dominant grass species utilised is Bermuda grass. The main pitch is over seeded with perennial rye before the fall and top dressed. The pitch is then utilised throughout the playing season. At onset of spring and high temperatures the Perennial Rye grass is not sprayed out but the sward is removed and the whole playing surface is re-turfed with Bermuda grass. This process costs approximately \$60,000 each time! All of this expense and effort is justified so the pitch stays green all year! The other pitches are maintained by traditional methods as described above.

Image below showing main pitch at Wakemed facilities



Spraying turf

Some golf courses, athletic grounds and base ball venues paint their natural turf surfaces instead of over seeding them, as it requires fewer resources than over seeding and is a more environmentally responsible alternative according to the Department of Environmental Protection, Florida. Whilst on a visit to American Base ball at Cary, NC State I was able to observe the spraying of the Bermuda grass infield and outfield with green dye to enhance presentation. The spraying with green dye was also to hide the scalping of the turf as the Bermuda grass had grown away and once cut exhibited evidence of scalping, this is due to the dense, vigorous growth of Bermuda. The new shoots have a tendency to shade the lower shoots so by excess defoliation the sward exhibits poor colour.

See image below showing spraying of field with green dye.



My visit to NCSU gave me the opportunity to develop an understanding of transitional zone turf grass management techniques. It is fascinating that both warm season and cool season grasses can be grown in the same geographical location.

Here in the UK we complain about our erratic growing condition conditions however compared to the high extremes of temperature and humidity in NC State and the potential level of pest and disease problems that have to be managed and controlled compared with the levels of pest/disease problems we have to combat in the UK, we may just be fortunate without realising!

Many of the turf grass techniques practised in the UK are the same as for transitional zone management. A management activity that I found very interesting was the winter dormancy practice. The removal of cool season grasses such as Perennial Rye grass from warm season swards by herbicides in the spring and the re-establishing of the Perennial Rye grass in the autumn by over seeding. This practice is undertaken to ensure that the sward stays green throughout the playing season. Imagine what reaction turf managers would get in the UK if they adopted this practice. I am sure we see comments relating to a waste of money, a drain on resources e.g. irrigation etc, increased usage of pesticides and all of this to keep the grass green. In the states this is a well established practice and people expect turf to be green!

The Americans attitude to having everything bright green all year round was very amusing to me. Turf mangers in the UK especially at the top end are under pressure to maintain quality surfaces due to the demands of players, television etc. But would they resort to the spraying tactics? For most of us in the profession we understand that during our occasional hot summers grasses will exhibit signs of heat stress and will discolour. Take for example the Open Championship hosted by the Royal Liverpool Golf Club in 2006 in the middle of a heat wave. During the championship day time temperatures were in excess of 85 degrees, the fairways and rough could only be described as “Golden”. Did the need arise to mask natures colours with green paint to provide a better viewing experience for the global TV audience? Thankfully NO! so why do turf grass managers state side feel they have to bow to the “great god green” unfortunately expectation now means that if it isn’t green then it’s no good. People are making visual quality assumptions based on colour alone with little or no knowledge of turf grass management. A case in point that when visiting the American baseball facility at Cary the crew were spraying the in and outfield green when in fact if they had raised the cutting height of the mower and just topped the Bermuda grass and then gradually brought the height of cut back down to regulation, they would not have need to spray it green. Maybe the use of chemicals/sprays etc are a quick fix and don’t encourage turf managers to undertake sound turf grass management techniques.

The media plays a major role in influencing people, it’s about time turf managers used this vehicle to their own advantage. During coverage of major events played on natural surfaces, it would be a major benefit that instead of the endless “what if’s and buts” from the pundits, we actually saw how the surface was prepared with out the use of the quick fixes. This would not only improve public perception of just how skilled our industry is but might just educate a few which might just make some turf managers lives less stressful (Probably wishful thinking) then we might just have people respecting our surfaces.

Conclusions

- i. Both cool and warm season grasses are managed in the transitional zone.
- ii. It is possible to have quality grass growth for nine months of the year but toleration is required during the less favourable months or both warm and cool have to be managed.

- iii. Greater emphasis is placed on maintaining the colour of turf than the UK.

The role of “Extension Departments” and how NCSU & GU liaise with industry.

North Carolina Cooperative Extension gives the residents of the state easy access to the resources and expertise of NC State University and NC A&T State University. Through educational programs, publications, and events, Cooperative Extension field faculty deliver unbiased, research-based information to North Carolina citizens. The extension officers are funded by the state however all visits etc must be undertaken on a full cost return basis therefore keeping the extension system financially sound. Due to the current global downturn Extension officers and faculty staff undertake industry sponsored research and grass species performance trials to generate income for the program. The extension service also produces various information booklets appropriate to the state; these include Carolina Lawns (covering the mountains, Piedmont and coastal plains) Calibration of boom sprayers, IPM, Colour Atlas of weeds, Organic lawn care, and pest control for professional turf grass managers. This service is unique to NCSU.

Guelph University (GU) operates a similar extension service to NCSU. As with NCSU having direct links with the extension department, GU hosts the Guelph Turf grass Institute and Environmental Management centre. The Guelph Turf grass Institute was established in 1987 to conduct research and extension and provide information on turf grass production and management to members of the Ontario turf grass industry. As part of the University of Guelph the institute is supported by the university, the Ontario Ministry of Agriculture and Food and the turf grass industry. The Institutes main aims are to expand and enhance turf grass research, expand information and extension services, to encourage and prepare young people for careers in the industry and in research through undergraduate and graduate programs at GU and to develop a world class turf grass facility. Faculty staff are involved in the role of extension but this role is undertaken on and above teaching commitments where as NCSU employ extension staff and technicians. Part of the service includes the ongoing production of excellent web sites carrying details of disease alerts, maintenance programs, decision aids and integrated pest management strategies and short courses to name but a few activities of this vital service. Please see <http://www.guelphturfgrass.ca> and www.turfflies.ncsu.edu and have a browse!

Vital to the success of both Institutions is the liaison with industry. Extensive research is undertaken on behalf of industry partners. This research funds the activities of NCSU extension and GU turf grass institute. Current research at GU/NCSU includes

- Disease and Insect Biology and Control
- Pesticide Alternatives
- Evaluation of Turf Varieties
- Velvet Bentgrass Establishment and Management

- Warm season cultivar trials
- Effects on plant growth & Photosynthesis when using white line marking materials
- Thatch Management
- Nutrient Management
- Irrigation Scheduling
- Sportsfield Overseeding
- Management of an Active Sportsfield
- Grassland Ecology
- Water quality
- Storm Water Management
- Annual and Perennial Plant Evaluation

Conclusions

- I. The turf grass extension services provided by NCSU are second to none. The information provided by the department is not only applicable to sports turf professionals but also those with an interest in maintaining healthy lawns. The Turf files website is outstanding and is both interactive and informative.
- II. Not only do NC state residents have access to turf files and extensive research but they can post questions, ask for advice from the extension specialist. Having witnessed at first hand the amount of enquires they receive, they are certainly kept busy! This only proves how beneficial and successful this type of service is to NC residents.
- III. This type of service would be most welcome in the UK; however the funding of such a project could be problematic as it won't be seen as an essential service.
- IV. Like my colleagues at Guelph University, I often receive request from members of the public for advice on lawns, bowling greens, cricket etc this ad hoc service is on and above full teaching commitments, it would be more professional if land based colleges could commit to something similar to the extension service. This would have benefits such as increasing the public's education and assist with improving the perception of the turf grass professional. If land based colleges could develop research opportunities with industry this would assist with development of teaching staff, be of benefits to students however this could only happen if time and resources are made available to undertake this valuable work.

To investigate how the province of Ontario is moving towards sustainability and the effects of new legislation introducing pesticide bans for the amenity sector

On October 10, 2007, Dalton Mc Guinty and his Ontario Liberal party won a consecutive majority government in the 39th general provincial election. Mc Guinty's promise to Ontario's residents during his second term was to ban the use of cosmetic pesticides in the province thus replacing previous provincial by-laws.

On April 22nd 2008 the following statement was made in the media.

McGuinty Government Plans Ban on Cosmetic Pesticides

“Ontario is moving to reduce exposure to toxic chemicals by banning the sale and cosmetic use of pesticides.

Legislation to be introduced today would make Ontario's pesticide rules among the toughest in North America. It would also replace a variety of municipal by-laws in place across the province.

Studies by public health experts are showing growing evidence of the potential health risk of pesticides, particularly for children”.

Ontario's cosmetic pesticides ban came into effect on April 22, 2009. The requirements of the ban are detailed in Ontario Regulation 63/09 and the Pesticides Act, which was amended by the Cosmetic Pesticides Ban Act, 2008. (See appendix A4, page 49)

The provincial ban supersedes local municipal pesticides bylaws to create one clear, transparent and understandable set of rules across the province.

Pesticides cannot be used for cosmetic purposes on lawns, vegetable and ornamental gardens, patios, driveways, cemeteries, and in parks and school yards. There are **no** exceptions for pest infestations (insects, fungi or weeds) in these areas, as lower risk pesticides, bio-pesticides and alternatives to pesticides exist. More than 250 pesticide products are banned for sale and over 95 pesticide ingredients are banned for cosmetic uses.

However some exceptions do exist

Public health or safety: Pesticides can be used to control plants that are poisonous to the touch, such as poison ivy; insects that bite, sting, or are venomous or are disease carrying, like

mosquitoes; and animals, insects or plants that may cause damage to a structure or infrastructure, such as termites.

Natural resources: There is an exception, with Ministry of Natural Resources approval, to control invasive species that may be detrimental to health, the environment or the economy, or to protect a native plant, animal or a rare ecosystem.

Golf courses are conditionally exempt from the ban provided they follow tough new rules. They must become accredited for Integrated Pest Management (IPM) by an approved accreditation body. IPM uses a variety of tools, including best practices, mechanical and biological methods, along with pesticides when necessary, to manage pest populations. Golf courses must prepare an annual report on how they minimized their pesticide use and make the report accessible to the public. Also, they must hold a public meeting annually to present the report.

Sports fields are allowed a short term exception from the ban to host national or international level sports competitions. Written approval for the exception must be granted by the Minister of the Environment. Once the event concludes, the use of pesticides must end. Areas such as lawns and gardens around the sports fields are not exempt from the ban.

Specialty turf: Pesticides can be used to maintain specialty turf used for lawn bowling, cricket, lawn tennis and croquet if certain conditions are met. Areas such as lawns and gardens around the specialty turf are not exempt from the ban. IPM and annual reporting conditions, similar to those imposed on golf courses, must be followed.

Trees: Since trees are so important to protecting our climate, licensed exterminators can use conventional pesticides with the written opinion of a tree care professional that states that the use of the pesticide is necessary to protect the health of the tree. Homeowners and licensed exterminators can also buy and use biopesticides and lower risk pesticides (e.g., *Btk* - a biopesticide sprayed over Ontario cities for Gypsy moth control) to care for trees without requiring an opinion from a tree care professional.

Agriculture: The use of pesticides is necessary for agriculture from an economic and operational perspective. Ontario farmers already have stringent rules on the use, handling, storage and application of pesticides, and these rules will continue. The exception does not apply to a farmer's household vegetable garden and lawn.

Forestry: The use of pesticides in forestry is essential to protect trees from pests, and to control competing vegetation. Ontario's forestry workers must follow stringent rules on the use, handling, storage and application of pesticides. The exception applies to a range of forestry activities including harvest and reforestation.

Public works: Under the health or safety exception, pesticides are allowed to be used to maintain safe conditions, and the security of and emergency access to public works. Public works include highways, railways, power works, gas works, water works and other utilities, transit/transportation corridors and the perimeter of nuclear facilities. The exception does not apply to the use of a pesticide on a portion of a highway to which pedestrians has access on a regular basis or where the public is invited to stop including picnic and rest areas.

Notice Signs

Homeowners can apply biopesticides or lower risk pesticides to control weeds and other pests on lawns, gardens, driveways and other areas around the home. However, if licensed exterminators use a lower risk pesticide or biopesticide, the exterminator must post a green notice sign on the lawn. This sign makes it clear that the exterminator is not using an illegal pesticide and satisfies the public's right to know about the use of a pesticide. For example, if an exterminator treated a lawn with corn gluten meal to suppress weeds, he/she would need to post a green sign.

Pesticide Storage and Fire Department Notification

The ministry has harmonized storage and fire department notification requirements for manufacturers with existing requirements for operators (including commercial lawn care companies) and vendors. These requirements ensure that local fire departments know where pesticides are stored to protect human health and the environment.

Pesticide Classification

To support the cosmetic pesticides ban, a pesticide classification system consisting of eleven classes of pesticides has been established.

Class 1 are manufacturing concentrates used in the manufacture of a pesticide product.

Classes 2, 3 and 4 are commercial or restricted pesticides that can continue to be used by farmers and licensed exterminators for non-banned uses. If the pesticide contains a Class 9 pesticide, it may only be used for an exception to the ban (e.g., agriculture, forestry, golf courses).

Classes 5 and 6 pesticides can be used by homeowners and include biopesticides and lower risk pesticides allowed for cosmetic uses.

Class 7 includes dual-use pesticides (i.e. indoor/outdoor uses). Such pesticides will only be allowed to be used for non-cosmetic purposes. For example, they can be used indoors to kill pests or outdoors for public health or safety reasons, but cannot be used outdoors to kill weeds. Retailers must give information to notify purchasers that only certain uses of these pesticides are legal. In two years' time, consumers will also not have ready access to these products, and continue to receive notification about the legal uses.

Class 8 are banned domestic products. (e.g., pesticide-fertilizer combination products, weed and insect control products for lawns and gardens).

Class 9 lists ingredients in pesticide products. These ingredients are banned for cosmetic use. Commercial or restricted products containing these ingredients may still be used by farmers or licensed exterminators for exceptions under the ban.

Class 10 pesticides are ingredients in pesticide products. These are the only ingredients that may be used to control plants that are poisonous to the touch under the public health or safety exception.

Class 11 lists ingredients that are biopesticides or lower risk pesticides. Licensed exterminators that use Class 11 pesticides are required to post a green notice sign to provide public notice of the use of these pesticides.

The cosmetic pesticide ban probably played a key part of Mc Gunity's election manifesto. However the campaign did receive vociferous backing from pressure groups such as the Ontario College of Family Physicians and the Canadian Cancer Society which have been calling for a ban on the cosmetic use of pesticides as a prudent measure to protect the health of the nation.

In a letter dated 22 December, 2008 to The Senior Policy Advisor, Ministry of the Environment Integrated Environmental Planning Division, Mr Robert Bilyea the Canadian Environmental Law Association (CELA) re the Ontario pesticide ban state "CELA is pleased to provide this submission in response to the proposed new general regulation under the *Pesticides Act*. We offer our continued strong support for the overall intent of this new law and regulation and congratulate the Province of Ontario for decisive leadership on this issue of widespread public interest. We make suggestions herein for further strengthening and clarifying the proposed regulation". (See appendix A5, page 50)

Not only was the ban supported by pressure groups, scientists were also quick to make their feelings and research known such as

(BRENNAN-RIEDER Ph.D, 2008) concluded her research ("Scientific basis for banning both sale and use of synthetic pesticides) by stating "nothing short of a total ban on the sale and use of synthetic lawn and garden pesticides is acceptable". This research was undertaken by producing a summary of peer-reviewed research papers on Roundup/glyphosates conducted by non-industry funded scientists. (See appendix A6,page 51)

As you can probably imagine the view point from the turf grass industry was slightly different! The Western Canada Turf grass Association published letters in their August/September journal from Mr Jeffery Lowes, Principal Investigator for M-Rep Communications. A group of lawn care professionals had asked M-Rep Communications who provide services on environmental policy and communication in the area of municipal relations to review the current and pending by laws in the province. Mr Lowes article makes interesting reading. The letter dated 20th March 2009 claims the following counter claims against the pressure groups:

"There has been information presented as fact at different council meetings in a number of municipalities, where as the information was hear say. Based on the rules surrounding hear say

evidence in court, most of what has been presented would be considered inadmissible and not object of truth”.

Senior Epidemiologist & Research Scientist Dr. Tye Arbuckle is listed as peer reviewing the OCFP Pesticide Literature Review Report which is the foundation of all pesticide laws in Canada. In an e mail to Mr Lowes, Dr. Arbuckle clarifies that he was not a peer reviewer of the report and was “quite disturbed to see he was listed as peer reviewer” Other investigations on other members listed as peer reviewing the report had some additional disturbing results!

The Canadian Association of Physicians for the Environment (CAPE) claims in letters and presentations made to municipalities that the Canadian paediatric Society (CPS) authored a study that found the following:

“We could cite many studies but draw your attention to research published in April 2006 by the CPS, Canada’s most distinguished authority on children’s health. The CPS examined the most common lawn care pesticide in Canada, 2,4-D and concluded that it can be persuasively linked to cancers, neurological impairment and reproductive problems”. As the result of a presentation made in Kingston, Ontario in September 2007, an e mail from Elizabeth Moreau, Director, Communications & Public Education, for the CPS states the following:

“The study referred to was published in Paediatrics & Child Health, which is the journal of the CPS by authors who have no affiliation with the CPS. It was not written by the CPS, and does not reflect the opinion of the CPS. Currently we do not have any position on statements on pesticide use.

The reference for the study in question is as follows: Sears M, Walker CR, Van Der Jagt RHC, Claman P. Pesticide assessment protecting public Health on the Home Turf. Paediatric & Child Health, Vol 11, No 4, April 2006

The CPS should not be cited as this information. This has been communicated to CAPE”

Lowes also reveals that Dr. Meg Sears “Is not a medical Doctor” and other “Individuals listed in the medical report have questionable credentials”. Dr. Meg Sears also presented the same report in Ontario and claimed she worked for a children’s hospital. After speaking with the CEO of Children’s hospital of Eastern Ontario (CHEO), Dr. Meg Sears is not an employee of CHEO as she claimed.

Lowes also concludes that “There is some confusion that the Canadian Cancer Society are medical experts when in reality they are a fund raising organisation, hence the reason they supported the golfing industry.

So for every claim made by the pressure groups a counter claim is being made by the turf industry and those representing it. (See Appendix 7A, page 52))

It is inevitable that both sides would be vociferous in their defence. The pesticide ban is now in place and thankfully strategies are being put in place so the industry can move on. Integrated Pest Management (IPM), although nothing new to turf grass professionals now becomes more important when managing turf. IPM can be defined as a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health, and environmental risks. Ontario has set up its own IPM accreditation program to ensure that all turf managers; home lawn owners etc follow best practice. The IPM Accreditation Program (IPMAP) recognizes companies and/or organizations that demonstrate commitment to the principles of IPM (Integrated Pest Management) and PHC (Plant Health Care). The IPM Council of Canada will govern the process through certification, audit, and

professional development. The Council's directive is to have an audit program that is rigorous, independently implemented, credible and open to scrutiny by the public, governments and relevant stakeholders.

Those with a vested interest in IPM can gain accreditation by undergoing the following: Successful completion of IPM Accreditation Examination, Completing a desk Review audit, on site Audit and by continuing professional development activities.

In order to continue using pesticides in their maintenance operations, all existing golf courses must be fully accredited in Integrated Pest Management (IPM) by April 22, 2012. IPM accreditation is a three year process, so golf courses are encouraged to start the process as soon as possible. IPM accreditation requires training of grounds-keeping staff, maintaining detailed records of pesticide use, employing alternative methods of controlling pests prior to pesticide use, and participating in an annual audit process.

Certified IPM Agents and IPM certified applicators require a minimum of 8 Continuing Education Credits (CECs) per year to maintain their certification within the IPM Accreditation Program. The IPM Council wants to ensure there are adequate opportunities to attain the required CECs and recognizes that there are many educational opportunities available from various sources. IPM Ontario regularly publish lists of suitable events for gaining CEC's

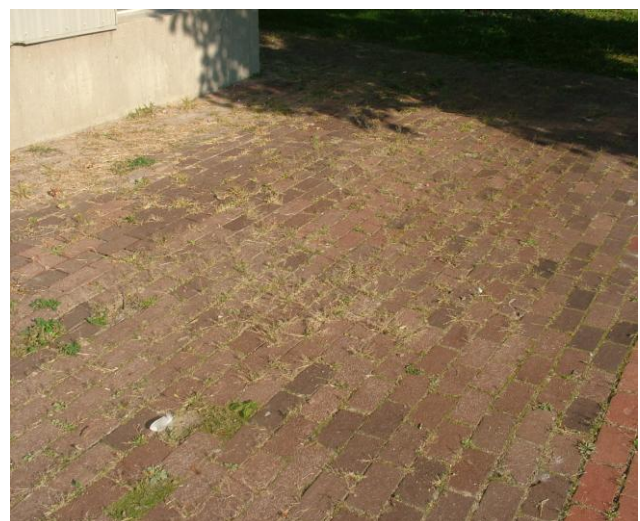
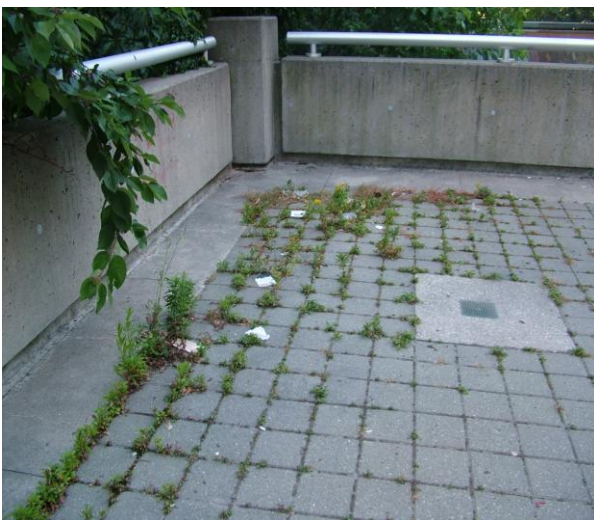
Although the current situation in Canada, with many provinces banning the use of pesticides (cosmetic) and the continued publicity given to pressure groups campaigning on child health issues, things may seem a little grim for turf managers, lawn utility company's and the lawn enthusiast. The most staggering issue must be how all of this has got out of hand? Research has been undertaken by non industry specialists, alleged biased companies, scare mongering all provides an interesting mix not to mention the politics. Whilst Ontario's regulations may be the toughest yet, organisations still call for even tighter regulations. Pesticide bans are nothing new Denmark's turf managers have been operating under restrictions Torben Kastrop Petersen stated that "since 1999 when the government and former minister of environment "Svend Auken" had focus on the pesticide use, especially on the areas owned by the municipalities to follow suit the Danish Golfing Union wanted the same rules for every golf course in Denmark, and signed a pesticide agreement in 2005 to achieve this aim", other European countries have followed suit.

On further investigation of Ontario's pesticide ban a few issues concerned me, for example a farmer can spray his crops with a vast range of chemicals, yet under Bill 64 he is prohibited from spraying his own vegetable garden or lawn. Sports fields are granted temporary exemption from the ban to host International or national competitions providing they apply for written approval from the minister of the environment. On conclusion of the event the use of pesticides must cease. However amenity areas around the venue such as lawns, flower beds etc are not exempt from the ban and potentially could affect the overall presentation and end user experience if appropriate resources are not made available. At present golf courses can use pesticides providing that they follow a recognised IPM program and have a member of staff that has passed the IPM exam, complete the desk and site audit and acquire the required number of professional development credits from attending accredited seminars. Bowling clubs, cricket, croquet and lawn tennis have to follow a similar regime to golf clubs. As for sports fields the maintenance of amenity areas around the clubs facilities are not exempt from the ban.

The reduction campaign on the back of vociferous support and media hype claiming that children were risk etc has meant that school playing fields, municipal sports areas cannot be maintained using pesticides. So where is the logic in this? Don't children play golf or represent Canada at international youth sports events?? So these areas can only be maintained by physical, cultural and biological methods. The use of IPM strategies also includes the use of

biological controls however these are limited in availability and efficiency with little research undertaken. Biological controls currently available include Corn gluten meal for control of Dandelions, white clover, Crab grass and broad leaf weeds. Sclerotinia minor for Dandelions, Acetic acid for broad leaf weeds, Fatty acids for moss, algae, broad leaf weeds on driveways, pavements etc Entomopathogenic nematodes for control of grubs, caterpillars. However all are affected by environmental conditions that will reduce their efficiency. With only the use of cultural, physical and limited biological controls to manage pest, disease and weed populations it is inevitable that given the unpredictability of mother nature, populations will rise and fall each year. Fortunately this years populations were at low levels this will also take in to account that the ban has only been in place since April, next year could well be a very different story as it is likely that populations will be much higher due to the lack of chemical control measures. Would this therefore see an increase in health issues amongst children who use sports facilities? Asthma, hay fever, skin allergies could all increase due to the lack of effective control measures not to mention that weed infested pitches not only have poor playing surface characteristics but can also be considered dangerous as weeds do not tolerate the wear and tear that a dense healthy sward can accommodate. Once the surface has lost its integrity players are prone to injury. So given that the pesticide ban was implemented to prevent children from suffering from chemical related illnesses a whole new area of health concerns may only be just around the corner, only time will tell. Another issue to arise if the quality of natural turf surfaces can't be maintained to a safe standard then we will see a greater interest in artificial turf although these surfaces come with issues such as they are not maintenance free, do not behave like natural turf and can cause joint problems also environmental issues as what do you do with the carpet at the end of its lifespan. With regards to amenity paved areas etc, how long before complaints are received about untidy areas and associated problems as they start to hit the desk at the town hall, especially if resources are not in place to deal with these issues e.g. enough manual labour for hand removal or burning?

Images below showing weed infestation in public areas



So why the interest in pesticide bans?

By the end of 2011 we are likely to be adapting to life under the EU Thematic strategy for Pesticides. The aim of this legislation is to reduce the risk to human health and the environment. The proposed legislation comprises of 4 parts

1. Replacement of 91/414
2. New sustainable use directive
3. New statistics regulations
4. Amendment of machinery directive

Replacement of 91/414, this proposal updates the existing legislation; this directive governs the placing of pesticides on to the market and requires each active ingredient and product to go through a comprehensive risk assessment before being approved. This legislation introduces specific hazard criteria on which to automatically exclude products. If a product exceeds health or environmental red flags for example if the active ingredient is carcinogenic it will be de-registered or non approved. The idea is to remove the most hazardous chemicals from the market place. Currently chemicals are assessed on the risks of actual exposure to an active ingredient rather than the active ingredients inherent hazard. If chemical manufacturers can prove a product will be safe to use as directed it can be approved, even if the active ingredient might be hazardous. The new proposals would mean the product is automatically not approved because it contains that hazard, regardless of whether it is dangerous or not when used as directed. According to the UK's pesticide safety directorate the proposal could remove 5-10% of insecticides, 5-12% herbicides and 7-35% fungicides from the market.

New sustainable use directive, requires the establishment of a national action plan to set quantitative objectives, targets, measures and indicators to reduce the risk and impact of pesticides and encourage development of IPM to reduce reliance on pesticides. Member states shall ensure all professional users; distributors and advisors have access to appropriate training provided by designated competent authorities.

The protection of water is accounted for under the proposed framework with all member states ensuring that appropriate measures to protect the aquatic environment and drinking water supplies from the impact of pesticides are adopted. By taking into account the results of risk assessments and having high regard for the necessary hygiene, public health and biodiversity, member states shall prohibit or minimise the pesticide usage in areas used by the general public or vulnerable groups. Areas are defined as parks, public gardens, sports and recreation grounds, school grounds, play grounds and in close vicinity of healthcare facilities. (I feel a theme of commonality starting to prevail with the EU and Canada)

New statistics regulations, establishes a requirement on Member States to collect statistics relating to the: placing of plant protection products on the market (i.e. sales); and agricultural use of plant protection products. The data will be used by Member States and the Commission to calculate risks arising from the use of pesticides and the effectiveness of measures adopted under the Thematic Strategy for Pesticides

The amendments to the machinery directive, this will ensure that pesticide application equipment in professional use shall be inspected at regular intervals. Currently the UK has a voluntary testing program in place for agricultural sprayers however this does not include knapsack sprayers at present.

Again in keeping with Canada and others, member states are required to take all measures to promote IPM and should be working to implementing the general principles of IPM (crop or sector specific) by all professional users by the start of 2014. In the UK, we are already complying with many parts of the proposals; a national action plan has been running for over two years and includes an "Amenity action plan". The highly successful operator certification scheme is already in place and the NPTC's PA certification scheme is well known in the amenity sector. Advisors/technical representatives are covered by the "Basis" award and apart from voluntary testing of sprayers the UK amenity sector has been undertaking risk assessments and observing buffer zones under the Local environmental risk assessment scheme (LERAPS). The UK's greatest challenge will be adopting IPM strategies and management of amenity areas as defined by the legislation e.g. parks, school grounds etc it is vital that we learn the lessons from Ontario with respect to IPM and understand that communication and discussion between all industry groups is vital to ensure a workable and safe future for all.

Conclusions

- i. The pesticide ban played a key part in the election of Ontario's Mc Guinty and received vociferous support from major organisations in the province with concerns about the health effects of chemical use on amenity areas.
- ii. Research undertaken on behalf of these groups was undertaken by non industry specialists.
- iii. The entire process was poorly organised with little or no meaningful dialogue with industry or end users.
- iv. The ban was introduced literally overnight with no thought to offering a phased in approach.
- v. The pesticide reduction may have been more widely received if maximum influence on the regulation via voluntary agreement from the sector. Failure to comply with voluntary agreement would lead to a total ban.
- vi. Given the lack of negotiation, the golf industry managed to present a case for avoiding a total ban but were handed restrictions such as following a recognised IPM program, desk and site audit and continuing education credits.
- vii. Due to the lack of a united industry voice some sectors have lost out e.g. soccer. It was at this time industry wide representation was required. It is vital that in the UK that all interested parties (Institute of Groundsmanship, British and International Green keepers Association, Turf Grass Growers Association etc) all play an active part and contribute to the amenity forum to ensure a workable outcome.
- viii. In Canada it is rather ironic that organisations supporting the ban raise considerable funds from hosting golf events.

- ix. Depending on weed, disease and pest populations each year the quality of playing surfaces will vary greatly. This has potential to increase the number of sporting injuries sustained by participants and see an increase in numbers of those affected by asthma, allergies etc. The situation could encourage claims against the province for failure to provide a duty of care. If this situation should arise then it would make an interesting item on any political opponents manifesto!
- x. There is little or no standardisation within the pesticide ban. Farmers can spray crops but not their own vegetables or lawn, Venues hosting International/National events can spray during the preparation but must cease afterwards, golf courses can continue to spray with some restrictions, school fields and parks cannot use any chemicals yet children play on all of the above surfaces.
- xi. A greater emphasis is being placed on IPM and compliance is integrated into Bill 64.
- xii. Now more than ever, a greater emphasis will be placed on the skill of the groundsman/green keeper to maintain quality turf/amenity areas. Without the use of chemicals greater resources will be required.
- xiii. An educational program is required to change perceptions of users of turf facilities and amenity areas.
- xiv. There is a lack of viable biological alternatives available to turf/Amenity managers.
- xv. Greater research into biologicals and other alternatives is required.
- xvi. The UK is already some way to complying with proposed EU legislation with the Amenity action plan, voluntary sprayer testing and Pesticides application certification.
- xvii. IPM is the way forward; we must stop doing this lip service and fully implement integrated programs.
- xviii. The enforcing of the thematic pesticides regulations needs to be decided, will it fall into the remit of Environmental agency, Health and safety directorate or local authority HSE inspectors.

I would like to thank the Farmers club for supporting my visit to North Carolina and Guelph University. The experience was very rewarding and worthwhile, the knowledge and experience I have gained has already been beneficial in my teaching and my improved knowledge of warm season grass management has been particularly beneficial for a project in India that Reaseheath College are currently involved in.

The overall theme behind my investigations is that communication between all parties is vital to ensure that both sides of the debate end up with a workable and safe future.

Feedback from North Carolina State University

Dear Gareth,

A belated thanks for coming to North Carolina State University. Your class presentation was well received by the students. We have received a lot of good feedback. I am glad we had the opportunity to share ideas regarding turf management especially as it relates to environmental and pesticide issues. Our hope, as it is yours, is to produce acceptable turf while helping to preserve and/or improve the quality of life for our citizens. Working together benefits all of us. By the way, we have just completed our discussion of turfgrass IPM in the Professional Golf Management class. Exams begin next week.

Sincerely,

Dr. Art Bruneau
Professor Emeritus

Feedback from Guelph University

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(519) 824-4120 EXT 56886

DEPARTMENT OF PLANT AGRICULTURE
Associate Diploma in Turfgrass Management
Tuesday, December 8, 2009

The Secretary
The Farmers Club
3 Whitehall Court
London, England

Dear Sir/Madam:

I am writing to thank you for supporting Gareth Phillips' visit to the University of Guelph this past September.

Gareth contributed greatly to our understanding of professional turf management in the United Kingdom. He participated in classes and met with faculty, staff and students. One of the more valuable aspects of his visit was his willingness to meet with various industry professionals. He brought a level of expertise in specialty turf management pertaining to lawn bowling and cricket which is very limited anywhere in Canada.

We learned a great deal from Gareth's visit and established links to the United Kingdom that I hope will be beneficial to the promotion of excellence in turf management in both of our countries.

Thanks again to The Farmers Club for making his visit possible.

Sincerely;

Rob Witherspoon, Director
Associate Diploma in Turfgrass Management

Appendices

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- 46, Table 2. Characteristics of principal lawn grasses grown in North Carolina. Courtesy of North Carolina Cooperative Extension service.
- 47, Bermuda grass athletic field maintenance calendar, Courtesy of North Carolina Cooperative Extension service
- 48, Syringing: Does it really help? Golf Course Management 1996
<http://www.gcsaa.org/gcm/1996/july96/syringin.html>
49. Bill 64
50. Letter from Canadian Environmental Law Association to Mr R Bilyea, Senior Policy Advisor, Ministry of the Environment, 22/12/08
51. Proposed Cosmetic Pesticide ban in the Province of Ontario, Scientific basis for banning both sale and use of synthetic pesticides, Denise Brennan-Rieder ,PhD.
52. Western Canada Turf grass association Journal page 28-32, August/September 2009

Appendix A1

Appendix A2

Appendix A3

Appendix A4

Appendix A5

Appendix A6

Appendix A7

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Dorothy Lyons

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Jonathon Smith, Golf and Environmental Organisation

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