Chris Kehoe

From: Benvegna, John <John.Benvegna@wsp.com>
Sent: Monday, July 15, 2019 10:04 AM
To: Chris Kehoe
Cc: Michael Preziosi; Christopher Smith; Anthony Martin Petrovic
Subject: Hollow Brook Pesticide Recommendations
Attachments: 2019 05-31 Hollow Brook Golf Club Petrovic Pesticide Reportreview.pdf

Hi Chris,
I have reviewed the pesticide review report prepared by Marty Petrovic for the Hollow Brook Golf Course dated May 31, 2019 (attached). Based on my review, and the answer to some questions which were provided by Marty below, I have no issues with adding the approved pesticides to the list of products approved for use at Hollow Brook. I do have a few comments which are noted below.

1) Note: only the 15 products listed on the top of page two were reviewed and approved by Marty. The other products in the following pages, which are registered and approved for use in NYS, were provided for future reference.

2) We will include any of the newly approved products in the monitoring program if and when they are applied on the course.

Please let me know if you have any questions.

Thank you

Copies 1 Planning Board
..... Town Board
..... Zoning Board
..1.. Legal Dept.
..1.. DOTS Director
..1.. C.A.C.
..... A.R.C.
..1.. Applicant
.....
.....
Sent 7/17/19

John Benvegna, PG(NY), CPG
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Leggette, Brashears & Graham is now WSP.

From: Anthony Martin Petrovic [mailto:amp4@cornell.edu]
Sent: Friday, July 12, 2019 11:13 AM
To: Benvegna, John <John.Benvegna@wsp.com>
Subject: Re: Hollow brook Pesticide Recommendations

Hi john, sorry for the delay in responding. Here are my answers to your questions below:
1. I am only recommending the one Chris requested on page 2. But if he finds out he need them he could ask to add them to the approved list .

2. Not an issue with the short list but some of the natural organics do not need to go through risk assessment.

3. The notes are only for weeds since some of the herbicides can not be used on greens, etc.
4. For now he has a very comprehensive list and should not need addition pesticides. Have a nice weekend, Marty

Sent from my iPad

On Jul 8, 2019, at 2:22 PM, Benvegna, John <John.Benvegna@wsp.com> wrote:

> Hi Marty,
>
> I need to give the Town my review on your pesticide recommendations report for Hollow Brook and I have a few quick questions.
>
> 1) Are you approving all the pesticides listed in the report for use on the course or just those on the top of page two that they requested?
>
> 2) If all, what about those where the Total Env. Impact is listed as "not rated" or "not available"? How do we know those are ok?
>
> 3) Some of the pages near the end have a "Notes" column with application recommendations but I don't see that on all the pages. I just want to make sure that it did not get cut off some of the pages.
>
> 4) Are there any currently NYS registered pesticides that should NOT be used at Hollow Brook?
>
> Thank you and enjoy the summer!

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May 31,2019

INTRODUCTION AND RECOMMENDATIONS

The report below is a risk assessment of the proposed new pesticides for use on the Hollow Brook Golf Course. The report can also aid the golf course superintendent Chris Smith in selecting and using pesticides that have the best potential to control a given pest, provide the least risk to the environment and reduce the risk of developing pest resistance to a given pesticide or pesticides. The report below does provide the information on how effective the pesticides registered in NYS are in controlling a pest, the risk of developing resistance to that or similar pesticides and the environmental risk of using that pesticide. The outcome of this analysis is to recommend additional pesticides to use that have a low risk to the environment, give the most effective control, and have a low risk of developing resistance. If a pest becomes resistant to a pesticide it will become resistant to all the pesticides with the same mode of action and often many others pesticides making it much harder to control the pest.

Hollow Brook is requesting permission to use the following pesticides:

disease control- Myclobutanil, Fludioxonil, Pyraclostrobin, Polyoxin D Zinc, Cyazofamid, Etridiazole, Fluazinam, Fluxapryroxad

insect control- Spinosad, Cyfluthrin

weed control- Mesotrione, Prodiamine, Fluroxypyr+Triclopyr, Sethoxydim

Previously WINPST was used to conduct the environmental risk assessment looking at potential surface and ground water risks. A more comprehensive approach will now be used call the Field Environment Impact Quotient (FEIQ) method. The FEIQ method is an expanded risk assessment that accounts for a pesticide persistence in the soil, the potential for leaching or run-off, and the toxicity to humans, wildlife, and non-target organisms like honey bees, aquatic plants and fish.

Base on the FEIQ method, the pesticides above with a low risk are recommended to be added to the list of useable pesticides at Hollow Brook:

For diseases:

Myclobutanil, Fludioxonil, Pyraclostrobin, Polyoxin D Zinc, Cyazofamid, Etridiazole, Fluazinam, Fluxapryroxad

insect control: Spinosad, Cyfluthrin

weed control: Ethofumesate, Mesotrione, Prodiamine, Fluroxypyr+Triclopyr, sethoxydim

FULL ENVIRONMENAL RISK ANALYSIS RESULTS

The complete report below is broken out into pest types, diseases, insects and weeds. It does not contain a list of every pesticide product but has the current list of most active ingredients registered in NYS for use on golf courses. Based on risk assessment done in the past, the Hollow Brook golf course is not allowed to use many of these pesticides since they were shown to have a high environment risk, while most other golf courses in the area can and do use them. For each pest the current list of pesticides legal in NYS and a recommendation for new ones that provide as good or better control, reduce pest resistance and have a low environmental risk.

The tables below have an environment risk evaluation using the Field Environment Impact Quotient (FEIQ) method developed by the Cornell University Integrated Pest Management Program (Eshenaur, B., Grant, J., Kovach, J., Petzoldt, C., Degni, J., and Tette, J. www.nysipm.cornell.edu/publications/EIQ. Environmental Impact Quotient: "A Method to Measure the Environmental Impact of Pesticides." New York State Integrated Pest Management Program, Cornell Cooperative Extension, Cornell University. 1992 – 2015.). The Environmental Impact Quotient (EIQ) was developed to rate the risk of pesticides to human health and non-target organisms. The EIQ value is derived from mathematically weighting all the risk factors into a quotient. The EIQ is multiplied by the rate of application and percent active ingredient to determine the Field EIQ Rating (FEIQ):

FEIQ = EIQ x Rate (lbs/acre) x %AI

The EIQ is a value assigned to a specific pesticide that is calculated based on 13 different criteria. The factors account for are persistence in the soil, the potential for leaching or run-off, and the toxicity to humans, wildlife, and non-target organisms. The EIQ is a quantitative assessment of the ecological impact of a pesticide. However, the EIQ, by itself, is only an index of the active ingredient of the pesticide. Calculations must take into account the percent active ingredient and the rate of application. Therefore, the Field Use Rating for a particular pesticide product is calculated from the EIQ of the active ingredient, the percent active ingredient, and the application rate of a specific pesticide product. For a few new pesticides FEIQ values were not available, but I estimated a similar value based on published information.

DISEASE CONTROL

Diseases are often the pest that requires the greatest number of pesticide applications. Proper id is essential and understanding disease biology can go a long way in getting the most effective control. The tables that follow have the same basic format, the active ingredient and trade name, rate of application, how well it controls the pest, resistance information (general risk and risk due to the mode of action of the pesticide) and total environmental risk that includes water quality (not site specific like the previous reports) including risk to the applicators, non-target organisms, etc. Local information from other superintendents on how effective a pesticide is in controlling a pest is extremely valuable as well as a little onsite, small scale testing on new materials should be consider. Available research can't cover every situation, so do some testing first.

Pesticides for the treatment of algae

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Environmental Impact
Fluazinam (Secure)	0.5	good	low,29	moderate
Fluxapryoxad (Xzemper)	0.16 0.26	suppressive	low,7	low to moderate

Pesticides for anthracnose basal (crown) rot and foliar blight

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
Azoxystrobin (Heritage)	0.2-0.4	good	high, 11	very low
azoxystrobin (Heritage TL)	1-2	good	high, 11	very low
Bacillus licheniformis SB3086, indole-3-butyric acid (Roots Ecoguard)	20	limited data	not known	no concern
Bacillus subtilis GB03 (Companion Liquid Biological Fungicide)	4-6	limited data	low, F6	no concern
fludioxonil (Medallion)	0.25-0.5	moderate	low, 12	very low
myclobutanil (Eagle 20 EW)	1.2	fair	moderate, 3	very low
Polyoxin D zinc salt (Endorse)	4	good	moderate 19	very low
Pseudomonas aureofaciens str Tx-1 (Spot-less Biofungicide)	0.73-1.47	limited data	no concern	no concern
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	0.55-1.1	limited data	high 11,7	very low
triadimefon (The Anderson's Professional Turf Products 1% Bayleton)	1.5-3	fair	moderate, 3	very low-low
Trifloxystrobin (Compass)	0.15-0.25	great	high, 11	very
trifloxystrobin, triadimefon (Armada)	0.6-1.5	limited data	high, 11,3	very low
trifloxystrobin, triadimefon (Tartan)	1-2	limited data	high,3	very low

Pesticides for Bentgrass dead spot

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
boscalid (Emerald)	0.18	limited data	moderate, 7	very low
fludioxonil (Medallion)	0.3-0.5	limited date	low-moderate, 12	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	0.55-1.1	limited data	moderate-high,11,7	very low

Pesticides for brown patch

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	good-excellent	high,11	very low
azoxystrobin (Heritage TL)	1-2	good	high,11	very low
Bacillus licheniformis SB3086, indole-3-butyric acid (Roots Ecoguard)	20	good	not known	no concern
Bacillus subtilis GB03 (Companion Liquid Biological Fungicide)	4-6	fair	not known, F6	no concern
Bacillus subtilis str QST 713 (Rhapsody)	2-10	fair	not known, F6	no concern
Cyproconazole (Sentinal)	0.123	good	moderate, 3	very low
fludioxonil (Medallion)	0.2-0.5	good	low-moderate, 12	very low
iprodione (Chipco 26109)	1	good	moderate, 2	low-moderate
iprodione (Anderson's Golf Products Fungicide X)	4.8-7.21	good	moderate, 2	moderate
metconazole (Tourney)	0.28-0.37	good	moderate, M3	very low
myclobutanil (Eagle 20 EW)	1.2	fair-good	moderate, M3	very low
Polyoxin D zinc salt (Endorse)	4	good	moderate, 19	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	0.55-1.1	limited data	moderate, 11, 7	very low
triadimefon (The Anderson's Professional Turf Products 1% Bayleton)	1.5-3	fair	moderate,3	very low-low
Trichoderma harzianum Rifai T-22, Trichoderma virens str G-41 (Turfshield Plus G)	0.37-1.47	limited data	low	no concern
Trichoderma harzianum Rifai T-22, Trichoderma virens str G-41 (Turfshield Plus WP)	0.5-1.5	limited data	low	no concern
Trifloxystrobin (Compass)	0.15-0.25	excellent	high, 11	very low
trifloxystrobin, triadimefon (Armada)	0.6-1.5	fair	high,11,3	very low-low

Brown patch continued

trifloxystrobin, triadimefon (Tartan)	1-2	fair	high, 11,3	very low

Pesticides for copper spot

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
myclobutanil (Eagle 20 EW)	1.2	fair-good	moderate, 3	very low
triadimefon (The Anderson's Professional Turf Products 1% Bayleton)	0.55-1.1	limited data	moderate, 3	very low

Pesticides for Damping-off, seed rot

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance	Total Env. Impact
Mefenoxam (Subdue Maxx)	0.5	great	high, 4	very low
Polyoxin D zinc salt (Endorse)	4	limited data	moderate, 19	very low
Propamocarb hydrochloride (Banol)	1-1.75	limited data	moderate, 28	very low

Pesticides for Dollar Spot

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
Bacillus licheniformis SB3086, indole-3-butyric acid (Roots Ecoguard)	20	good	not known	not available
Bacillus subtilis GB03 (Companion Liquid Biological Fungicide)	4-6	fair	not known, F6	not available
boscalid (Emerald)	0.13-0.18	good	moderate, 7	very low
Cyproconazole (Sentinal)	0.123	good	moderate, 3	very low
Fluazinam (Secure)	0.5	good	low,29	moderate
Fluxapryoxad (Xzemper)	0.16 0.26	excellent	low,7	low to moderate
iprodione (Chipco 26019)	1	good	moderate, 2	moderate
metconazole (Tourney)	0.18-0.37	excellent	moderate, 3	very low
myclobutanil (Eagle 20 EW)	0.5-2.4	excellent	moderate, 3	very low
propiconazole (Banner Max	0.5-2	good	moderate, 3	very low-low
Pseudomonas aureofaciens str Tx-1 (Spot-less Biofungicide)	0.73-1.47	limited data	none	no data
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	0.83-1.1	limited data	moderate-high 11,7	very low
triadimefon (The Anderson's Professional Turf Products 1% Bayleton)	1.5-3	excellent	moderate, 3	very low
Trichoderma harzianum Rifai T-22, Trichoderma virens str G-41 (Turfshield Plus G)	.1-4	fair	low	no concern
Trichoderma harzianum Rifai T-22, Trichoderma virens str G-41 (Turfshield Plus G)	0:5-1.5	fair	none	no concern
Trichoderma harzianum Rifai T-22, Trichoderma virens str G-41 (Turfshield Plus WP)	0.5-1.5	fair	none	no concern
trifloxystrobin, triadimefon (Armada)	0.6-1.5	fair	mod-high,11,3	very low-low
trifloxystrobin, triadimefon (Tartan)	1-2	fair	mod-high,11,3	very low

Pesticides for fairy ring

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.4	good	high,11	very low
azoxystrobin (Heritage TL)	2	good	high,11	very low
fludioxonil (Prostar 70 WP)	2.2	good	moderate,7	moderate
metconazole (Tourney)	0.37	good	moderate,3	very low
Polyoxin D zinc salt (Endorse)	4	fair-good	moderate,19	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	1.1	limited data	moderate-high,11,7	very low

Pesticides for gray leaf spot

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
metconazole (Tourney)	0.37	good	moderate, 3	very low
myclobutanil (Eagle 20 EW)	1.2-2.4	limited data	moderate, 3	very low
Polyoxin D zinc salt (Endorse)	4	fair	moderate, 19	very low
trifloxystrobin, triadimefon (Armada)	0.6-1.5	limited data	mod-high, 11,3	very low-low
trifloxystrobin, triadimefon (Tartan)	1-2	limited data	mod-high, 11,3	very low

Pesticides for leaf spot

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	limited data	high, 11	very low
azoxystrobin (Heritage TL)	1-2	limited data	high, 11`	very low
fludioxonil (Medallion)	0.5	great	moderate,12	very low
iprodione (Anderson's Golf Products Fungicide X)	0.88-2.6	limited data	moderate	low-moderate
iprodione (26GT Fungicide)	3-4	limited data	moderate	low-moderate
myclobutanil (Eagle 20 EW)	1.2	limited data	moderate	very low
Polyoxin D zinc salt (Endorse)	4	fair	moderate, 19	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	0.55-1.1	limited data	moderate-high, 2	very low
Trifloxystrobin (Compass)	0.15-0.25	limited data	high, 3	very low
trifloxystrobin, triadimefon (Armada)	0.6-1.5	limited data	mod-high,11,3	very low-low
trifloxystrobin, triadimefon (Tartan)	1-2	limited data	mod-high, 11,3	very low

Pesticides for Pink Snow Mold

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.4	good-great	high,11	very low
azoxystrobin (Heritage TL)	2	good-great	high,11	very low
fludioxonil (Medallion)	0.5	great	moderate,12	very low
metconazole (Tourney)	0.370.44	limited data	moderate, 3	very low
myclobutanil (Eagle 20 EW)	1.2-2.4	good	moderate, 3	very low
Polyoxin D zinc salt (Endorse)	4	limited data	moderate,19	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	0.55-1.1	limited data	moderate. 11,7	very low
triadimefon (The Anderson's Professional Turf Products 1% Bayleton)	1.1-2.2	good	moderate.3	very low-low
Trichoderma harzianum Rifai T-22, Trichoderma virens str G-41 (Turfshield Plus WP)	0.5-1.5	limited data	none	no concern
Trifloxystrobin (Compass)	0.25	great	high, 3	very low
trifloxystrobin, triadimefon (Armada)	1.2-1.5	limited data	mod-high, 11.3	very low-low
trifloxystrobin, triadimefon (Tartan)	2	limited data	mod-high, 11,3	very low

Pesticides for necrotic ring spot

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	limited data	high, 11	very low
azoxystrobin (Heritage TL)	2	limited data	high, 11	very low
myclobutanil (Eagle 20 EW)	1.2-2.4	great	moderate, 3	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	1.1	limited data	moderate, 11,7	very low

Pesticides for pink patch

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	limited data	high, 11	very low
azoxystrobin (Heritage TL)	1-2	limited data	high, 11	very low
Trifloxystrobin (Compass)	0.1-0.25	limited data	high, 11	very low

Pesticides for Pythium blight

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	good	high, 11	very low
azoxystrobin (Heritage TL)	2	good	high, 11	very low
Bacillus subtilis GB03 (Companion Liquid Biological Fungicide)	4-6	limited data	low, F6	no concern
Cyazofamid (Segway)	0.9	good	low ,21	low
Etridiazole (Terrazole 35% WP) (tees and greens only)	2-4	fair	low, 14	very low-low
mefenoxam (Subdue Maxx)	0.5-1	great	high, 4	very low
mono and dipotassium salts of phosphorus acid (Riverdale Magellan)	4.1-8.2	limited data	low, 33	not available

Pesticides for Pythium root rot

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	good	high, 11	very low
azoxystrobin (Heritage TL)	2	good	high, 11	very low
Cyazofamid (Segway)	0.9	good	low ,21	low
Etridiazole (Terrazole 35% WP) (tees and greens only)	2-4	fair	low, 14	very low-low
mefenoxam (Subdue Maxx)	0.5-1	great	high, 4	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	1.1	limited data	moderate, 11,7	very low
Trichoderma harzianum Rifai T-22, Trichoderma virens str G-41 (Turfshield Plus G)	1-4	limited data	none	no concern
Trichoderma harzianum Rifai T-22, Trichoderma virens str G-41 (Turfshield Plus WP)	0.5-1.5	limited data	none	no concern

Pesticides for red thread

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	excellent	high, 11	very low
azoxystrobin (Heritage TL)	1-2	excellent	high, 11	very low
flutolanil (ProStar 70 WP)	1.5	excellent	moderate, 7	moderate
iprodione (26GT Fungicide)	4	good	moderate, 2	moderate
myclobutanil (Eagle 20 EW)	1.2	good	moderate, 3	very low
Polyoxin D zinc salt (Endorse)	4	excellent	moderate, 19	very low
triadimefon (The Anderson's Professional Turf Products 1% Bayleton)	1.5-3	great	moderate, 3	very low-low
Trifloxystrobin (Compass)	0.15-0.25	limited data	high, 11	very low
trifloxystrobin, triadimefon (Armada)	0.6-1.5	limited data	mod-high, 11,3	very low-low
trifloxystrobin, triadimefon (Tartan)	1-2	limited data	mod-high, 11,3	very low

Pesticides for rust

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	excellent	high, 11	very low
azoxystrobin (Heritage TL)	1-2	excellent	high, 11	very low
Bacillus subtilis QST 713 (Rhapsody)	2-10	limited data	no concern	not available
myclobutanil (Eagle 20 EW)	1.2	limited data	moderate, 3	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	0.55-1.1	limited data	moderate, 11,7	very low
triadimefon (The Anderson's Professional Turf Products 1% Bayleton)	1.5-3	great-excellent	moderate, 3	very low-low
Trifloxystrobin (Compass)	0.1-0.25	good-great	high, 11	very low
trifloxystrobin, triadimefon (Armada)	0.6-1.5	limited data	mod-high, 11, 3	very low-low
trifloxystrobin, triadimefon (Tartan)	1-2	limited data	mod-high, 11,3	very low

Pesticides for summer patch

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	excellent	high, 11	very low
azoxystrobin (Heritage TL)	1-2	excellent	high, 11	very low
fludioxonil (Medallion)	0.5	limited data	low-moderate, 11	very low
myclobutanil (Eagle 20 EW)	1.2-2.4	great	moderate, 3	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	1.1	limited data	moderate, 11,7	very low
triadimefon (The Anderson's Professional Turf Products 1% Bayleton)	1.1	great	moderate, 3	very low
Trifloxystrobin (Compass)	0.2-0.25	great	high, 11	very low
trifloxystrobin, triadimefon (Armada)	1.2-1.5	limited data	mod-high, 11,3	very low-low
trifloxystrobin, triadimefon (Tartan)	2	limited data	mod-high, 11,3	very low

Pesticides for take-all patch

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	great-excellent	high, 11	very low
azoxystrobin (Heritage TL)	2	great-excellent	high, 11	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	1.1	limited data	moderate, 11,7	very low

Pesticides for gray snow mold

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.4	limited data	high, 11	very low
azoxystrobin (Heritage TL)	2	limited data	high, 11	very low
fludioxonil (Medallion)	0.5	limited data	low-moderate,11	very low
iprodione, thiophanate-methyl (Anderson's Golf Products Fertilizer + Fungicide VIII)	1.1	limited data	moderate-high, 2,1	very low
iprodione (Anderson's Golf Products Fungicide X)	0.9-2.6	limited data	moderate, 2	low
Polyoxin D zinc salt (Endorse)	4	limited data	moderate, 19	very low
pyraclostrobin, boscalid (Honor Intrinsic Brand Fungicide)	1.1	limited data	moderate, 11,7	very low
triadimefon (The Anderson's Professional Turf Products 1% Bayleton)	1.1	limited data	moderate, 3	very low

Pesticides for yellow patch

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
azoxystrobin(Heritage)	0.2-0.4	limited data	high, 11	very low
azoxystrobin (Heritage TL)	2	limited data	high, 11	very low
Bacillus licheniformis SB3086 indole-3-butyric acid (Roots Ecoguard)	20	limited data	none	not available
fludioxonil (Medallion)	0.5	good-great	low-moderate, 11	very low
iprodione (Anderson's Golf Products Fungicide X)	4.8-7.21	limited data	moderate, 2	moderate
metconazole (Tourney)	0.37-0.44	limited data	moderate, 3	very low
myclobutanil (Eagle 20 EW)	1.2	limited data	moderate, 3	very low
Polyoxin D zinc salt (Endorse)	4	limited data	moderate, 19	very low
Trifloxystrobin, triadimefon (Tartan)	1-2	limited data	mod-high, 11,3	very low

INSECT

All pests today can develop resistance, even insects and weeds. White grubs back in the early 1970's became resistant to the most widely used insecticides of the time, chlordane and DDT. We have seen other turf insects doing the same, namely annual bluegrass weevil. Often resistance to one insecticide will mean resistance to others or more difficulty in controlling them.

Pesticides for annual bluegrass weevil

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	% Control **	Resistance group	Total Env. Impact
azadirachtin (Ornazin 3% Botanical Insecticide)	0.22	limited data	unlisted	not rated
Azadirachtin (AzaGuard)	0.22-0.37	limited data	unlisted	very low
Beauvaria bassiana (Botanigard ES)	2-5	limited data	no concern	not rated
cyfluthrin (Tempo Ultra GC Insecticide)	0.28	90/45	3A	very low
bifenthrin (Andersons Golf Products 0.15G Prosect)	12-49	90/45	3A	very low
bifenthrin (Menace GC)	0.2-0.4	90/45	3A	very low
bifenthrin, carbaryl (Andersons Turf Products Duocide Insect Control)	32-64	limited data(LD)	3A-1A	low-moderate
chlorantraniliprole (Acelepryn)	0.28-0.46	85/30	28	very low
chloropyrifos (Andersons Golf Products Insecticide III)	0.6	65-85*/LD	1B	very low
Deltamethrin (Suspend SC Insecticide)	0.6-0.9	80-90/LD	3A	very low
Imidacloprid (Grub Ex Pro)	0.9-1.2	50-75/LD	4	very low
Imidacloprid (Merit 2F Insecticide)	0.9-1.2	50-75/LD	4	very low
Imidacloprid (Merit 75 WP)	0.15-0.2	50-75LD	4	very low
Imidacloprid (Armortech IMD 75)	0.15-0.2	50-75/LD	4	very low
imidacloprid, bifenthrin (Bithor SC)	2.6-3.3	65-75/LD	4-3A	very low
lambda-cyhalothrin (Cyonara 9.7 Insecticide)	0.23	98/LD	3	very low
lambda-cyhalothrin (Demand EZ Insecticide)	0.9	98/LD	3	very low
lambda-cyhalothrin (Scimitar GC Insecticide)	0.23	98/LD	3A	very low
spinosad (Conserve SC Turf and Ornamental)	1.2	70-80/80	5	very low
cypermethrin (Amdro Quick Kill				

Lawn & Landscape Insect Killer Concentrate)	7.5	limited data	3A	not available

*= depending on growth stage. ** % control on non-resistant/resistant annual bluegrass weevils in studies in Met NY area.

Pesticides for white grubs

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact
Azadirachtin (AzaGuard)	0.18-0.48	limited data	no concern	very low
Bacillus thuringiensis subs galleriea (Grubgone!G)	37-55	limited data	11A	not available
Beauvaria bassiana (Botanigard ES)	2-8	limited data	no concern	not available
Beauvaria bassiana (Botanigard 22 WP)	1-4	limited data	no concern	not rate
chlorantraniliprole (Acelepryn)	0.18-0.36	excellent	28	very low
Heterorhabditis bacteriophora (NemaSeek)	follow label	limited data	no concern	not available
Imidacloprid (Grub Ex Pro)	0.9-1.2	excellent	4	very low
Imidacloprid (Merit 2F Insecticide)	0.9-1.2	excellent	4	very low
Imidacloprid (Merit 75 WP)	0.15-0.2	excellent	4	very low
Imidacloprid (Armortech IMD 75)	0.15-0.2	excellent	4	very low
imidacloprid, bifenthrin (Bithor SC)	2.6-3.3	good	4-3A	very low
Paenibacillus popilliae (Milky Spore Powder)	4	poor	no concern	not available

Pesticides for cutworms

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Resistance group	Total Env. Impact
acephate (Acephate 90 WDG)	0.4-1.6	1B	very low-moderate
azadirachtin (AzaGuard)	0.18-0.5	no concern	very low
azadirachtin (Ornazin 3% Botanical Insecticide)	0.18	no concern	very low
Bacillus thuringinensis subsp. Kurstaki (Javelin WG)	0.36	11A	very low
Bacillus thuringinensis subsp. Kurstaki (Crymax)	0.18-0.7	11A	very low
Cyfluthrin (Tempo Ultra GC Insecticide)	0.14-0.28	3A	very low
chlorantraniliprole (Acelepryn)	0.05-0.1	28	very low
chloropyrifos (Andersons Golf Products Insecticide III)	27	1B	very low
cyantraniliprole (Ference)	0.05-0.37	28	not available
deltamethrin (Suspend SC Insecticide)	0.4-0.6	3A	very low
Imidacloprid (Grub Ex Pro)	0.9-1.2	4	very low
Imidacloprid (Merit 2F Insecticide)	0.9-1.2	4	very low
Imidacloprid (Merit 75 WP)	0.15-0.2	4	very low
Imidacloprid (Armortech IMD 75)	0.2	4	very low
lambda-cyhalothrin (Cyonara 9.7 Insecticide)	0.11-0.22	3	very low
lambda-cyhalothrin (Demand EZ Insecticide)	0.46-0.9	3	very low
lambda-cyhalothrin (Scimitar GC Insecticide)	0.11-0.23	3A	very low
spinosad (Conserve SC Turf and Ornamental)	0.22-1.2	5	very low

Weed Control

Weeds often are just a problem on localized areas, where thinning or damage to turf occur: high traffic areas near cart paths, areas on fairways and tees where divots are taken and very dry areas often where bedrock is near the surface.

Annual bluegrass

Annual bluegrass is the most common weed of golf courses in the Northeast. It can tolerate very short mowing, compacted soils and revegetate an area from a large soil seed bank. However, if it is not very drought or pest tolerant and requires much more pesticides, water and fertilizer that bentgrasses. It is important that Hollow Brook continue to prevent the establishment of a large population of annual bluegrass.

Pesticides for crabgrass and other annual grasses

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact	Notes
benefin (Lebanon Balan 2.5G) Pre-emergent Pre-emergent	22	fair	3	very low	
dithiopyr (Dimension Ultra 40WP) Pre-emergent	0.17-0.23	excellent	3	very low	not for greens
fenoxaprop ethyl (Acclaim Extra) post -emergent	0.3-0.9	good	2	very low	
mesotrione (Tenacity) pre&post-emergent (small plants)	0.11-0.18	good-great	27	very low	not for greens
Pendimethalin (Pendulum) Pre-emergent	1.3-2.6	excellent	3	very low-low	other product with same properties
prodiamine (Barricade 65 WG) Pre-emergent	0.36-0.83	excellent	12	very low	not for greens
prodiamine (Barricade 4 FL) Pre-emergent	0.23-0.70	excellent	12	very low	not for greens
siduron (Lebanon Crabgrass Control 4.6% Tupersan) Pre-emergent	64	poor	8	moderate	
siduron (Tupersan) Pre-emergent	1.5- 4.5	poor	8	very low	
topramezone (Pylex) post –emergent	0.023-0.034	good	-	very low	not for greens/collars
trifluralin (Lebanon Treflan 5G) pre-emergent	29	fair	3	moderate	

Pesticides for annual bluegrass

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact	Notes
dithiopyr (Dimension Ultra 40WP) Pre-emergent	0.17-0.23	good	3	very low	
bispyribac-sodium (Velocity SG) post-emergent	0.02-0.14	good	2	very low	greens/roughs only
Mesotrione (Tenacity) Pre-emergent	0.11-0.18	good	27	very low	not for greens
Pendimethalin (Pendulum) Pre-emergent	1.3-2.6	good	3	very low-low	other product with same properties
prodiamine (Barricade 65 WG) Pre-emergent	0.36-0.83	excellent	12	very low	not for greens
prodiamine (Barricade 4 FL) Pre-emergent	0.23-0.70	excellent	12	very low	not for greens
Sethoxydim (Poast)	0.3	good	1	low-moderate	
trifluralin (Lebanon Treflan 5G) pre-emergent	29	fair	3	moderate	

Pesticides for most broadleaf weeds

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact	Notes
2, 4-D, triisopropanolamine salt, fluroxypyr, triclopyr (Momentum FX2)	1.1-1.5	good-excellent	48,4	very low	not on greens/tees
2,4-D dimethylamine salt, dicamba, fluroxypyr (Escalade 2)	0.75-1.1	good-excellent	48,4	very low	
2,4-D, dimethylamine salt, dicamba, clopyralid (Millennium Ultra 2)	0.73-1.1	excellent	48,4	very low	not on greens/tees
2,4-D, dimethylamine salt, MCPP, dicamba, sulfentrazone (Surge)	1.25-1.5	excellent	48,4	very low	
2,4-D, dimethylamine salt, triclopyr (Turflon II Amine)	1	excellent	48,4	very low	
2,4-dichlorophenoxyacetic acid, MCPP, dicamba (Strike 3)	0.67-1.5	excellent	48,4	very low	
clopyralid (Lontrel T&O)	0.25 - 0.5	fair-excel	4	very low	
clopyralid, 2, 4-D, triisopropanolamine salt, triclopyr (Riverdale XRM-5202)	1.1-1.5	excellent	48,4	very low	not on greens/tees
clopyralid,triclopyr (Confront)	0.55-0.74	fair/excel.	48,4	very low	not on greens/tees
dicamba, MCPA, triclopyr (Cool Power)	0.91-1.29	good-excel.	4	moderate	
fluroxypyr, triclopyr (Tailspin)	2.2	good	48,4	very low	not on greens/tees
MCPP, dicamba, 2,4-D, triisopropanolamine salt (Trupower 3 Selective)	0.67-1.5	excellent	48,4	very low	
MCPP, dicamba,carfentrazone, 2,4-D, 2-ethylhexyl ester (Speed Zone)	1.1-1.8	good-excel	48,4,14	very low	not on greens
MCPP, dicamba, carfentrazone, MCPA (Power Zone)	1.3-1.8	good-excel	48,4,14	moderate	not on greens

Pesticide for silvery thread moss

Active Ingredient (Trade Name)	Product Rate (oz/1000 sq.ft.)	Control	Resistance group	Total Env. Impact	Notes
carfentrazone-ethyl (Quicksilver T&O)	0.154		14	very low	