Oregon Chapter GCSAA Golf Course Superintendents Association of America

Pest Management Webinar Series

Surface and Subsurface Insect Management for the PAC-NW

Presented by
Rick Fletcher, Technical Services Manager – T/O

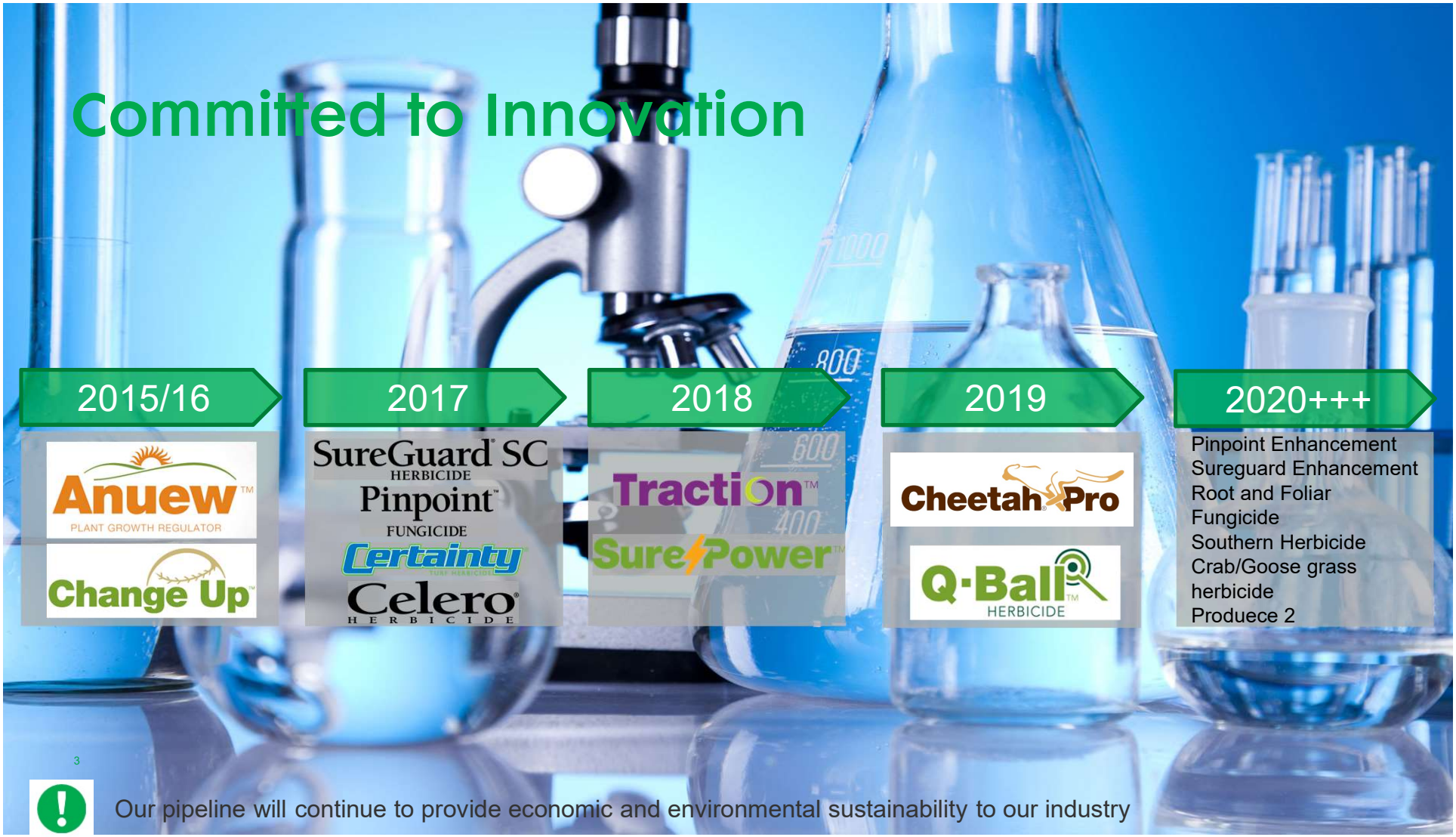
Nufarm Grow a better tomorrow.

Virtual Educational Seminars

Golf Insect Management

- Turf Insect Management
  - Focus on a select few
  - Review of Biology and Life Cycle as part of best management practices
  - Review of Chemical and Physical Control practices to reduce disease damage.
  - What's new?
    - Here come the IRAC 28's

Committed to Innovation



2015/16	2017	2018	2019	2020+++
Anuew™ PLANT GROWTH REGULATOR Change Up™	SureGuard® SC HERBICIDE Pinpoint™ FUNGICIDE Certainty® TURF HERBICIDE Celero® HERBICIDE	Traction™ SurePower™	Cheetah® Pro Q-Ball™ HERBICIDE	Pinpoint Enhancement Sureguard Enhancement Root and Foliar Fungicide Southern Herbicide Crab/Goose grass herbicide Produece 2

Our pipeline will continue to provide economic and environmental sustainability to our industry

Nufarm

VIRTUAL LEARNING SERIES

Combine Beauty and Savings with Naturalized Areas

Nufarm technical services manager Aaron Hathaway presents solutions for saving time and money, and adding beauty to your course, using naturalized areas.

→ WATCH THE MODULE

Sure Power® Herbicide in Cool Season Turf

Technical services director Jason Fausey describes when, where, and why to apply Nufarm's Sure Power® Herbicide for the best control of ground ivy, wild violets, and other weeds in cool season turf.

→ WATCH THE MODULE

Anuew™ PGR for Seedhead Suppression

Nufarm technical services manager Aaron Hathaway presents the newest solutions for seedheads with Nufarm's Anuew™ PGR.

→ WATCH THE MODULE

Save Labor and Cost with Anuew™ PGR in Cool Season Golf Turf

Learn how Nufarm's Anuew™ PGR can save labor and chemical costs in cool season golf turf, presented by technical services manager Aaron Hathaway.

→ WATCH THE MODULE

Anuew™ PGR and Growing Degree Days

Learn how to get the most out Anuew™ PGR by utilizing Growing Degree Day models with Nufarm technical services manager Aaron Hathaway.

→ WATCH THE MODULE

Premium Weed Control for Sedges and Kyllinga

In this short webinar, Nufarm's technical services director Dr. Jason Fausey, explains how to achieve premium weed control for difficult-to-control sedges, including kyllinga.

→ WATCH THE MODULE

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Grow a better tomorrow

Turf Insect Pests

Spring to Fall Approach

- Chinch bug
- Billbug
- White grub
  - Which one?
- Cutworm/Webworm
- Other turf pests
  - Crane Fly

Guess which bug did this?

Guess which bug did this?

Winter Cutworm

Chinch Bugs

Chinch Bugs, *Blissus* spp.

- Hairy chinch bug (B. leucopterus hirtus), which causes damage in northeastern states from Virginia to Minnesota
- Southern chinch bug (B. insularis), found from the Carolinas to southern California
- Blissus spp. (The “Western” chinchbug, an regional species unique to the PAC NW
  - Blissus occiduus Barber

Western Chinch Bug

Blissus occiduus Barber

Description and Biology

- Small red or black bug, 0.18 inch long, with characteristic white marks on wing covers.
- Nymphs are reddish with white or black markings.
- The wings of the adult are folded flat over their backs.

Description and Biology

- The western chinch bug is thought to have one generation per year, and likely overwinter as adults.
- They become active in spring when temperatures reach 45°F. Eggs are laid, which depending on temperature may hatch in 7 days or up to 6 weeks.
- The five immature (nymphal) stages are usually completed in 4-6 weeks

Description and Biology

- Chinch bugs are not consistent pests in the PAC NW.
  - While conditions suitable for damage occur each year in the PNW, there are not large regional outbreaks.
- Chinch bugs are Hemipterans and as such have piercing, sucking mouth parts, sucking sap from the crown and stem of grasses.
  - They are not likely to damage vigorous, well-irrigated turfgrass stands.
  - Because chinch bugs tend to aggregate, damage often occurs in clumps.

Chinch Bug, *Blissus* spp.

- Damage can be observed from June to August on sunny lawns (usually southern exposure)
- Warm, dry springs favor CB development

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Detection

- Look in yellow grass (Not dead grass)
  - Soil surface and thatch
  - Near sidewalks, driveways
  - Adults are fast & small
- “Dustbuster” vacuum
  - Dump on light colored surface
- Soapy water drench

Chinch Bug Control

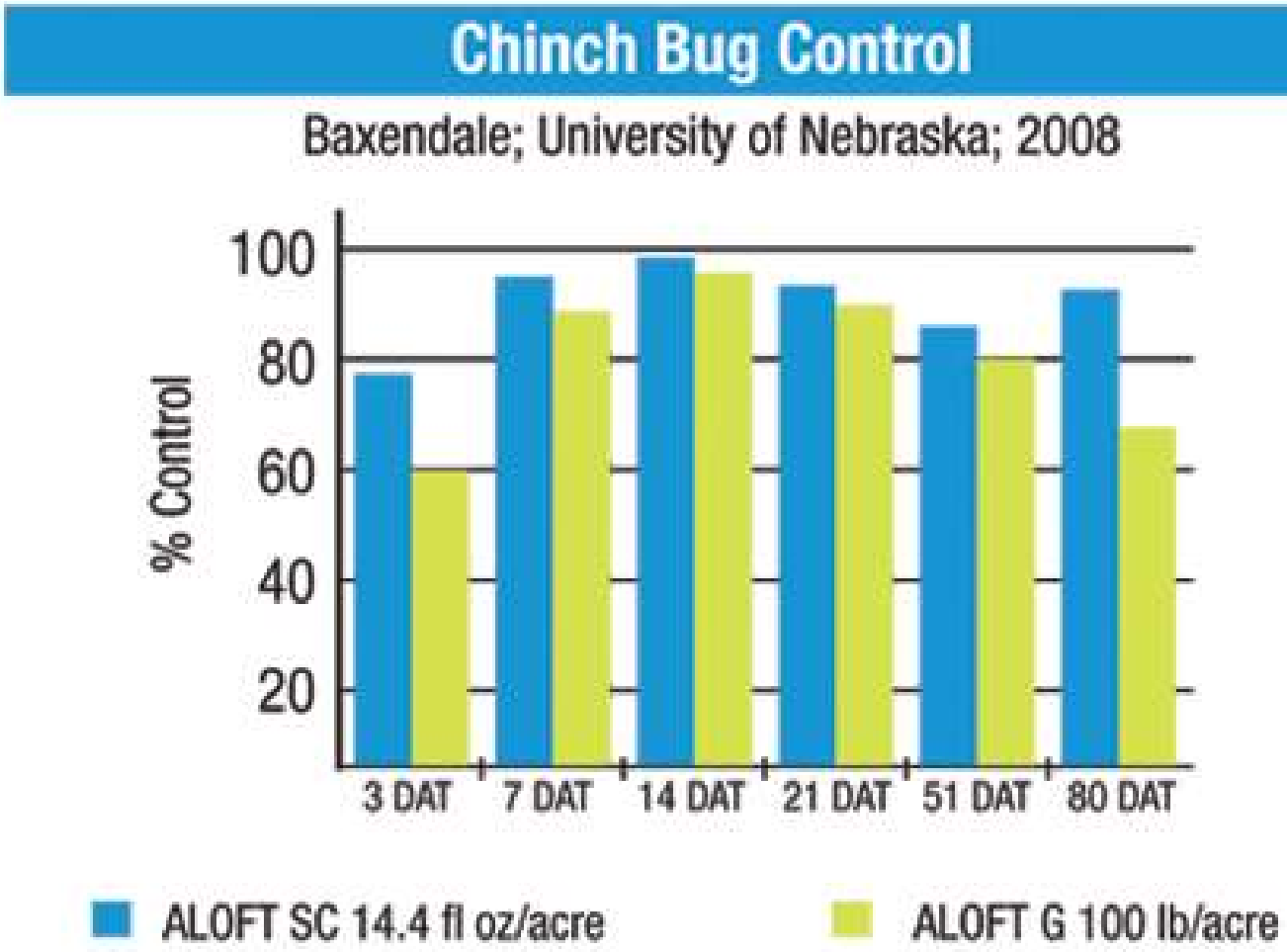
PACIFIC NORTHWEST
Pest Management Handbooks

>Aloft
>Arena
>Acelepryn
>Botanigard
>Conserve
>Dursban
>Neem
>Pyrethroids [Talstar, Menace, Tempo, Deltagard)
>Sevin

Efficacy of Chinch Bug Insecticides in Ohio 1996 – 2010

Insecticide	rate lb.ai./a.	ave % control	# tests	range % control
Bifenthrin (=Talstar)	0.1	**93.9**	17	69-100
	0.2	**91.5**	10	55-100
Beta-cyfluthrin (=Tempo Ultra)	0.1	**83.0**	1	83
Ch-niliprole (=Acelepryn)	0.2	**57.5**	2	56-57
	0.3	**37.6**	5	32-54
Clothianidin (=Arena)	0.2	**92.2**	5	83-100
	0.3	**98.5**	2	97-100
Cyfluthrin (=Tempo)	0.14	**33.7**	3	0-79
Imidacloprid (=Merit)	0.3	**83.6**	11	50-100
	0.4	**77.8**	6	61-100
L-Cyhalothrin (=Scimitar)	0.05	**88.8**	6	76-95
Thiamethoxam (=Meridian)	0.2	**69.0**	3	29-79
	0.26	**88.5**	2	79-98

Aloft University Data



Application Date: 6/30/08
Untreated Check Populations (live CB/0.7 sq ft) 3 DAT-9.8; 7 DAT-14.2; 14 DAT-13.4; 21 DAT-9.0; 51 DAT-16.6; 80 DAT-6.2


Billbugs
www.insectpod.com

Turfgrass Billbug.

Bluegrass billbug (Sphenophorus parvulus)
Denver billbug (Sphenophorus cicatristriatus)
Hunting billbug (Sphenophorus venatus)
Phoenician billbug (Sphenophorus phoeniciensis)

> Billbugs cause problems mainly in eastern Oregon, central Washington and Idaho, especially around Ontario-Baker City and Boise-Twin Falls, and also occasionally from La Grande into the Columbia Gorge.

Turfgrass Billbug.

Biology and Life Cycle

- Bluegrass billbugs overwinter as adults. Eggs are laid on grass stems in May or June and hatch in about 2 weeks.
- As the larvae mature, they move from the crown of the plant deeper into the soil where they feed on roots.
- There is one generation per year.

Turfgrass Billbug.

Biology and Life Cycle

- Adults are about 0.375 inch long, black, with a distinct snout.
- They lay eggs in late spring. Larvae are white with a brown head, and about 0.25 inch long when mature.
- Larvae generally reach damaging size by midsummer. Larvae feed on grass roots, cutting them off.

Turfgrass Billbug.

Biology and Life Cycle

- Damage often shows up as irregular patches of drought-stressed turf.
- Kentucky bluegrass most commonly is attacked by billbug larvae. However, tall fescue, perennial rye, and chewings fescue and annual bluegrass are also susceptible. -

Billbugs, *Sphenophorus* spp.

- Larvae feed in the stem & burrow to the crown
- Stems are hollowed out or filled with sawdust-like frass

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Billbug damage

- Damage observed in mid-late summer, especially during drought
- Tug test may be helpful for diagnosis

Billbug Control

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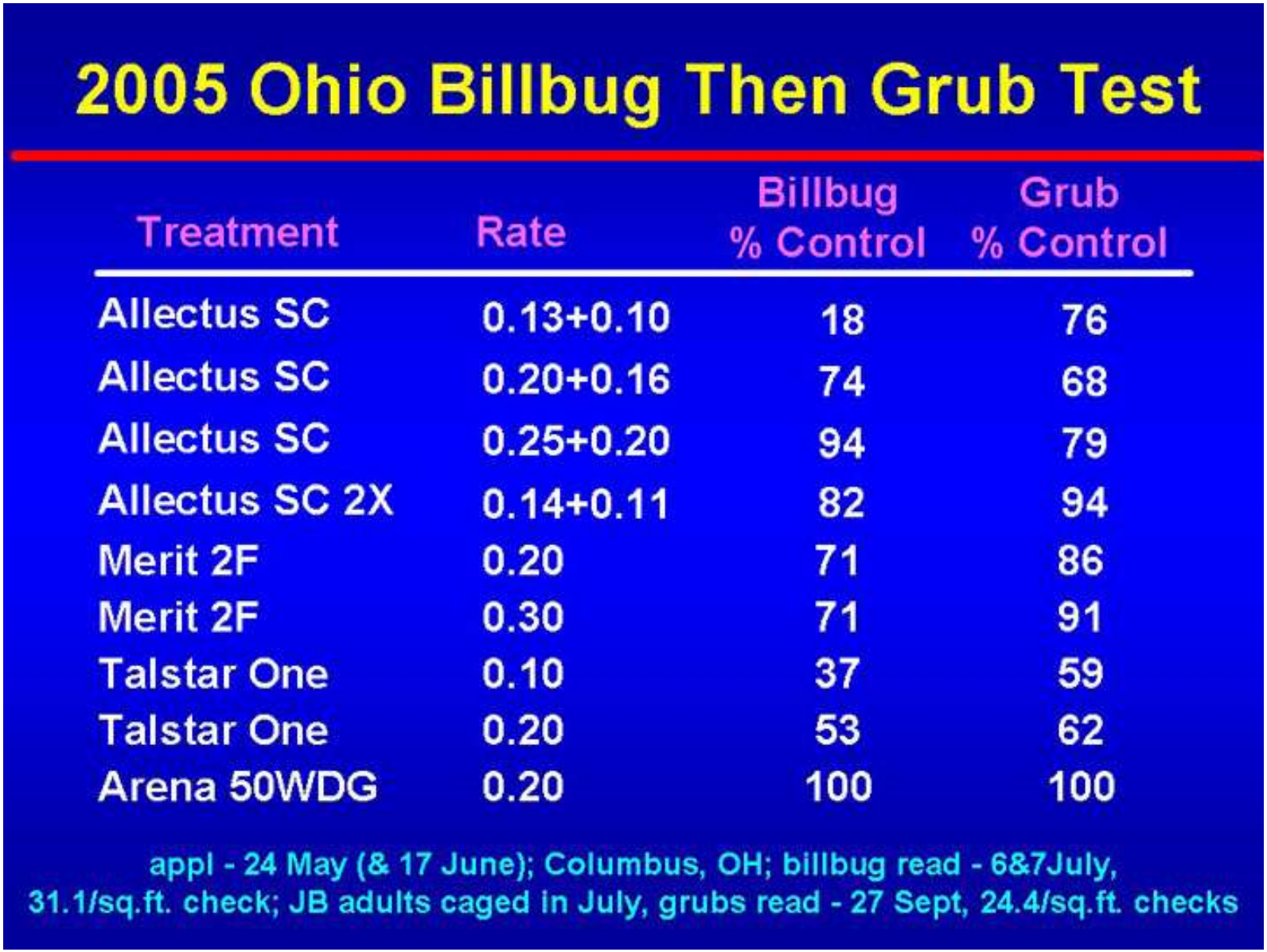
Pest Management Handbooks

>Acelepryn
>Allectus
>Aloft
>Arena
>Botanigard
>Dursban
>Meridian
>Merit/Mallet
>Pyrethroids [Talstar, Menace, Tempo, Deltagard)

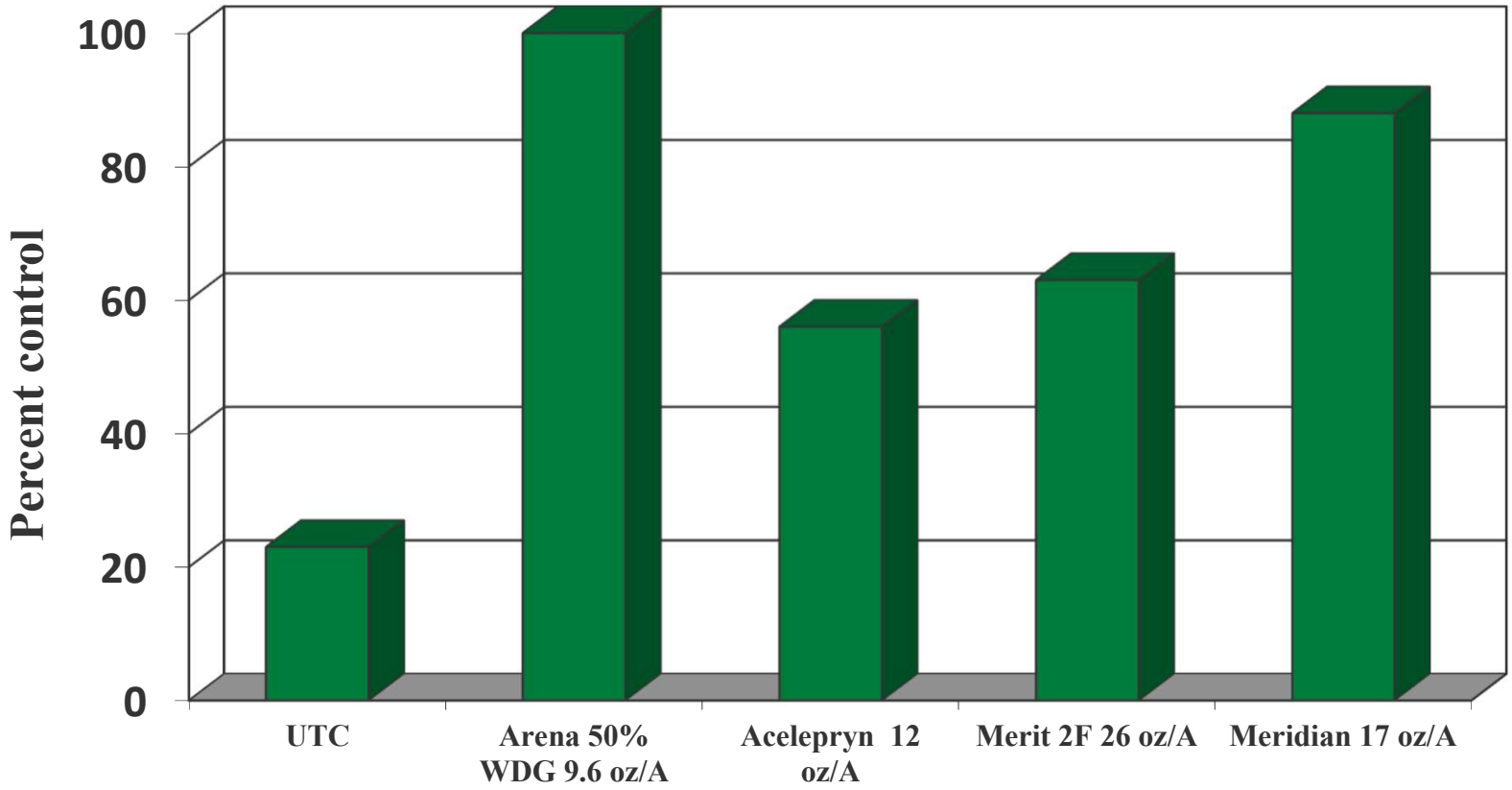
Efficacy of Bluegrass Billbug Insecticides in Ohio 1996 – 2012 (preventive & early curative)

Insecticide	rate lb.ai./a.	ave % control	# tests	range % control
Bifenthrin	0.1	**66.5**	15	37-100
(=Talstar)	0.2	**76.5**	4	53-100
Dinotefuran	0.36	**84.1**	7	73-93
(=Zylam)	0.54	**71.6**	7	46-86
Ch-niliprole	0.1	**71.8**	8	12-86
(=Acelepryn)	0.2	**82.4**	5	74-94
Clothianidin	0.2	**93.8**	5	75-100
(=Arena)	0.3	**94.1**	7	80-100
Cyfluthrin (=Tempo)	0.14	**67.0**	2	67
Deltamethrin (=Deltagard)	0.13	**67.0**	1	67
Imidacloprid	0.3	**77.4**	21	55-95
(= Merit)	0.4	**92.5**	5	73-100
L-Cyhalothrin (=Scimitar)	0.06	**78.4**	5	64-95
Thiamethoxam	0.2	**87.2**	6	81-100
(= Meridian)	0.26	**100**	2	100

Billbug and White Grub Data- Dave Shetlar



Billbug Control in Turf



Trial was conducted in Aberdeen, ID. Treatments were applied on 16 June, 2008.
Turf was Kentucky Bluegrass mowed to 2.5". Thatch ranged from 0.5 to .75". Plot was irrigated as needed to maintain turf.
Plots were sampled July 17th.
Billbug species composition was70% bluegrass billbug (*Sphenophorus parvulus*) 30% Rocky Mountain Billbug (*Sphenophorus cicatristriatus)*

GRIS Report # 2008TMAYH003

Control timing & choices

(Avg. timing for NJ)

Billbugs	**Stage**	**Apr**				**May**				**June**				**July**				**Aug**				**Sept**				**Oct**			
	Pu																														
	Ad																														
	Egg																														
	L1-5																														
Damage	**L3-5**																														
Pyrethroids	**Ad**																														
Merit	**L1-2**																														
Meridian #	**L1-2**																														
Arena #	**L1-4**																														
Acelepryn $	**L1-2**																														
Sevin	**L3-5**																														
S.carpocap	**L3-5**																														
Insecticide	**Target**	**Apr**				**May**				**June**				**July**				**Aug**				**Sept**				**Oct**			

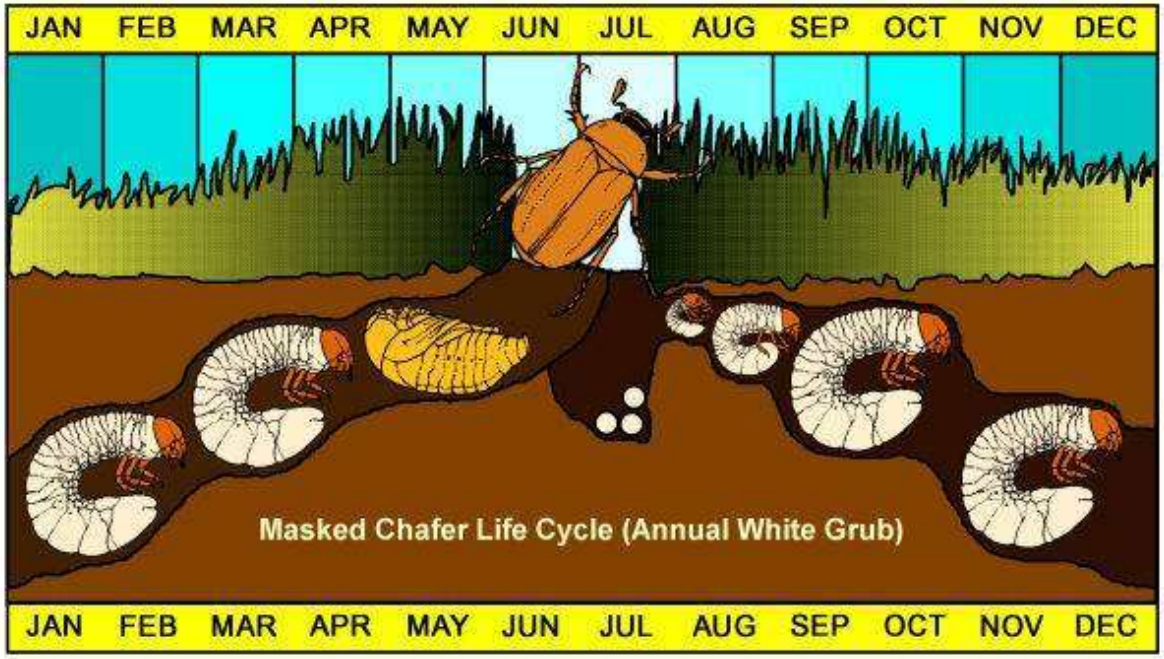
#, not in NY; $, not on LI


UGA1327103

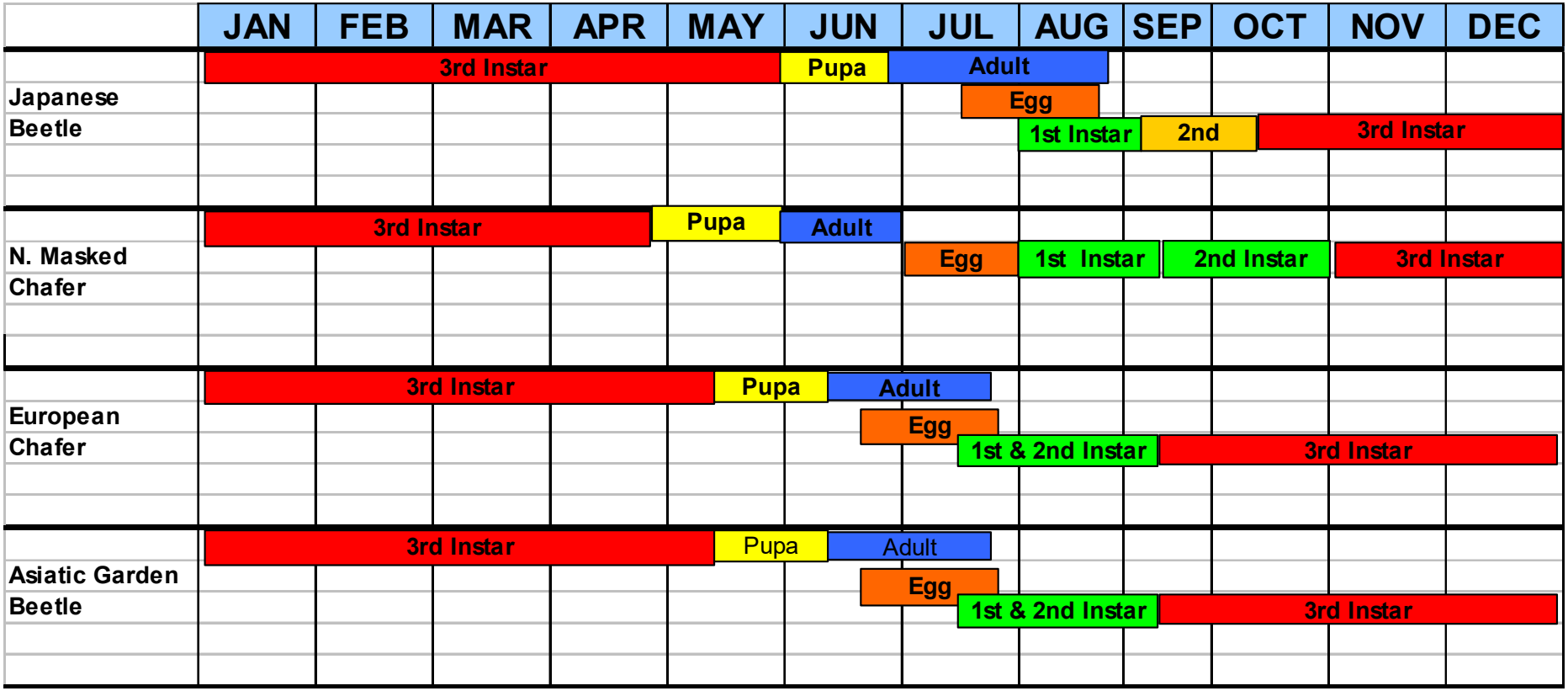
White Grub Complex

>Turf Insect Pest Background

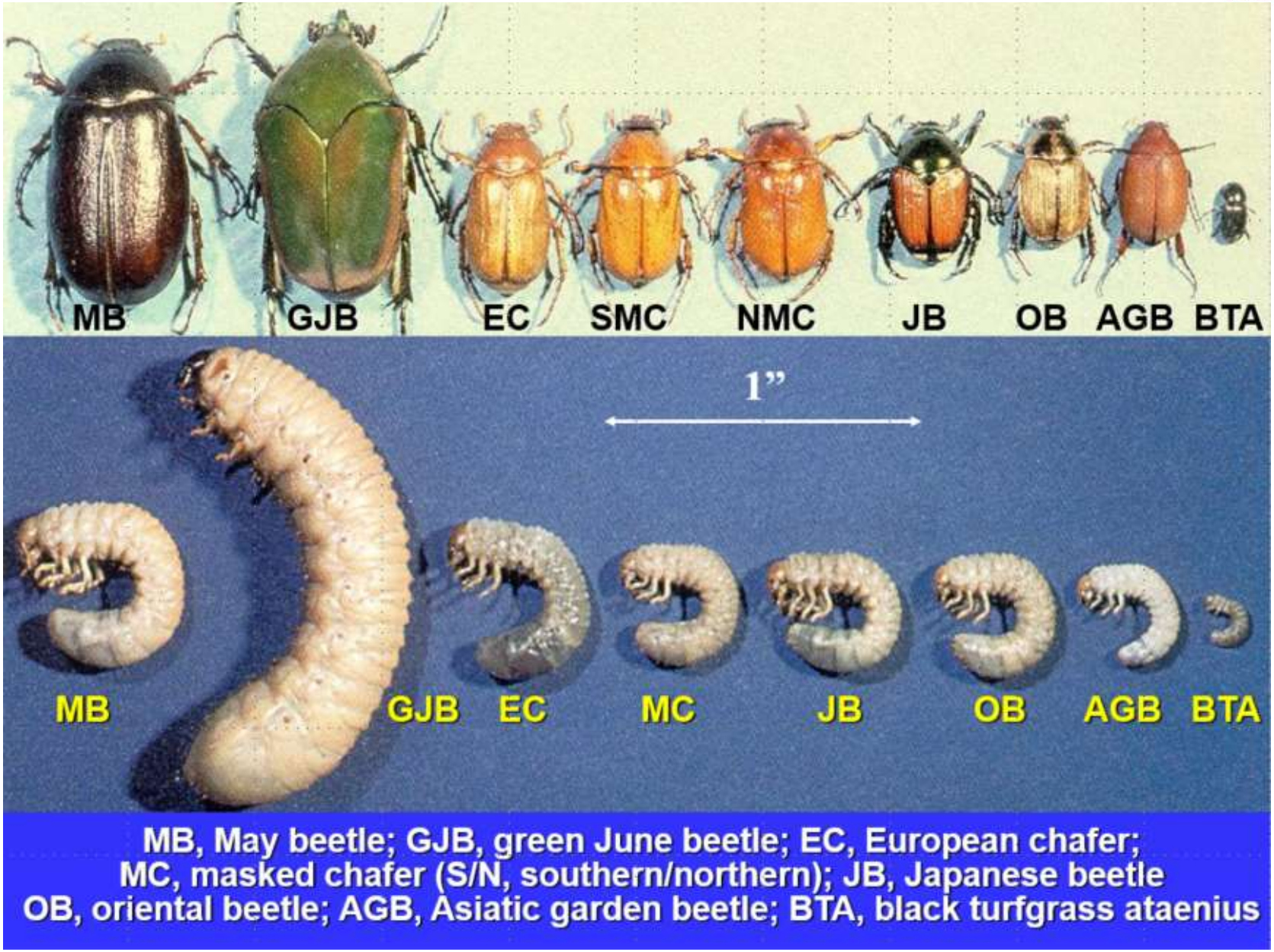
- Soil pests (primarily grubs)
  - Overwinter as mature larva
  - Pupate, adults lay eggs to start cycle over
  - One generation per year
  - Chemical control targets 1st instar larva



Grub Biology

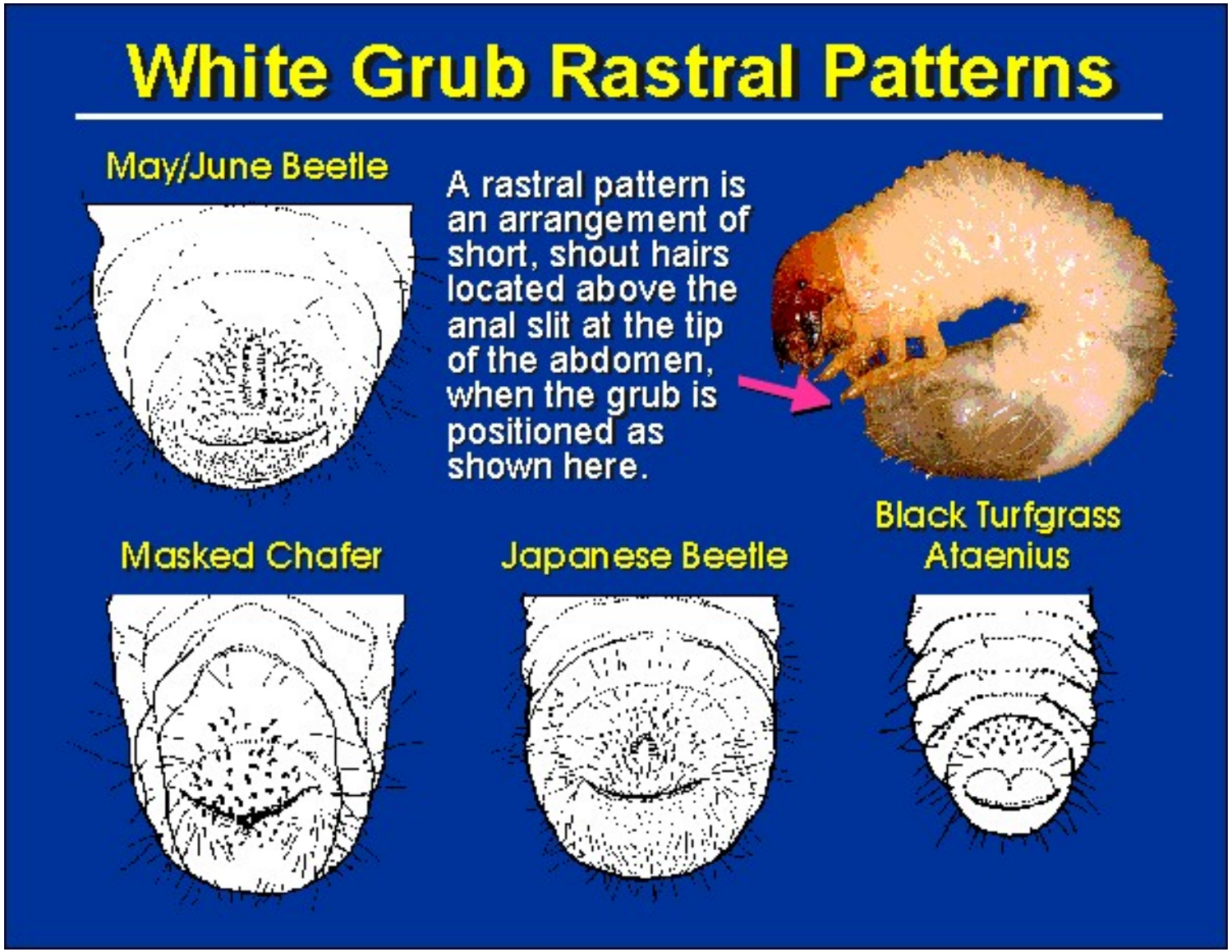


Adult “Grubs”



MB, May beetle; GJB, green June beetle; EC, European chafer;
MC, masked chafer (S/N, southern/northern); JB, Japanese beetle
OB, oriental beetle; AGB, Asiatic garden beetle; BTA, black turfgrass ataenius

Grubs - Identification



- Larvae feed on roots
- Ground may feel spongy
- Turf can be ‘rolled back’

Turfgrass White Grub

Aphodius granaris, European Dung Beetle
Aphodius pardalis, West Coast Dung Beetle
Rhizotrogus majalis, European Chafer

- White grubs are the larvae of a number of scarab beetle species.
- The most common in the PNW are members of the dung beetle family, Aphodius granaris, a european species, and A. pardalis, a west coast species.
- Other white grubs found in the PNW are larvae of May or June beetles, and European Chafer.

Turfgrass White Grub

European chafer

- Adult European chafers are tan or brown beetles up to 1.5 cm in length.
- The larvae are soft, white and C-shaped, up to 2.5 cm long.
- The insect overwinters as larvae under turf, feeding on the roots of the grasses in winter and spring.

Turfgrass White Grub

European Chafer

White Grub Control

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Pest Management Handbooks

- >Arena
- >Acelepryn
- >Conserve
- >Dylox
- >Merit/Mallet
- >Meridian
- >Orthene
- >Sevin

What Makes *Arena* Different?

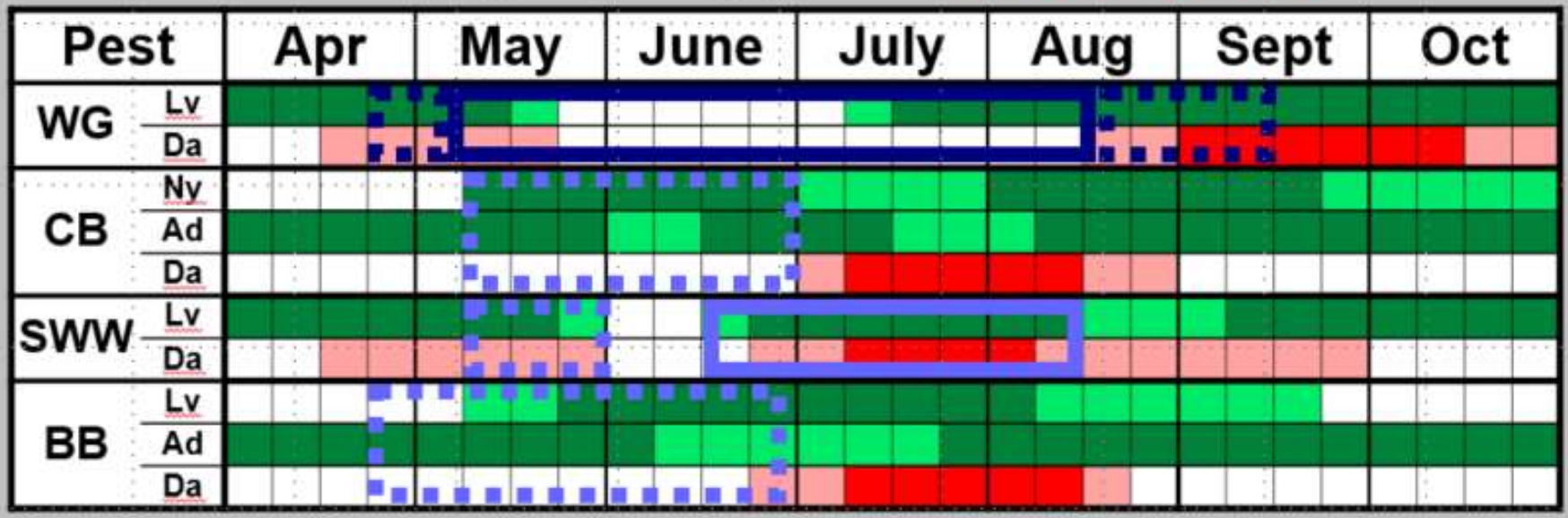
- Grub market
  - Every product controls Japanese beetle
  - Early season applications of Merit® or Meridian® are weak on
    - N. Masked Chafers
    - European Chafers
    - Asiatic Garden Beetle
  - *Arena*'s long residual there for <u>all</u> grub species
  - Arena provides curative

Ranked Efficacy of White Grub Insecticides 1976 – 2008[a]

Insecticide	rate lb.ai./a.	ave % control	# tests	range % control	% of tests below 70%
Carbaryl (=Sevin)	8.0	**72.8**	43	13-100	40
Cl-antraniliprole (=Acelepryn)	0.1	**93.9**	11	70-100	0
	0.2	**98.9**	7	89-100	0
Clothianidin (=Arena)	0.25	**94.7**	3	90-100	0
	0.3	**99.5**	4	99-100	0
Halofenozide (=MACH2)	1.5	**91.2**	65	10-100	12
	2.0	**89.6**	53	56-100	9
Imidacloprid (=Merit)	0.3	**94.1**	88	58-100	6
	0.4	**94.1**	7	82-100	0
Permethrin	0.26	**31.8**	8	0-54	100
Thiamethoxam (=Meridian)	0.2	**96.1**	38	0-100	3
Trichlorfon (=Dylox, Proxol)	8.0	**77.6**	91	0-98	19

[a] Data from ESA publications (1977-2008) & Ohio testing using masked chafer and Japanese beetle data where label timing recommendations were used and at least 4.0 grubs per sq.ft. were found in checks.

Multi target - Key pest: *White Grubs*



- Arena: WG control @ 0.2 lb ai/ac

→for early & late applications vs. WG up to 0.4 lb ai/ac

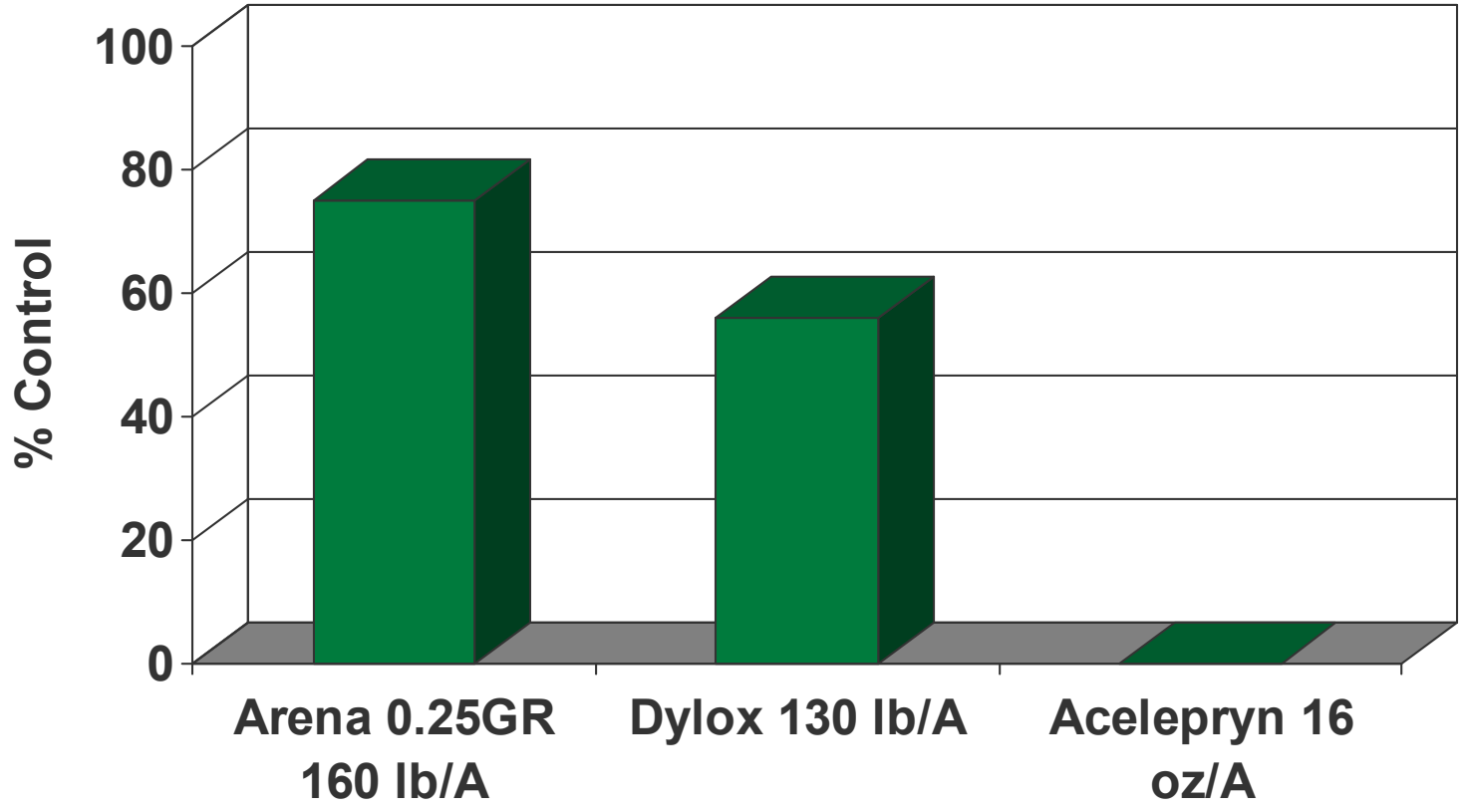
→also SWW control.

→for BB control: 0.3-0.4 lbs ai/ac.

→for CB control: 0.4 lbs ai/ac.

Arena Curative White Grub Control

(R Youngman, VA Tech)



Applied October 10
Masked Chafer 3rd instar
Evaluated October 24

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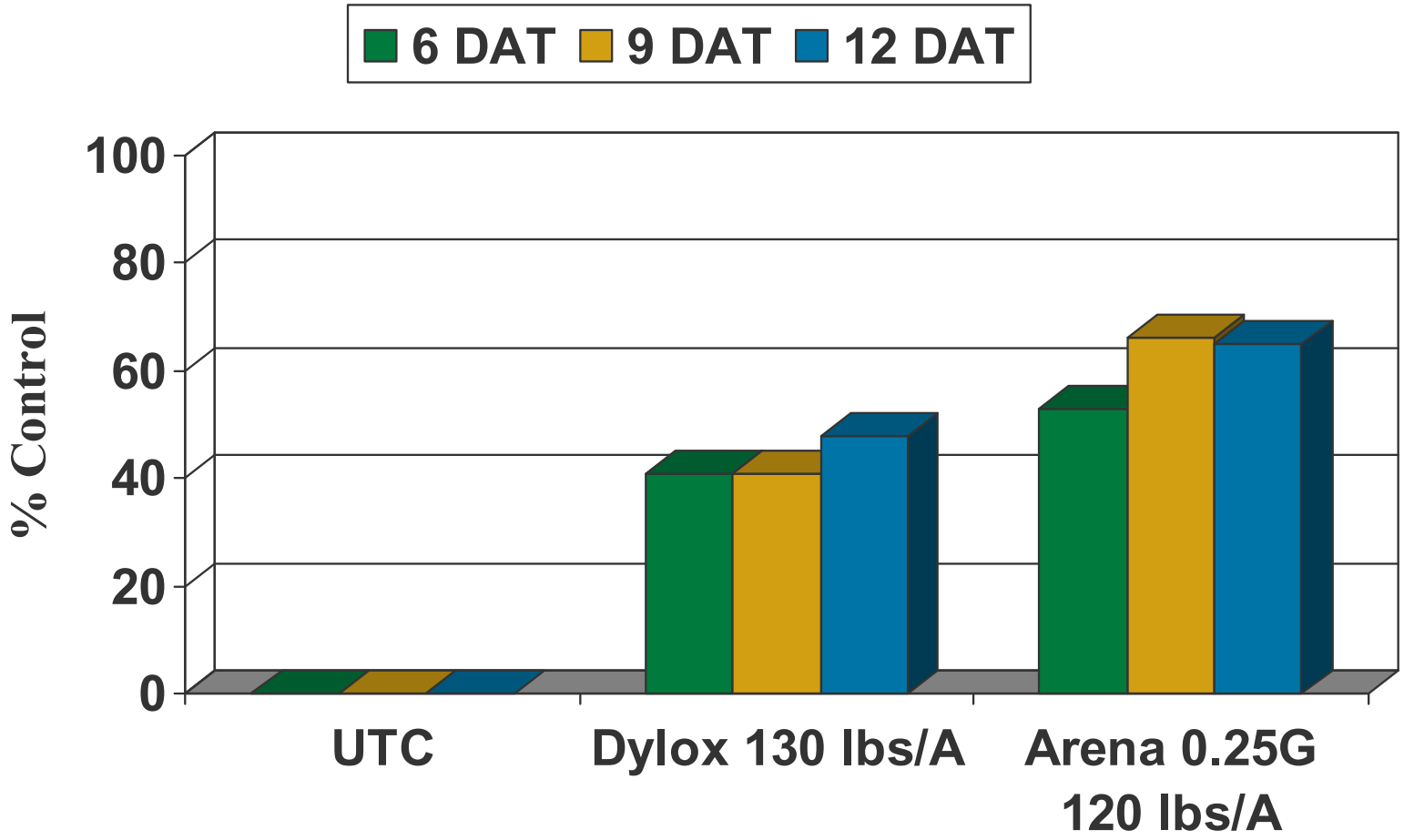
Arena Speed of Activity
Curative Applications[1]



Treatments applied on Sept. 20th to 3rd instar Northern Masked Chafer

1 = D. Sheltar Curative Grub Control Speed of Activity

Concentrate

Stay Awake...

Guess which bug did this?

Winter Cutworm

Winter Cut Worm [Yellow Underwing Moth]

Noctua pronuba

- Winter cutworm [*Noctua pronuba*] was first detected in Oregon in 2001, and had it first major impact on the area in 2015 feeding on many crops including lawns, meadows, sod, golf course collars, the approach to putting greens, and weeds.
- Above-ground crop damage occurs when larvae chew/notch leaves, or chew through stems completely at ground level (mowing).
- Root feeding has also been observed with insects seeking warmer, protected environments

Winter Cut Worm [Yellow Underwing Moth]

Feb 2015

Courtesy B. McDonald - OSU

Winter Cut Worm [Yellow Underwing Moth]

Feb 2015

Courtesy B. McDonald - OSU

Winter Cut Worm [Yellow Underwing Moth]

Noctua pronuba

- Winter cutworms are 0.125 to 2 inches in length depending on developmental stage.
- Coloration of larvae progresses with development, changing from greenish-gray to dark brown larvae.
- All larvae are characterized by dark brown/black hash marks along the sides and back, becoming more prominent toward the posterior end of the abdomen.

Courtesy A. Dreves - OSU

Winter Cut Worm [Yellow Underwing Moth]

Noctua pronuba

Courtesy A. Dreves - OSU

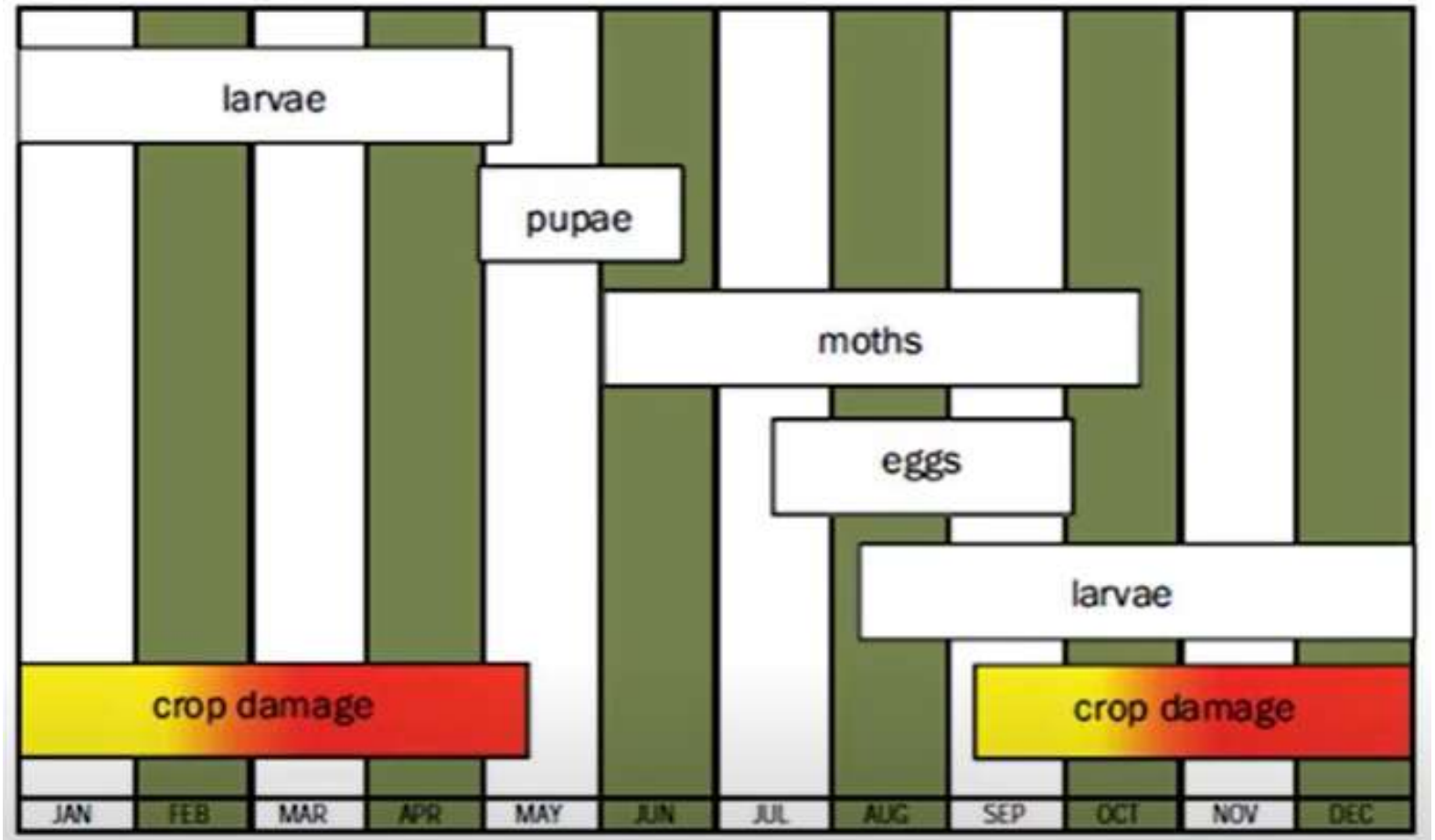
Winter Cut Worm [Yellow Underwing Moth]

Noctua pronuba

- The adults are strong fliers, can migrate, and are able to disperse over long distances.
- Females will lay as many as 2,000 eggs over the reproductive lifespan, on both plant and non-plant surfaces, making detection difficult.
- Eggs require 2 to 4 weeks to hatch, depending on conditions.
- Winter cutworms are 0.125 to 2 inches in length depending on developmental stage.
- All larvae are characterized by dark brown/black hash marks along the sides and back and light brown head capsule has a black upside-down "Y" with two black, angled lines.
- The pupae are reddish-brown, about an inch long, and found hidden in cavities under the soil and debris about 2-3 inches.
  - They are difficult to identify because of the close similarities to other Noctuid species in this pupal stage, especially armyworm and other cutworm species.

Winter Cut Worm [Yellow Underwing Moth]

Life cycle



Can overwinter as fully mature larva (pupate early spring), or earlier instar that feed through spring

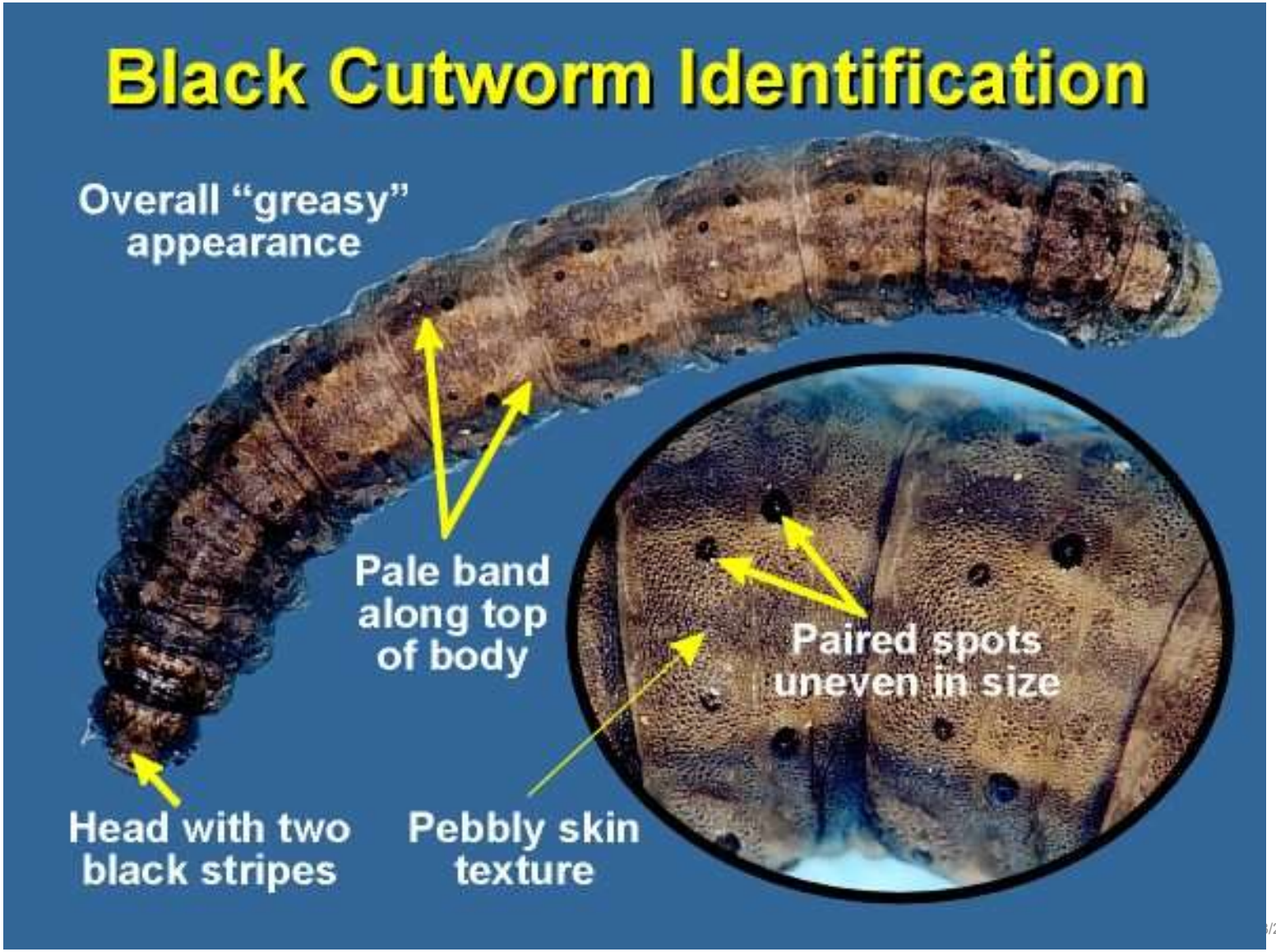
Turfgrass Cutworm

Black cutworm (Agrotis ipsilon)
Variegated cutworm (Peridroma saucia)

- PAC NW focus on Black cutworm (Agrotis ipsilon) and Variegated cutworm (Peridroma saucia)
- Adult cutworms are medium to large moths but all damage is due to larval feeding.
- Larvae are typically about an inch long, have a small black head and vary in color from nearly black to grey brown or multicolored in the case of variegated cutworms.

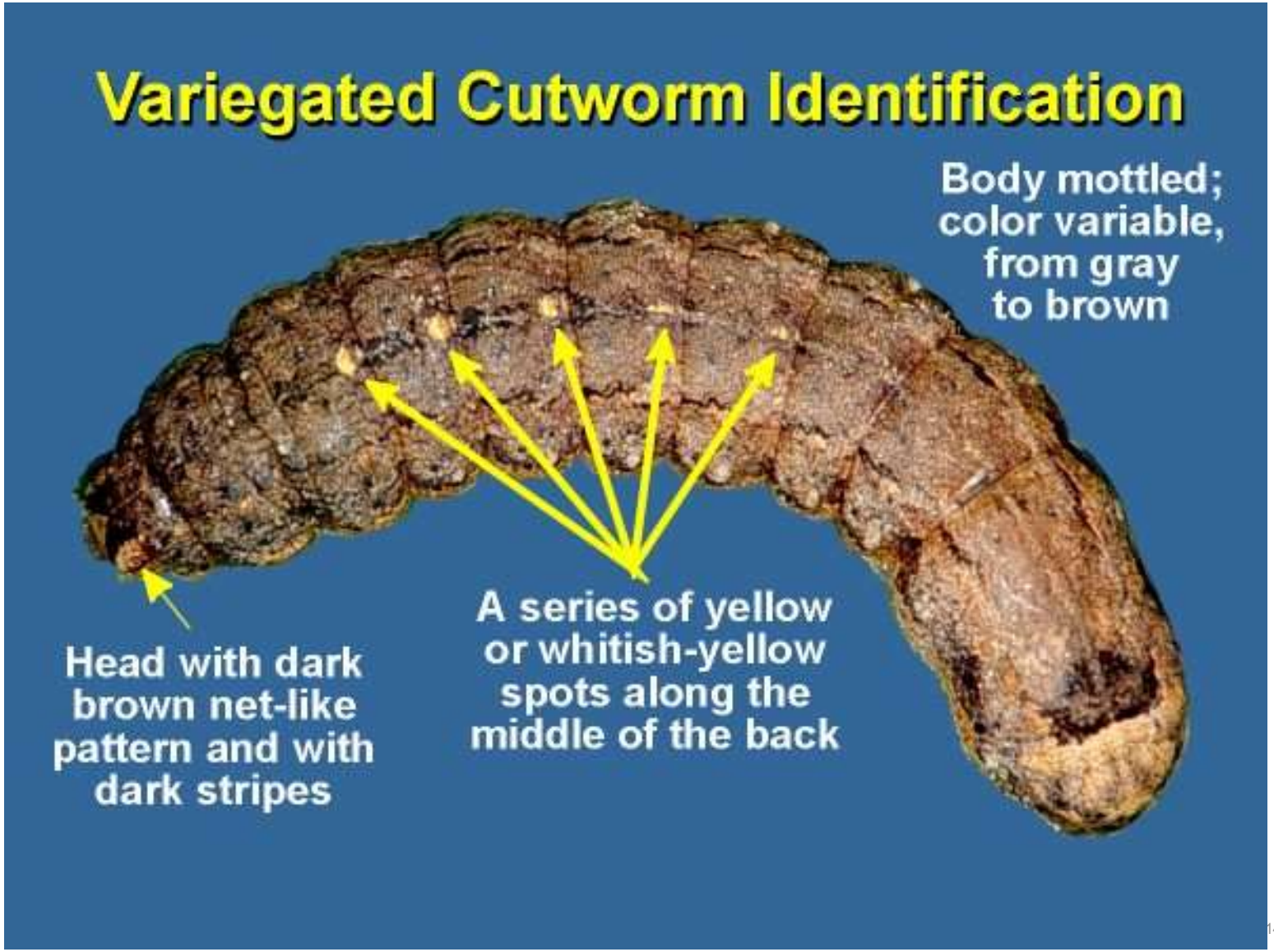
Black Cutworm Adult

Black Cutworm Adult



Variegated Cutworm Adult

Variegated Cutworm Larvae



Life cycle

- Both species overwinter as larvae and adults emerge throughout May and June.
- Eggs are laid on host plants, and hatch after a few days.
- Young larvae feed only on foliage, although mature larvae develop a subterranean habit and may cut off plants at the surface and feed on them in their burrows.

Turfgrass Cutworm

Black cutworm (Agrotis ipsilon)
Variegated cutworm (Peridroma saucia)

- Commonly found in older turf stands, particularly those dominated by bluegrass and fine fescues.
- Activity generally is confined to foliage, although at times feeding may be at ground level.
- Populations build as summer progresses.
  - Actual cutworm damage to home lawns is rare, they are more of an issue on golf course putting surfaces.

Control timing & choices (Avg. NJ timing)

- Apply treatments as sprays late in day.
- Delay irrigation and mowing for 1-2 d.

Sod web-worms	Stage	Apr	May	June	July	Aug	Sept	Oct
	Pu							
	Ad							
	Egg							
	L1-7							
Damage	L4-7							
Acelepryn $	L							
Arena #	L							
Provaunt	L							
Conserve	L							
Pyrethroids	L							
Sevin	L							
S.carpocap	L							
Insecticide	Target	Apr	May	June	July	Aug	Sept	Oct

#, not in NY; $, not on LI

Turfgrass Cutworm and Webworm Control

- >Dipel
- >Acelepryn
- >Aloft
- >Arena
- >Conserve
- >Dursban
- >Dylox
- >Neem
- >Meridian
- >Orthene
- >Provaunt
- >Pyrethroids (Bifenthrin, Menace)

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Pest Management Handbooks


UGA5005067

Turfgrass Crane Fly

Common crane fly *(Tipula oleracea) CCF*
European crane fly *(Tipula paludosa) ECF*

Turfgrass Crane Fly

Common crane fly *(Tipula oleracea) CCF*
European crane fly *(Tipula paludosa) ECF*

- European crane fly (ECF) is a native of Western Europe which was introduced to eastern Canada and found in British Columbia in 1965.
- The mild winters, cool summers and relatively abundant rainfall in the PNW is ideal habitat for this insect and its range now extends as far south as central California.
- It has recently been documented east of the Cascades

Turfgrass Crane Fly

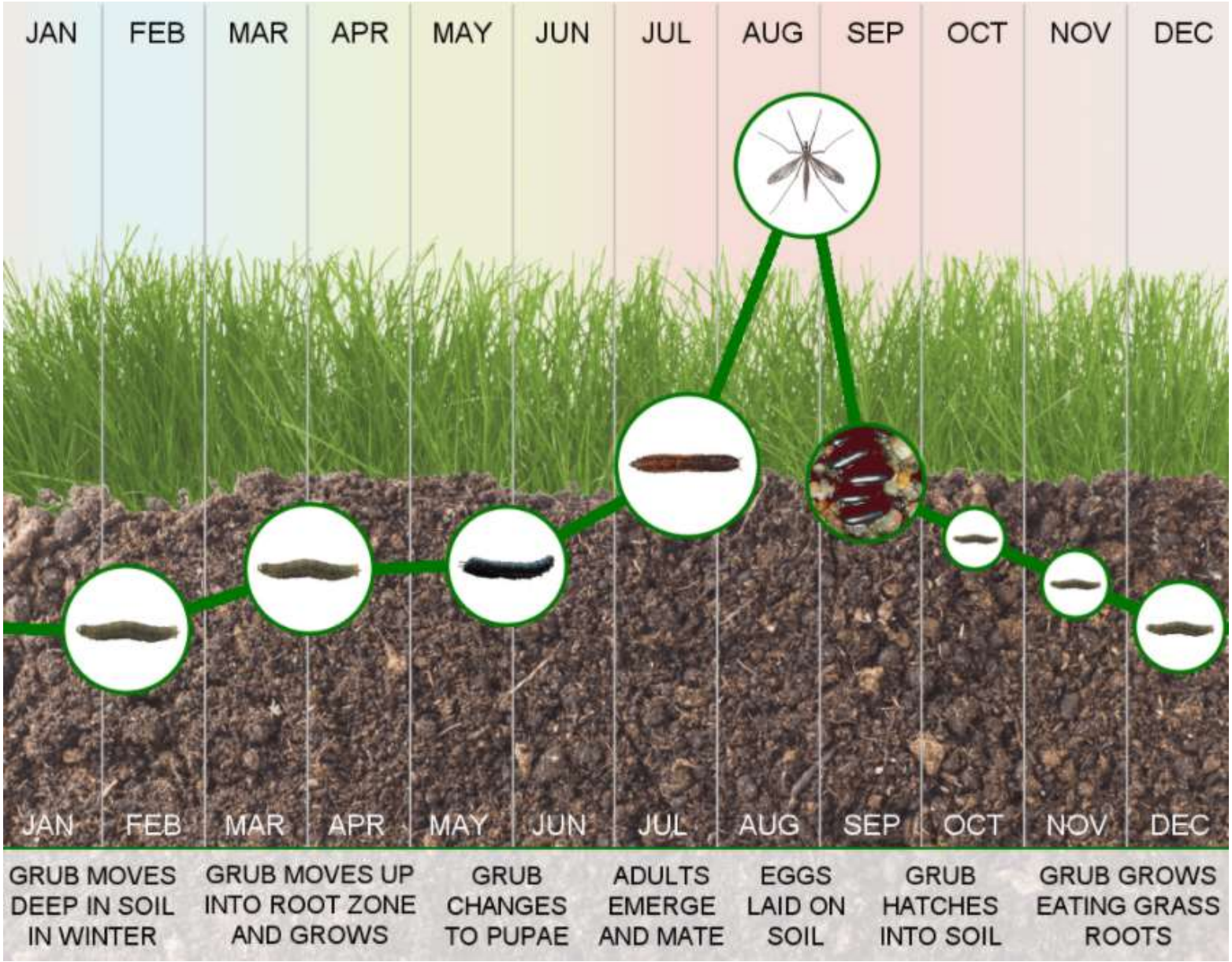
Biology and Life Cycle

- The adult ECF is a large two-winged fly that is often compared to a large mosquito.
- The larvae are wormlike, with leathery skin, 1 to 1.5 inches long.
- Larvae hatch in late summer (Aug.- Sept.) and feed through winter and into spring, damaging turf anytime between December and May.
- ECF larvae feed primarily on shoots and crowns, but also feed on roots.
- ECF have one generation per year.

Turfgrass Crane Fly

Common crane fly *(Tipula oleracea) CCF*
European crane fly *(Tipula paludosa) ECF*

Turfgrass Crane Fly



Turfgrass Cutworm and Webworm Control

>Dipel
>Acelepryn
>Aloft
>Arena
>Conserve
>Dursban
>Dylox
>Neem
>Meridian
>Orthene
>Provaunt
>Pyrethroids (Bifenthrin, Menace)

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>Fall - late fall applications (Sept-Nov.)
>Early spring applications (Jan.-Feb)
>Late spring application (Mar-Apr)

Turfgrass Crane Fly

Common crane fly *(Tipula oleracea) CCF*
European crane fly *(Tipula paludosa) ECF*

Table 14: Late Fall 2007 Crane Fly Control:
Snoqualmie Ridge, WA Pretreatment: 12-18-07
Post-treatment: 2-25-08

Treatment	Rate	Pre-Avg. larvae/ sq. ft.	Post-Avg. larvae/ sq. ft.	% Larval Reduction
Arena 50 WDG	6.4oz/A	44.5	15.3	69.1
Arena 50 WDG	10.6 oz/A	44.1	13.0	68.6
Arena 25 G	80 lbs./A	39.1	10.0	75.0
Arena 25G	125 lbs./A	48.7	21.5	48.2
Aloft	7.2 oz/A	55.6	0.4	99.6
Aloft	14.4 0z/A	57.5	3.1	95.9
Talstar EZ	0.2 lbs./A	48.3	0.4	98.9
Talstar EZ	0.4 lbs./A	52.1	0.8	98.5
Dursban DTI	1 lb. ai/A	51.8	0.4	99.3
Untreated		55.2	10.7	78.2

Life Cycle Guide linked to GDD

Target Pest	Stage	Degree Days
Northern Masked Chafer	1st adult activity	898-905
	90% adults	1377-1575
Bluegrass Billbug	1st adult activity	280-352
	30% adult activity	560-624
	70% egg hatch	925-1035
Hairy chinch bug	1st egg laying	198-252
	1st egg hatch	522-702
Larger sod webworm	1st generation adults	846-882
	2nd generation adults	1980-2100
Baseline 50 F, starting 1 February		


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Insecticide differentiation

A. Koppenhofer – Rutgers University

Pest	Arena	Merit	Meridian	Acelepryn
White Grub	All Species	Jap Beetle	All Species	All Species
ABW	Good-VG	Fair	Fair	VG
Billbug	VG	Good	Good	Good
Chinch bug	VG	Suppression	Suppression	Suppression
Web/Cut Worm	VG	Poor	Poor	VG

Program options –what is target?

- Acelepryn [Mid april to Late May]
  - White Grub [prevention only]
  - Overwintering Insects such as ABW, Billbug and Web worm [except chinchbugs]
  - Fall Crainfly
- Arena [May to mid Sept]
  - White Grub [Prevention and Curative]
  - Overwintering Insects above including chinch bugs
  - Fall Crainfly
- Aloft [Mid April to Sept]
  - Overwintering Insects above including chinch bugs
  - Summer Surface Generations

What's New - Insect Ryanodine Receptor

Are they the same?

- Currently 2 IRAC Group 28 actives registered with EPA for Turf uses.
  - Chlorantraniliprole [Acelepryn]
  - Cyantraniliprole [Ference]
- One is registered for Ornamental uses
  - Cyclaniliprole [Sarisa]
- A 4th AI is pending registrations
  - Tetraniliprole [Tetrino]

Ryanodine Receptor Modulators - Diamides

Pests		Chlorantraniliprole Acelepryn	Cyantraniliprole Ference	Tetraniliprole Tetrino
White Grubs	Japanese	E	E	E
	EU Chafer	ND	ND	ND
	No. Masked	E	E	E
	Oriental	ND	ND	ND
	BTA	ND	ND	ND
ABW		Poor	E	Good
Billbug		ND	ND	ND
Chinch Bug		Poor	ND	ND
EU Cranefly		Good	Good	ND
Turf Caterpillars (Web, Cut, Army)		E	E	ND

1. Timing is key with each different AI.
   - Acelepryn has longest residual and need 2-3 weeks "build up" time
   - Ference and Tetrino have a shorter residual and are similar.
     - Tetrino – try to apply nearest to stage trying to control (e.g. white grubs – apply close to egg hatch).
     - Tetrino – some curative ABW control.
2. All expected to control billbugs and EU Chafer but no data.
3. Minor chinch bug activity expected from all 3, Acelepryn lists as suppression, other with no data.

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Ryanodine Receptor Modulators - Diamides

APA/APVMA Data	chlorantraniliprole Acelepryn	cyantraniliprole Ference	tetraniliprole Tetrino
pH Stability	pH 9 < 10d	pH 9 < 1.8d	pH 7 < 4d; pH 9 < 1d
Aerobic Soil DT_{50}	> 300d	31 d geomean (16-89)	86d geomean (28-171)
K_{oc}	328 (high)	241 (high)	411 (high)
K_{ow}	2.1 (systemic)	2.02	2.6
Photodegradation	32.5d	12.5d	27d
Bee (Apis) Contact LD_{50}	> 100 ug ai/bee (class 3 EPA – low)	0.0374 ug ai/bee (highly toxic)	0.425 ug ai/bee (highly toxic)
Bee (Apis) Oral LD_{50}	> 119 ug ai/bee	0.0422 ug ai/bee	0.010 ug ai/bee

Virtual Educational Seminars

Golf Insect Management

- Turf Insect Management
  - Focus on a select few
  - Review of Biology and Life Cycle as part of best management practices
  - Review of Chemical and Physical Control practices to reduce disease damage.
  - What's new?
    - Here come the IRAC 28's


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Polling Questions

> Question 1:

- Which of the insect we discussed today are you better equipped to diagnose and manage in the future?

- Answers could include Chinch bug, Billbug, White Grubs, Turf Worms, or Crane Fly

> Question 2:

- What is the new Mode of Action group for insecticides that will rotate well with existing older chemistries like Pyrethroids and Neo-Nicotinoids?

- Answer should be the IRAC group 28 MOA commonly referred to as Ryano receptor agonists.