2014 OSU TURF FIELD DAY

Lewis Brown Horticulture Farm
Corvallis, OR
33329 Peoria Rd.
Corvallis, OR 97333
Friday - August 29, 2014

Speakers:
Alec Kowalewski, Turfgrass Specialist
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Brian McDonald, Senior Faculty Research Assistant
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Clint Mattox, Graduate Assistant
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Brian Daviscourt, Graduate Assistant
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Field Day Agenda

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Formal Field Tour – Part 1

IPM for Oregon Public Schools
Alec Kowalewski
8:30 to 8:40 am

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As of 2009 Oregon Statute requires Integrated Pest Management (IPM) in all schools. This bill requires all schools to adopt an IPM plan, create a list of acceptable low-impact pesticides, designate an IPM coordinator, annual training for IPM coordinators and periodic training for other school employees. Similar programs have been put into place in California, New Jersey, Texas, West Virginia and other states. While other training options are available, none specific to the needs of the Oregon school grounds employees were available prior to this pilot project. The objective of this project was to develop and deliver an engaging, needs-based IPM training curriculum for public school IPM Coordinators and grounds employees in the Portland-METRO area. A focus group and survey was used to identify high priority training topics, which were 1) landscape rodent management, 2) landscape and turf weed management, 3) hardscape weed management, 4) building a low maintenance landscape, and 5) maximizing low impact pesticides. Site visits were conducted to confirm the severity of these issues and determine if other IPM related topics need to be incorporated into the future training events. Four separate training events were held in two different school districts, Portland and Beaverton, on September 23 and 24, 2013, and then March 25 and April 1, 2014, respectively. Panel discussions and hands-on field demonstrations were used to facilitate the information and actively involve the trainees. The four training events collectively reached sixty six employees from 15 of the 23 school districts in the Portland area. Surveys were used to assess the quality of the training, and then a follow-up focus group was used to quantify the impacts of this training. Survey analysis determined that the majority, 67% of the participants felt that the information provided improved their knowledge of turf and landscape IPM.

Formal Field Tour – Part 1

Fungicide Update: Rotations for control of Microdochium Patch and Anthracnose
Brian McDonald
8:40 to 8:50 am

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Microdochium patch (not under snow cover) rotation products that have performed well in our trials: For a preventative program, begin applying when rain begins in the fall (Oct 1st), or first sign of disease. Alternatively, use an indicator green to time your first application.

Product
1. Chipco 26GT + Secure
2. Instrata
3. PCNB
4. Endorse + Fore
5. Banner + Secure
6. Interface
7. Headway

Note: Most DMI fungicides have been weak on M. Patch (not under snow cover) in our trials. The only exception is Banner Maxx.

Cultural Practices:

- Avoid high nitrogen applications during fall and spring coring, if possible.
- Keep nitrogen applications at 0.10 lbs. of N/1,000 sq. ft. per application fall through spring.
- Use a balanced N-P-K ratio (e.g. 5-1-4).
- Apply Sulfur at a rate of 0.25lbs/1,000 sq. ft. per month fall through spring.

Fungicide Update: Rotations for control of Microdochium Patch and Anthracnose (Cont.)

Anthracnose rotation products that have performed well in our trials.

Example rotation: The order can be changed to suit local needs or to control other summer diseases. However, we recommend using DMI's early and/or late. Be careful using DMI's when you are on a Primo program or in hot weather. Wait at least 4 weeks before making a second DMI application. Start earlier if local conditions dictate. The general rule is to make your first application 3 weeks prior to first symptoms.

Date	Chemicals	Notes
1st week of June	Banner, Mirage, Trinity, or Torque, (Avoid Bayleton & Tourney) mixed with Daconil Action (3.5 oz.)	Bayleton is weak. Tourney injures *Poa annua.*
3rd week of June	Heritage, Insignia, Compass, or Briskway mixed with Secure (0.5 oz.)	Only use if no resistance issues
1st week of July	Velista mixed with Signature (4.0 oz.) and Secure (0.5 oz.)	
3rd week of July	Medallion SC (1.0 oz.) mixed with Daconil Action (3.5 oz.)	Good on brown patch as well.
1st week of August	Thiophanate methyl mixed with Daconil Action (3.5 oz.)	Only use if no resistance issues
3rd week of August	Affirm (0.9 oz.) mixed with Spectro 90 (3.6 oz.)	
1st week of September	Banner Maxx (2.0 fl. oz.) – will work as your first *Microdochium* patch application as well.	You could delay this application a couple of weeks if weather is still dry.

Cultural Practices to Limit Anthracnose:

- Apply 0.10 – 0.25 lbs of N/1,000 sq. ft. every 2 weeks April through September
- Mow as high as possible and use rolling, Primo, and verticutting to achieved desired green speeds
- Keep moisture levels consistent. Avoid dry down cycles if possible.
- Core in the spring and fall.
- Lightly topdress your greens with sand every two weeks.

Fungicide Alternatives for the Control of Microdochium Patch
Clint Mattox
8:50 to 9:00 am

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Introduction: *Microdochium nivale* is a major turfgrass disease in cool, humid regions of the Pacific Northwest, Western Canada and Northern Europe. Currently, traditional fungicide applications are the only known method to control this disease. In recent years, increasing pesticide bans and restrictions have generated concern regarding management of pathogens like *M. nivale*. The objective of this research was to evaluate the effects of the application of mineral oil, sulfur and potassium-phosphite as an alternative management option of *M. nivale* on *Poa annua* putting greens.

Methods and Materials:

A field experiment was initiated in September 2013 on a green that was built by placing 6 inches of USGA sand on a soil subgrade with no drainage at Oregon State University, Corvallis, OR. Experimental design was a 2 by 4 randomized complete split-block design, with four replications. Factors included mineral oil and winter fertilization. Mineral oil (Civitas One) was applied every other week at a rate of 27.06 L/ha^{-1} and compared to a control. Winter fertilization treatments included sulfur (Sulfur DF) and potassium-phosphite (PK Plus) applied at 9.77 kg S/ha^{-1} and 2.67 L H_3PO_3/ha^{-1}, respectively, as well as an untreated control. Turf quality (1-9 scale, with a 6 or greater considered acceptable) and percent disease (0-100%) were collected weekly from September to May 2014. Data were subjected to analysis of variance using a split block design with 4 replications. Differences between means were determined by Fisher's Protected LSD at the 5 percent level.

Results: Disease pressure was high during the trial and it appeared as early as 03 Oct 2013. The untreated check plots averaged 45.0 percent disease cover on rating date, 01 Mar. Civitas One, Sulfur DF and PK Plus alone were able to provide some disease control, but none were able to provide acceptable control for putting green quality. However, Civitas One, when applied in combination with PK Plus, Sulfur DF, or PK Plus and Sulfur DF was able to suppress *M. nivale* throughout the data collection period. In reference to turf quality and color of the same treatments, Civitas One applied in combination with PK Plus, Sulfur DF or PK Plus and Sulfur DF produced the greatest results (7.4 or greater).

	Disease severity[y]	Turf quality[x]	Color quality[x]
Treatment and rate (per 1,000 sq ft)[z]	1-Mar	1-Mar	1-Mar
Sulfur DF 0.25 lbs + PK Plus L 6.0 oz...	0.70% b	5.5 b	7.5 B
Sulfur DF 0.25 lbs.....	4.30% b	4.9 b	7.5 B
Civitas One L 8.5 oz.....	2.00% b	5.5 b	7.9 A
Civitas One 8.5 oz + Sulfur DF 0.25 lbs + PK Plus L 6.0 oz.....	0.00% b	7.4 a	7.5 B
PK plus L 6.0 oz.....	4.00% b	5.3 b	7.5 B
Civitas One 8.5 oz + Sulfur DF 0.25 lbs	0.00% b	7.6 a	7.9 A
Civitas One 8.5 oz + PK Plus L 6.0 oz ..	0.00% b	7.4 a	7.9 A
Untreated	45.00% a	3.5 c	6.9 C

[z]Initiated 26 Sept 2013; [y]Mean disease severity ratings are based on a 0 to 100% scale in three replicated plots [x] Turf quality and color ratings are based on 1 – 9 scale (9 = best, 5.0 is acceptable); Means followed by the same letter are not significantly different (LSD =0.05).

Cost-Benefit of Natural Grass and Synthetic Athletic Fields
Brian Daviscourt
9:00 to 9:10 am

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Introduction: With the rise in popularity of synthetic infill turf systems in the USA it is becoming increasingly important that facility directors and managers understand the costs associated with synthetic infill and natural grass fields so that informed decisions can be made regarding installation choices. Installation of synthetic turf systems in the USA was expected to rise by 20% from 2005 to 2009 with over 400 fields installed in 2004 and 8,000 synthetic fields currently in use in the USA. The goal of this study is to analyze the budgets and maintenance information of facilities at varying budgetary levels and explore which field type may have the best value.

Methods and Materials: A field study conducted on 10 fields – 5 synthetic infill systems and 5 natural grass systems from universities, school districts, and state run facilities – will be used to show any possible correlation between field type and maintenance budget. This study will also be used to determine the cost per usage-hour per person for each field over the course of 12 months. This information will be collected from budgets, maintenance plans, installation costs, maintenance equipment costs, and field use and practice schedules of the participating facilities. Using the gathered information, a secondary survey will be conducted among a broader group of facility managers to provide a larger amount of field and budget information.

The fields will also undergo quality testing on a monthly basis to show the change in field condition over time. The quality of the fields will be analyzed using surface firmness, temperature, and coverage. Firmness testing will be accomplished using a FieldScout TruFirm turf surface firmness meter, to measure inches of depression on each surface. Surface temperature will be measured using a Raytek MT6 Non-contact MiniTemp Infrared Thermometer. Coverage will be assessed using lightbox photos and analyzed using SigmaScan pro.

Current Data: Due to the intensity of summer maintenance at the facilities included, budgetary information will not be gathered until the fall of 2014 for the convenience of the maintenance crews participating in the study. Initial quality data was collected on four fields, two synthetic infill and two natural grass, from one facility on the 13th of August. The ambient temperature varied between 90 and 82^{o}F due to the partial sunny and cloudy conditions. The average surface temperature of the Synthetic fields were 52.1^{o}F hotter than the natural grass surface with similar Avg. firmness.

Table of Mean Values Collected from Tualatin Hills Park

Field Type	Firmness (inches)	Surface Temperature (F)
Synthetic	0.662[z]	133.0
Turfgrass	0.631	80.9

[z] The TruFirm device measures the inches of depression in a surface after a weighted missile dropped; therefore, the large the number (inches) the softer the surface.

Formal Field Tour – Part 1

Stop 1: New Technology for Monitoring Soil Moisture.
Alec Kowalewski
9:10 to 9:20 am

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Introduction: Irrigation is a critical cultural practice for maintaining a golf course putting through the summer months. Inadequate amounts of irrigation will result in summer desiccation and anthracnose, while over irrigation will leach the valuable nutrients and pesticides that have been applied. The objective of this project was to evaluate correlations between precipitation rates and soil moisture content following an irrigation audit.

Results: Fifty minutes of irrigation across the Lewis-Brown putting green produced an average irrigation depth of 0.25 inches (Table 1); however, the distribution uniformity was relatively poor (61.2%). Soil moisture content and precipitation rate were weakly correlated suggesting that spatial variability in soil type, organic matter and annual bluegrass health has a substantial effect of soil infiltration rates and water holding capacity (Figure 1). These findings stress the importance of hand watering according to spatial differences in soil moisture across a putting surface.

Table 1: Average (AVR) and low quarter average (LQ) precipitation rate and low quarter distribution uniformity (AVR/LQ = LQ-DU) collected from 288 catch cans after a 50 minute irrigation event.

AVR (inches)[z]
0.25
LQ (inches)
0.15
LQ-DU
61.20%

[z]AVR precipitation rate calculated across 288 data points; LQ precipitation rate calculated using the lowest quarter 72 data points of the 288 data points.

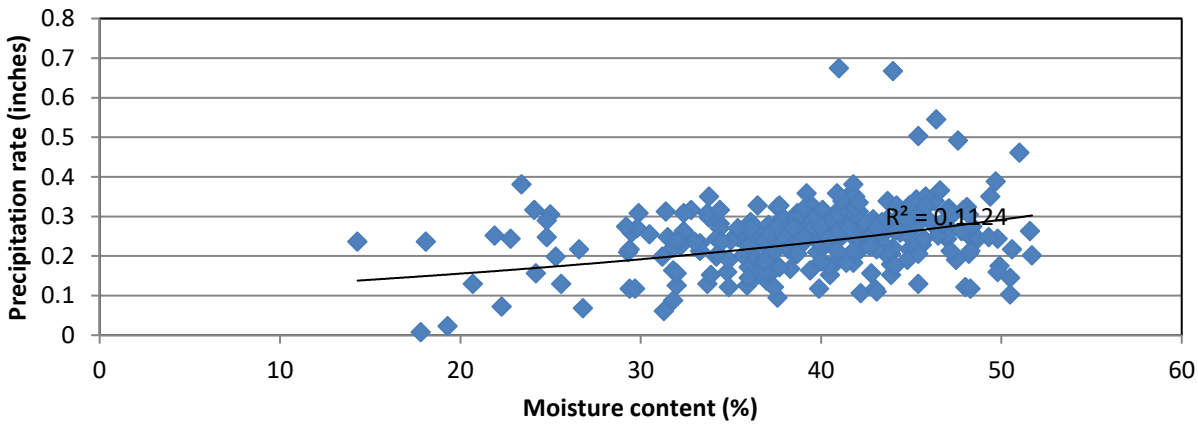

Figure 1: Trends in precipitation rate (inches) across moisture content (%) observed following a 50 minute irrigation event in Corvallis, OR. Strongest correlation (exponential) presented.

Stop 2: Annual Bluegrass Control in Creeping Bentgrass.
Speaker - B. McDonald
9:20 to 9:30 am

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Introduction: Superintendents have long searched for options to control annual bluegrass in bentgrass putting greens. With the anticipated arrival of the new active ingredient methiozolin (PoaCure), a demo trial was initiated on a predominantly bentgrass putting green to determine the best rate and irrigation practices to control annual bluegrass in the Pacific Northwest. For comparison, currently labeled plant growth regulators known to suppress or control annual bluegrass growing in creeping bentgrass were included in the trial. The experiment began on June 18th 2014 with the last application made on August 26th. Six applications were made of PoaCure, Primo, and the Cutless MEC + Primo mix. Three applications were made of Trimmit and Proxy.

Results: To date, the highest reduction in annual bluegrass populations was achieved with applications of Trimmit (paclobutrazol), followed by the highest rate of PoaCure (1.25 oz./1,000 sq. ft.) and immediately irrigated (0.25") after application. To date, PoaCure resulted in a reduction of annual bluegrass populations only when followed by an irrigation event of 0.25".

Bentgrass color was also measured in this trial. The highest rate of PoaCure (1.25 oz/1,000 sq ft) resulted in a slight yellowing of the bentgrass in the initial ratings which is why the color rating was deemed less than acceptable on the July 24 rating date.

Table: Percent change in Annual bluegrass populations determined by grid sampling (72 individual points) and bentgrass color ratings (rating scale of 1-9, with 9 being ideal turf and 6 being the lowest rating for acceptable putting green conditions) were recorded throughout the trial.

Percent Change in Annual Bluegrass Population						Bentgrass Color Rating	
% change in *Poa annua*	Product	Rate		Interval	Irrigation	July 24th	Aug 21st
- 62.3 %[w]	Trimmit	0.20	oz./M[z]	4 weeks	Water .25"	7.0 A[y]	7.0 C[y]
- 50.0 %	PoaCure	1.25	oz./M	2 weeks	Water .25"	5.0 D	7.5 A
- 15.5 %	Cutless MEC Primo Maxx	0.20 0.10	oz./M	2 weeks	Water .25" next day	7.0 A	7.0 C
- 5.9 %	PoaCure	0.6	oz./M	2 weeks	Water .25"	6.5 C	7.5 A
+ 8.6 %[x]	PoaCure	0.6	oz./M	2 weeks	Water .125"	6.8 B	7.5 A
+ 22.2 %	Untreated	na	na	Na	na	6.5 C	7.5 A
+ 40.0 %	PoaCure	0.6	oz./M	2 weeks	No water	6.5 C	7.5 A
+ 87.0 %	Proxy	5.0	oz./M	4 weeks	No water	6.5 C	7.2 B
+ 120 %	Primo Maxx	0.125	oz./M	2 weeks	No water	7.0 A	7.0 C

[w] (-) represents a reduction in annual bluegrass populations; [x] (+) represents an increase in annual bluegrass population; [y] columns with the same letter are not significantly different at a 0.05 level of probability; [z] M represents 1,000 sq. ft. P-value for % change in *Poa annua* = .07 which means there were no statistical differences because of wide variability in the data.

Formal Field Tour – Part 1

Stop 3: Effects of Supplemental Products on Annual Bluegrass Putting Greens.
Clint Mattox
9:30 to 9:40 am

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Introduction: In the search for perfect putting greens golf course superintendents have access to a wide variety of supplemental products promoted to improve playing conditions; however, research on these products is limited. The objective of this research were to explore the effects of various supplemental products (bio-stimulants, micronutrients, and plant extracts) on a mixed stand of annual bluegrass and creeping bentgrass maintained at typical golf course conditions (drought stress, daily traffic, lower than recommended mowing height).

Protocol:

Application schedule : 1st application: June 30, 2014 applied every two weeks
Spray Volume : 2 gallons/1000 ft^2
Traffic Simulation : 236 rounds of golf/day since June 30, 2014
(Average summer day at Trysting Tree)
Height of cut : 0.085" (quadruple mowing since August 18, 2014)
Irrigation regime : hand water as needed, with objective of 16 % VWC as of Aug 18, 2014

Results: In spite of the stress factors included in this experiment, little visual differences among the treatments could be observed throughout the trial. Treatments including Civitas One did have a higher visual quality rating, although this is likely due to the effect of the pigment in the product.

Trt #	Product Name	fl oz /1,000 sq ft	Description
1	Quality 5-0-20	6.00	Potassium Phosphite
2	Roots 1-2-3	6.00	Fertilizer, microbial nutrient, and microbial inoculant (Bacillus licheniformis, Bacillus subtilis)
3	Civitas One	8.50	Mineral Oil - shown to stimulate genes responsible for plants defense system
4	Kelp Grow 0.1-0.5-1.0	0.73	Seaweed (*Macrocystis Integrifolia*)
5	Stimplex	0.75	Marine Plant extract (0.01% Cytokinins as Kinetin)
6	Super Bio Soil Life 3-0-0	6.00	Bacillus species and microbial byproducts
7	Earthfort ProVide Earthfort ReVive	6.00 0.026 #/M	Microorganism liquid supplement Organic matter, humic acid and enzyme supplement
8	Andersons Ultra Mate SG	0.023 #/M	63% Humic Acid Granule (potassium humate based)
9	Ocean Organics 0-0-2 w/ 3% Si	22.00	Silica supplement
10	Algae Green 200	16.00	Seaweed Liquid Exract - *Ascophyllum nodosum* - (Cold extraction process)
11	PanaSea Plus	3.00	Seaplant extract (Phosphoric acid extraction)
12	Civitas One Sulfur DF	8.50 0.250 #/M	Mineral Oil Elemental Sulfur
13	Civitas One PK Plus 3-7-18	8.50 6.00	Mineral Oil Potassium Phosphite
14	Untreated	0.00	

Stop 4: Effects of Mowing Height and Spreading Perennial Ryegrass on Annual bluegrass Encroachment and Divot recovery.
Brian Daviscourt
9:40 to 9:50 am

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Introduction: In efforts to improve the use of perennial ryegrass breeders have developed spreading (stolonifierous) cultivars. These spreading cultivars repair from divoting, unlike conventional perennial ryegrass, and can be maintained at a lower mowing height. Accelerated recovery and the ability to be maintained at a lower mowing height are important traits for reducing *Poa annua* encroachment under conditions of extreme wear. Non-spreading varieties of perennial ryegrass will suffer from rapid *P. annua* encroachment when mowed below 1.5" and require frequent repair seeding in divot conditions. Spreading rygrasses form a network of stolons or pseudo-stolons to spread and fill in exposed soil and damaged areas. The formation of these stolons may be determined by season, eg. Natural Knit most readily forms its pseudo stolons in the spring.

Objective: Evaluate the effects of spreading perennial ryegrass cultivar on annual bluegrass encroachment.

Results: Four years after establishment Natural Knit had the lowest percentage of annual bluegrass encroachment, 10% (Table 1). All other cultivars, 'Fiesta 4', 'RPR' and 'SR 4600' had significantly greater amount of annual bluegrass encroachment, 30 to 35%. An inverse correlation between mowing height and annual bluegrass encroachment was also observed (Table 1). The 2.0" mowing height provided the greatest perennial ryegrass cover followed by the 1.25" height and finally the 0.625" height, which had the highest infestation of annual bluegrass.

Table 1: Effects of perennial ryegrass cultivar and mowing height on percent (0-100%) of perennial ryegrass and annual bluegrass cover 4 years after establishment from seed, Corvallis, OR July 2014.

Cultivar	% Perennial ryegrass		% Annual bluegrass	
'Fiesta 4'	70.2[z]	b[y]	29.9	b
'Natural Knit'	89.9	a	10.1	a
'RPR'	72.2	b	27.8	b
'SR4600'	64.6	b	35.4	b
Mowing height	% Perennial ryegrass		% Annual bluegrass	
0.625"	58.9	b	41.2	b
1.25"	77.4	ab	22.7	ab
2.0"	86.5	a	13.6	a

[x]Stratified sampling was used to determine the mean perennial ryegrass and annual bluegrass percentages (0 to 100%); [y]Means followed by the same letter are not significantly different according to Fisher's protected LSD (α=0.05).

Formal Field Tour – Part 2

Stop 5: The IPM Tools: The Pest Triangle, and Pest Scouting, Sampling, and Identification
Alec Kowalewski
10:00 to 10:30 am

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What do plants crave?

- Sun, Water and Air

What is the pest triangle?

- Pest, Host and Environment

Collecting a composite soil sample:

- **Step 1:** Sample soil from 10 or more locations, sample to a 3 inches soil depth. Discard all grass and accumulated thatch material.
- **Step 2:** Using a plastic bucket mix the soil taken into one composite sample. Spread soil on newspaper in a warm room to air dry overnight.
- **Step 3:** Put a cup of the sample into a plastic bag or a soil mailing kit bag. A basic soil test will include pH, lime requirements, phosphorus, and potassium at a minimum. Mail soil sample and submission forms to testing laboratory.

Root Feeding Insects – Sampling Method: Square-end Shovel (Image 1)

- Leather jackets (crane fly larvae) – action threshold: 25 to 50 per sq ft
  - Preventative sampling: January to March
- Bill bugs (larvae) – action threshold: 5 to 10 per sq ft
  - Preventative Sampling: June to July

Image 1: Sample for root feeding insects by digging a 12” by 12” by 3” hole.

Foliar Feeding Insects – Lemon Scented Dish Soap (Image 2)

- Adult bill bugs – 5 to 10 per sq. ft.
  - Preventative Sampling: May
- Cutworm – 1 to 2 per sq. ft.
  - Preventative Sampling: June to July

Image 2: Sample for foliar feeding insects using lemon scented dish soap.

Sampling Techniques for Turf Pathogens:

- 1. Sample before the application of fungicides
- 2. Sample area of distinct symptoms
- 3. Take samples from the edge of diseased area
- 4. Sample a 3 to 4 square inch plug
- 5. Remove excess soil
- 6. Do not add water
- 7. Keep the sample cool, but do not store the sample
- 8. Collect samples early in the week and then ship/deliver ASAP
- 9. Send pictures and management history (mowing, fertilization, irrigation and fungicides)

Formal Field Tour – Part 2

Stop 6: Maximizing Broad-spectrum Herbicides for Weed Control
Alec Kowalewski
10:30 to 11: 40 am

Introduction: Considering the difficulties associated with proper weed identification and herbicide selection product manufacturers have begun developing wide spectrum herbicides combing 3 or 4 active ingredients capable of controlling various combinations of broadleaf, grassy, perennial and annual weeds. However, after herbicides are applied if cultural practices are not improved weeds will only return to previously infested areas.

Objective:

- The objectives of this field stop are to i) focus on identifying weeds in the field, then ii) discuss the active ingredients that control these weeds, and finally iii) discuss the changes in fertility practices required to prevent the return of these weeds.

False dandelion:
Herbicides: 2,4-D,(Speed Zone, Trimec, T Zone, Surge and Q4), florasulum (Defendor)
Cultural practices: Supplemental irrigation in the summer (0.2 inches applied 3 to 4 times a week)

White clover:
Herbicides: dithiopyr (T zone and Weed-B-Gone Chickweed, English Daisy, Wild Violet Killer…)
Cultural practices: Increase fertility 4 to 6 lbs N per 1,000 sq ft annually.

Crabgrass:
Herbicides: quinclorac (Q4), dithiopyr (Dimension)
Cultural practices: 1) raise your mowing height, 2) inter-seed bare soil in the fall and then spring (9 lbs perennial ryegrass per 1,000 sq ft)

Nutsedge:
Herbicides: sulfentrazone (Surge, Q4 and Tzone), halosulfuron (SedgeHammer)
Cultural practices: 1) reduce irrigation, 2) inter-seed bare soil in the fall and then spring (9 lbs perennial ryegrass per 1,000 sq ft)

Weed	Preferred a.i	Speed Zone	T Zone	Q4	Surge
False dandelion	2,4-D	X	X	X	X
White clover	dithiopyr		X		
Crabgrass	quinclorac			X	
Nutsedge	sulfentrazone		X	X	X
X = This product contains the preferred active ingredient (a.i.) for control the weed in the left column.					

Formal Field Tour – Part 2

Stop 7: Glyphosate Tolerant Ryegrass and Fescue
Alec Kowalewski
10:40 to 10:50 am

Introduction: For those trying to control annual bluegrass and other grassy weeds options are limited. A handful of selective products are available for the management of hand to control grassy weeds like annual bluegrass; however, these products are expensive and typically require multiple applications providing sporadic control. In response to demands for more control options breeders have been exploring the development of glyphosate tolerant turfgrass cultivars. Unlike glyphosate resistant cultivars, tolerant cultivars, developed through traditional breeding practices, can be controlled by glyphosate when applied at higher rates.

Objective:

- The objective of this project was to explore the glyphosate tolerance of various perennial ryegrass and fescue species.

Materials and Methods: Field research exploring the effects of glyphosate on fifteen cultivars of perennial ryegrass and fescue (tall and fine) breed for glyphosate resistance was initiated on August 28, 2013. Turfgrass was seeded at at rate appropriate to the individual species in August 2013. Glyphosate applications were made on April 2 and then again on June 6 at a rate of 8 oz/acre.

Results: Cultivars that showed good tolerance to applications of glyphosate included '224', '2M20' and '2MAX' perennial ryegrass, 'Tareheel II', 'Tarnation GT' and '5T20' tall fescue, 'Enchantment' and 'Shademaster' chewings fescue, and 'Seabreeze' slender creeping fescue. (Figure 1) Cultivars that provided the lowest density included 'AuroraGold' and 'SoilGuard' hard fescue, which is likely the result of slow germination and establishment rates.

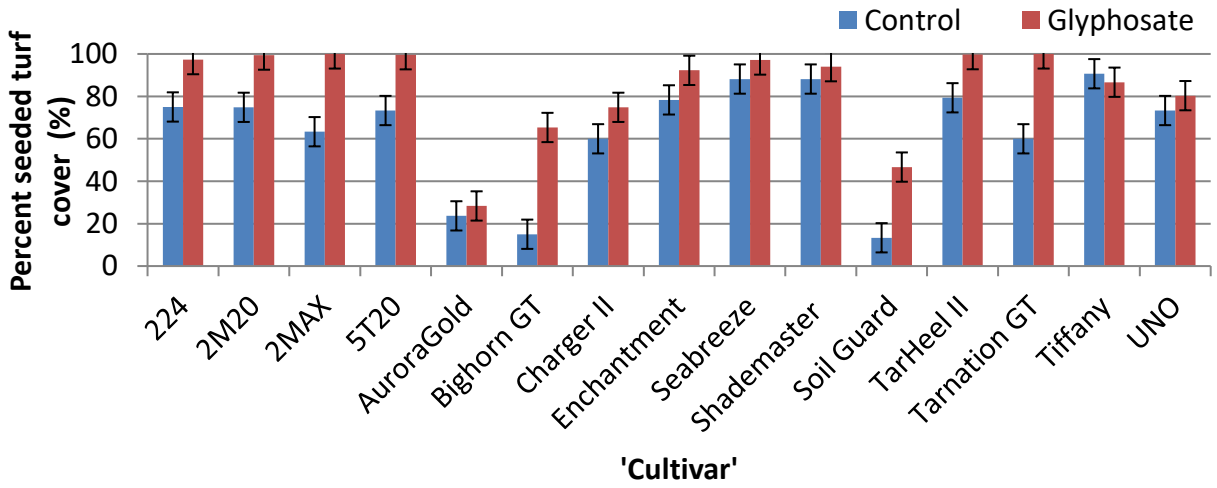

Figure 1: Effects of subsequent glyphosate (Round-up) applications at a rate of 8 oz/acre on April 2, 2104 and then June 6, 2014 on percent seeded turf cover (0-100%) observed July 14, 2014 in Corvallis, OR. Columns with overlapping error bars are not significantly different according to LSD (0.05).

Formal Field Tour – Part 2

Stop 8: Broadleaf Herbicides
Alec Kowalewski
10:50 to 11:00 am

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Introduction: Pre- and post-emergence herbicide selection and application timing is a critical step to successful herbicide use. While pre-emergence herbicides will prevent weed seed germination, these products will not control established weeds. Post-emergence herbicides, on the other hand will control established weeds, but will not prevent weed seed germination after the product is applied. Therefore, coupling pre- and post-emergence herbicides would be advantageous for those trying to minimize weed infestations and future encroachment. However, exploration into optimum application timing is needed.

Objective:

- Evaluate the effects of single and subsequent applications of broadleaf pre- and post-emergence herbicide combinations, as well as application timing on white clover and false dandelion management in a stand of perennial ryegrass.

Materials and Methods: Field research was initiated on perennial ryegrass infested with white clover and false dandelion on March 7, 2014. Treatments included single applications of Denfendor + Dimension, and Trimec Classic + Dimension, subsequent applications of Defendor + Dimension and a granular weed & feed product, and finally an application of Defendor + Dimension followed by an application of Defendor alone.

Results: With the exception of the single March application of Defendor + Dimension, all treatments reduced white clover populations to less than 1% cover (Table 1). Subsequent herbicide applications were required to reduce false dandelion populations to values less than 2.0% cover. Subsequent applications of Defendor + Dimension, or Defendor + Dimension followed by Defendor alone reduced false dandelion populations to levels less than 1% cover.

Table 1: Effects of various broadleaf and pre-emergence herbicide combinations and application timings on white clover and false dandelion percent cover within a perennial ryegrass stand in June 2014.

		Percent weed cover (0-100%) Observed 27-June	
Herbicide	**Application dates**	**White clover**	**False dandelion**
Defendor + Dimension 2 EW (0.013 lbs + 0.38 lbs ai/A)	7-Mar	1.7	10.0
Trimec Classic + Dimension 2 EW (0.9 pts + 0.38 lbs ai/A)	7-Mar	0.1	12.0
Defendor + Dimension 2 EW (0.013 lbs + 0.25 lbs ai/A)	7-Mar and 18-April	0.0	0.7
Granular Weed & Feed* (175 lbs product/A)	7-Mar and 18-April	0.6	1.9
Defendor + Dimension 2 EW (0.013 lbs + 0.38 lbs ai/A) and then Defendor (0.013 lbs ai/A)	18-April and 16-May**	0.0	0.9
Untreated	NA	27.5	20.0

* Dithiopyr & Florasulam

**16-May application received Defendor only

Stop 9: Quick Guide to Anthracnose Control in the Pacific Northwest
Brian McDonald
11:00 to 11:10 am

.....

Cultural Practices:

- Apply soluble nitrogen at .15 - .25 lbs. per 1,000 sq. ft. every 2 weeks along with potassium at a 2:1 ratio of nitrogen to potassium.
- Keep mowing heights as high as possible to achieve your desired putting green speeds. Use rolling, Primo, and verticutting to attain your desired speeds.
- Apply consistent amounts of irrigation (avoid dry down cycles if possible). Make monthly applications of wetting agents beginning in April or May before your greens dry out. There is some evidence that using wetting agents year around may reduce anthracnose.
- Apply a light sand topdressing every two weeks.
- Mow less: research at Oregon State University has shown that mowing Monday, Wednesday, Friday, and Saturday along with daily rolling achieves the same putting speeds as mowing and rolling every day.
- Core in the spring and fall. Use smaller tines (1/2") in the spring with closer spacing to create more holes for roots to grow.
- Use growth regulators: begin Proxy (5.0 fl. oz. per 1,000 sq. ft.) and Primo Maxx (0.125 fl. oz. per 1,000 sq. ft.) applications in early to mid-March in Oregon. Make 3 applications on a 4 week interval. Make Primo only applications 2 weeks after the Proxy and Primo applications at 0.125 oz. per 1,000 sq. ft. Continue Primo applications every other week at 0.125 fl. oz. per 1,000 sq. ft. throughout the summer. **Do not apply Primo with DMI fungicides.**
- Keep your sulfur/sulfate levels below 3.0 lbs. per year.

For more detailed information, see http://turf.rutgers.edu/research/GCM-BMP-Anthracnose.pdf

Stop 9: Quick Guide to Anthracnose Control in the Pacific Northwest (Cont.)

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Fungicide Rotation Programs: (Don't be late with first application!)

<u>Scenario Number 1: Goal of making the fewest applications as possible: – Must have low anthracnose pressure - (3 week spray interval)</u>

a. No resistance issues with Strobilurins or thiophanate methyl

Date	Chemicals	Notes
3rd week of June	Banner, Mirage, Trinity, Torque (Avoid Bayleton & Tourney) mixed with Daconil Action (3.5 oz.)	Bayleton is weak. Tourney injures *Poa annua.*
2nd week of July	Heritage, Compass, Insignia, or Briskway mixed with Secure (3.5 oz.)	Briskway is Heritage + Difenaconazole
1st week of August	Thiophanate methyl (e.g. 3336, Fungo 50) mixed with Daconil Action (3.5 oz.)	This application will take you into September

b. With Strobilurin and thiophanate methyl resistance (**3 week spray interval**)

Date	Chemicals	Notes
3rd week of June	Banner, Mirage, Trinity, Torque (Avoid Bayleton & Tourney) mixed with Daconil Action (3.5 oz.)	Bayleton is weak. Tourney injures *Poa annua.*
2nd week of July	Medallion SC (1.0 oz.) mixed with Daconil Action (3.5 oz.)	Good on brown patch as well.
1st week of August	Signature (4.0 oz.) mixed with Daconil Action (3.5 oz.)	If hot temperatures occur earlier, switch the 2nd and 3rd applications

Note: As you move into September and *Microdochium* patch season starts, you can apply Banner Maxx again which is strong on *Microdochium* patch and will also control anthracnose.

Note: Triton, Trinity, and Torque are all weak on *Microdochium* patch.

Stop 9: Quick Guide to Anthracnose Control in the Pacific Northwest (Cont.)

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Scenario # 2: Cadillac Program – apply every 2 weeks. Start earlier if local experience has shown symptoms appear earlier. Apply 3 weeks before you normally see symptoms.

Date	Chemicals	Notes
1st week of June	Banner, Mirage, Trinity, or Torque, (Avoid Bayleton & Tourney) mixed with Daconil Action (3.5 oz.)	Bayleton is weak. Tourney injures *Poa annua.*
3rd week of June	Briskway, Heritage, Insignia, or Compass mixed with Secure (0.5 oz.)	Only use if no resistance issues
1st week of July	Velista mixed with Signature (4.0 oz.) and Secure (0.5 oz.)	
3rd week of July	Medallion SC (1.0 oz.) mixed with Daconil Action (3.5 oz.)	Good on brown patch as well.
1st week of August	Thiophanate methyl (e.g. 3336, Fungo 50) mixed with Daconil Action (3.5 oz.)	Only use if no resistance issues
3rd week of August	Affirm (0.9 oz.) mixed with Spectro 90 (3.6 oz.)	
1st week of September	Banner Maxx (2.0 fl. oz.) – will work as your first *Microdochium* patch application as well.	You could delay this application a couple of weeks if weather is still dry.

Notes: Avoid repeated applications of Banner, Mirage, Triton, Trinity, and Torque. To avoid an excessive growth regulator effect (or brown tingeing) from these fungicides, wait at least 4 weeks to reapply. **DO NOT APPLY PRIMO WHEN USING DMI FUNGICIDES.**

New Products:

- Briskway – Difenoconazole + azoxystrobin. Difenoconazole does not appear to have the same growth regulator effects that other DMI's have.
- Secure – new contact. Early indications are that it is a good tank mix partner for both anthracnose and *Microdochium* patch.
- Velista – Good activity on anthracnose.
- Mirage – new DMI from Bayer that mixes tebuconazole and the StressGard pigment. Provides excellent control of anthracnose.

Formal Field Tour – Part 2

Stop 10: Release Characteristics of Nitrogen Fertilizers
Brian McDonald
11: 10 to 11:20 am
……

1. Soluble: Quick release: ammonium sulfate, calcium or potassium nitrate, urea etc.

There are two types: inorganic salts and urea. The inorganic salts dissolve quickly in water and separate into their constituent ions (e.g. NH^{4+} and SO^{4-} for ammonium sulfate). Either the ammonium or the nitrate gets taken up by the plant. Urea gets converted to ammonium by the urease enzyme in the soil and then may be converted to nitrate by a bacterium. "Stabilized nitrogen" includes urease inhibitors which, in theory, prevent ammonia volatilization (which can also be prevented by irrigation applied after fertilizing with urea), and bacteria inhibitors which prevent conversion from ammonium to nitrate. Ammonium will hold to the soil because it is a positively charged ion (the soil is negatively charged), but nitrate can leach because it is negatively charged.

2. Slow Release Fertilizers:
    a. Polymer Coated Urea (PCU): Polymer coated urea releases based on the coating thickness. Water diffuses into the coat and the nitrogen moves out of the particle by osmosis. However, they **are very temperature dependent and do not release well in winter or spring** because soil temperatures are cold.
    b. Sulfur Coated Urea (SCU): Wide variation in coating thickness provides differential timing of release of urea. Water enters through the micro pores and cracks and begins to dissolve the urea which fractures the coating. **Will release in the winter and spring.**
    c. Polymer Coated Sulfur Coated Urea (PCSCU): These add a sealant coating to SCU to assure a more even release of nitrogen. They act more like SCU than PCU. **PCSCU will release in winter and spring.**
    d. Synthetic Organics, also known as Ureaformaldehyde products: These both require microbes to release nitrogen which requires soil temperatures above 45 degrees F.
        i. Methylene Ureas: These provide a nice slow release when soil temperatures are warm. **They slow down in the winter, but will still release**.
        ii. UreaForm: These release is too slow in Oregon. **Not recommended for normal use in the Pacific Northwest.**
    e. Organic Fertilizers: Require microbes to release. Release characteristics based on organic source. Products with blood meal tend to release more quickly. These generally have a low nitrogen percentage (e.g. 5 or 6%) and can have high amounts of phosphorus and other heavy metals**. They generally do not release well in winter and spring.**

Stop 10: Release Characteristics of Nitrogen Fertilizers (Cont.)

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Results: Seven days after application the urea and N-stabilized fertilizers increased turf color, quality and healthy (normalized difference vegetation index values) (Figure 1). Turf color, quality and normalized difference vegetation index values in plots treated with urea and N-stabilized fertilizers began to decrease over time with the lowest ratings observed 28 days after the initial treatment. Plots treated with polymer coated urea and polymer coated-sulfur coated urea produced the opposite effects; color, quality and health increased over time with the biggest increase observed in the polymer coated urea treated plots.

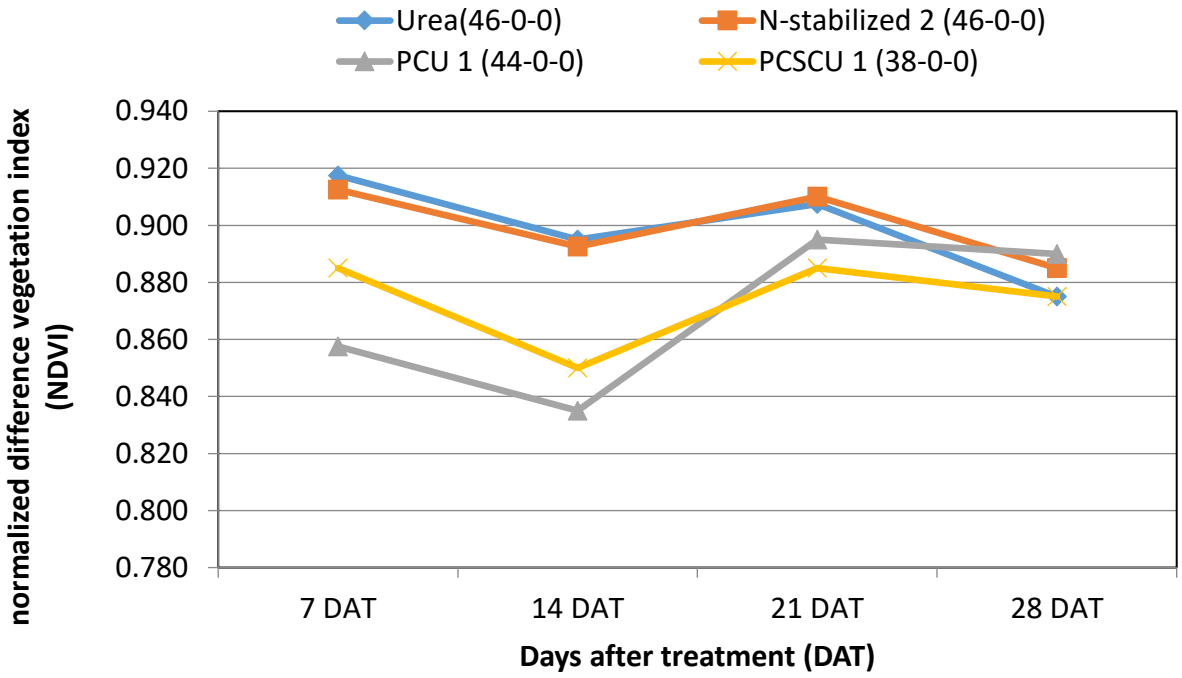

Figure 1: Effects of nitrogen source [urea, n-stabilized, polymer coated urea (PCU) and polymer coated sulfur coated urea (PCSCU)] on normalized difference vegetation index (NDVI) values observed 1, 14, 21 and 28 days after treatment (DAT) in Corvallis, OR. All fertilizers were applied on July 25, 2104 at rate of 1.5 lbs N per 1,000 sq ft.

Formal Field Tour – Part 2

Stop 11: Eco-lawn Mixtures
Brian McDonald
11:20 to 11:30 am
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Eco-lawns consist of turfgrass mixed with select broadleaf plants offering a diverse species composition that is friendly to pollinators and capable of supplying its own nitrogen requirements. Additionally, eco-lawns can be maintained with less mowing and irrigation.

Common Components to a successful Eco-lawn in the Willamette Valley include…

- **Perennial ryegrass:** Bunch type grass that is extremely wear-tolerant and commonly used as the dominant component in lawn seed mixtures. Fast seed germination (5 to 7 days under ideal conditions) leads to rapid establishment. Perennial ryegrass is inherently tolerant to the cool season diseases that decimate species during the rainy winters associated with the Oregon and Washington coast.

- **White Clover:** White clover is considered a beneficial component of natural or organic lawn care due to its ability to fix nitrogen and out-compete lawn weeds. Natural nitrogen fixing reduces leaching from the soil and can reduce the incidence of some lawn diseases that are enhanced by the availability of synthetic fertilizer.

- **Common Yarrow:** Yarrow is a desirable component to this mixture because of it is dark green, rhizomatous, moderately wear tolerant, and very drought tolerant. It is also very compatible with turfgrasses. Without a doubt, yarrow is the star of the show during the dry summer months in the Willamette Valley. It stays green longer than even the clover and blends quite well with most grasses.

- **English daisy:** Lawn daisies produce hundreds of beautiful flowers each spring without attracting bees. They also have a good track record in low fertility sites. In our plots daisies normally flower from March through May and range in color from white to red. However, the daisies we have planted tend to disappear from the mix which is unfortunate. Normally the daisies hold up for about 4 to 5 years and then dwindle to a few isolated plants. While they last they are a delightful addition to the mixes.

Eco-lawn Maintenance: Typical maintenance for eco-lawn mixtures containing perennial ryegrass, micro-clover and yarrow includes 1 to 2 cuttings a month at 2.5 to 3 inches, irrigation once a month during June, July and August, and no fertilization. During drought conditions the turf in these mixtures stops growing and turns off-color, or even straw brown, while the clover and yarrow remain green, resulting in a lawn with an overall green appearance.

Exhibitor Show: 10:00 to 11:30 am

Booth	Exhibitors	Representative	Phone	Email
1	Brandt	Tony Shepherd	503-421-2680	tony.shepherd@brandt.co
2	Bridgewell Resources, LLC	Stanley Muhr	866-939-1177	dmacfarlane@bridgewellres.com
3	Dow Agro Sciences	Elyssa Trejo	541-224-4632	eatrejo@dow.com
4	HARCO Fittings	Mike Scheel	434-382-7930	mscheel@harcofittings.com
5	Oregon Golf Course Superintendents Association	Linda Whitworth	503-680-6676	ogcsa@ogcsa.org
6	Oregon Seed Association	Angie Blacker	503-685-7555	bBlacker@pacwestcom.com
7	Oregon Seed Lab	Adriel Garay	541-737-4794	adriel.garay@oregonstate.edu
8	Oregonians for Food & Shelter (OFS)	Scott Dahlman	971-273-9838	scott@ofsonline.org
9	Rain Bird Corporation	Mark Willcut	503-798-7203	mwillcut@rainbird.com
10	Stevens Water Monitoring Systems	Carmen Magro	215-908-0044	cmagro@stevenswater.com
11	Syngenta	Dean Mosdell	805-480-0514	dean.mosdell@syngenta.com
12	Target Specialty Products	Gary Willis	503-703-8904	gary.willis@target-specialty.com
13	The Andersons	Ed Price	509-981-9077	ed_price@andersonsinc.com
14	The Toro Company	Tom McGlasson	541-915-0320	thomas.mcglasson@toro.com
15	Turfgrass Water Conservation Alliance	Jack Karlin	541-971-4418	jack.karlin@twca.org
16	Walla-Walla Community College	Gwen Stahnke	509-527-4225	gwen.stahnke@wwcc.edu
17	Washington State	Nathan Stacey		nathan.stacey@email.wsu.edu
18	Wilbur-Ellis Comp	Stan Presley John Westerdahl	503-550-4186 360-606-8560	stpresley@wilburellis.com jwesterdahl@wilburellis.com
19	RMT Equipment	Rich Schwabauer	503-667-5000	lud@rmtequipment.com
20	Coates Landscape Supply	Preston Farner	208-360-3892	preston@coatespower.com
21	Athletic Field Design	Mike Hebrard	(503) 698-6383	hebrard@athleticfield.com

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