

4-2012

Pesticide Safety 2012 - Label Review and Resistance Management

Martha Sylvia

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Pesticide Safety Training 2012

Pesticide Safety Review

**Martha Sylvia
Entomology Lab
Cranberry Station
UMass Amherst**



1. How to Keep Safe
2. Know your products
3. PPE Review
4. Acute Toxicity vs. Chronic Toxicity
5. Heat Stress
6. Licensing and Certification
 - MDAR and WPS
7. Label Review
8. Resistance Management
9. Update on New Insecticides
10. Winter Moth

Pesticide Safety and PPE


Label Review and Resistance Mgmt



MDAR



Massachusetts Department of Agricultural Resources

- ◆ Made up of 9 bureaus including dairy, land use and animal health
 - ◆ Includes Pesticide Bureau
- 



MDAR



MA Department of Agricultural Resources

FIVE Divisions:

- ◆ ADMINISTRATION
 - ◆ AGRICULTURAL MARKETS
 - ◆ ANIMAL HEALTH
 - ◆ CROP AND PEST SERVICES
 - ◆ AGRICULTURAL CONSERVATION and TECHNICAL ASSISTANCE
- 



MDAR- Pesticide Program

DIVISION OF CROP AND PEST SERVICES



Crop Inspectional Services

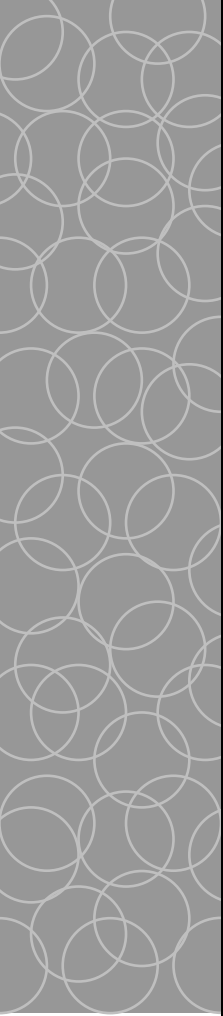
- ✓ Apiary Inspections – Al Carl

Pesticide Program

- ✓ Protects public health and the environment by licensing individuals who apply pesticides
- ✓ Protects the public drinking water supply
- ✓ Provides guidelines for the mixing, loading, storage, and disposal of pesticides
- ✓ Registers chemicals used in MA



MDAR - Pesticide Program

- 
- ◆ Pesticide Licensing
 - Private Applicators Certification
 - Allows use of restricted use pesticides
 - ◆ Pesticide Enforcement - Inspections
 - ◆ Zone II issues
 - Intrepid, Bravo, and Actara
 - ◆ Register pesticide products in Massachusetts



MDAR

- 
- ◆ **Commissioner of Ag Resources**
 - ~~Scott Soares~~ Greg Watson
 - ◆ **Division of Crop and Pest Services**
 - ◆ **Director - Pesticide Program**
 - Lee Corte-Real
 - ◆ **Pesticide Bureau – Licensing/
Certification Program Coordinator**
 - Steve Antunes-Kenyon
- 



MDAR

- ◆ **Chemist, Environmental Analyst – Zone II**
 - Hotze Wijnja
- ◆ **Toxicologist – Section 18's**
 - Steve Antunes-Kenyon
- ◆ **Pesticide Enforcement, Field Inspectors**
 - Mike McClean
 - Laurie Rocco
 - Taryn LaScola
 - Sunny Cai
 - Paul Ricco

Pesticide Applicators Rules and Reviews

Changes in MDAR Rules

RESTRICTED USE COMPOUNDS WATCH OUT!!

- ~~Working under the direct supervision of a certified individual~~
- Dealers must see your current license
- Enforcement actions

Pesticide Applicators Rules and Reviews

Pesticide Applicators

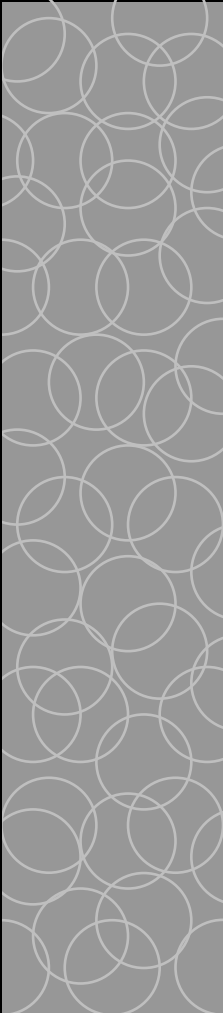

- Certified applicators may apply restricted use compounds (cranberry certification)
- Licensed applicators may assist certified applicators (core only)
- Private applicator
- Commercial applicator

License or Certification?

- **Commercial Applicator License:** Licensing for an individual to use General Use pesticides, or any restricted use pesticide under the direct supervision of a certified applicator, for hire or compensation for any purpose or on any property other than as provided by the definition of "private applicator certification". 
- **Commercial Applicator Certification:** Certification for pesticide applicators who use or supervise the use of any pesticide which is classified for Restricted-Use for hire or compensation for any purpose or on any property other than as provided by the definition of "private applicator certification". 
- **Private Applicator Certification:** Certification for private applicators who use or supervise the use of Restricted-Use or state limited use pesticides for the purpose of producing any agricultural commodity on property owned or rented by him or his employer or without compensation other than trading of personal services between producers of agricultural commodities on the land of another person. 

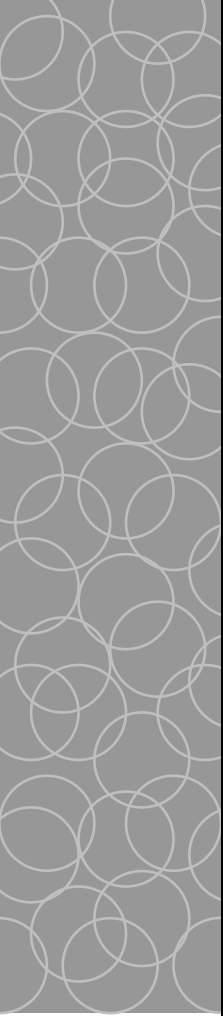


EPA's WPS

- 
- ◆ Worker Protection Standard
 - ◆ protect agricultural workers from the effects of exposure to pesticides
 - ◆ aimed at reducing the risk of pesticide poisonings and injuries among agricultural workers and handlers of agricultural pesticides
- 

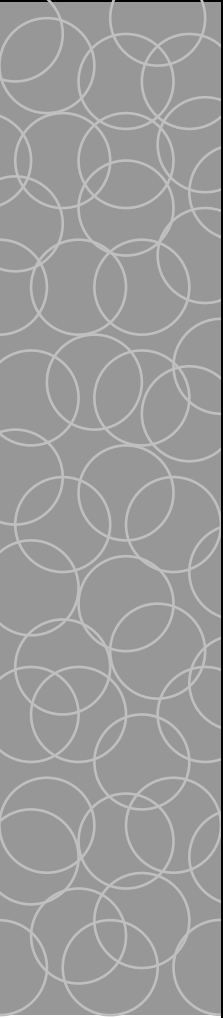


Requirements of WPS

- 
- ◆ pesticide safety training
 - ◆ notification of pesticide applications
 - ◆ use of personal protective equipment
 - ◆ restricted entry intervals following pesticide application
 - ◆ decontamination supplies
 - ◆ emergency medical assistance



Workers exposed to pesticides?

- 
- ◆ Mixing and loading the pesticide into application equipment, but not restricted use!
 - ◆ Applying pesticides, like roundup
 - ◆ Handling irrigation/chemigation heads
 - ◆ Entering areas where pesticides have been applied to scout, weed, or repair heads, after the REI is up!
 - ◆ Do not need training if you have a pesticides license!

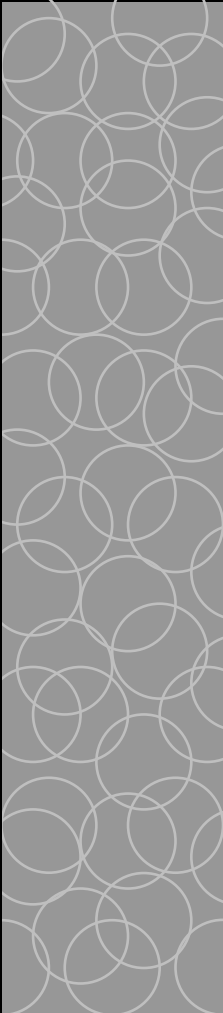
Changes in WPS Trainings

- ◆ Requires untrained workers to be provided basic pesticide information before entering pesticide-treated areas
 - You can do this, word of mouth
 - ◆ Pesticides, protection, signs, washing
 - Then official training within 5 days of working in pesticide-treated areas
 - Still good for 5 years

*new
book*



WPS Trainings

- 
- ◆ At the Cranberry Station Library
 - ◆ Last Wednesday of upcoming months
 - ◆ April 25 2-4
 - ◆ May 30 2-4
 - ◆ June 20 2-4
 - ◆ Send any workers, weeders, scouts, and mechanics. Training good for 5 years!
 - ◆ \$5 cost

Label Review

- Don't be scared of labels
- The best place to get info about a pesticide
- First few boxes have main info
 - REI, PHI, PPE
- Specifics for cranberry
 - Rate
 - Target
- Supplemental Labels

Label Review

- Brand Name, Ingredients and Type of Pesticide
- Signal Words and Symbols
 - Danger
 - Warning
 - Caution
- Statement of Practical Treatment and Precautionary Statement
 - Parts of the body to protect
 - First Aid Section
- Directions for Use
 - Storage, disposal
 - Mixing, Loading and Application
- Agricultural Use Requirements
 - REI, PPE
- Name and Address of Manufacturer



FULL HERE TO OPEN



Bravo Weather Stik

Agricultural Fungicide

Active ingredient:	
Chlorothalonil (tetrachloroisophthalonitrile)	54.0%
Other ingredients:	46.0%
Total:	100.0%

Contains 6.0 pounds chlorothalonil per gallon (720 grams per liter)

KEEP OUT OF REACH OF CHILDREN.

CAUTION

See additional precautionary statements and directions for use inside booklet.

EPA Reg. No. 50534-188-100
EPA Est. 50534-TX-001

SCP 50534-188A-L1F 0709
310376

2.5 gallons
Net Contents



Brand Name,
Ingredients
and Type of
Pesticide

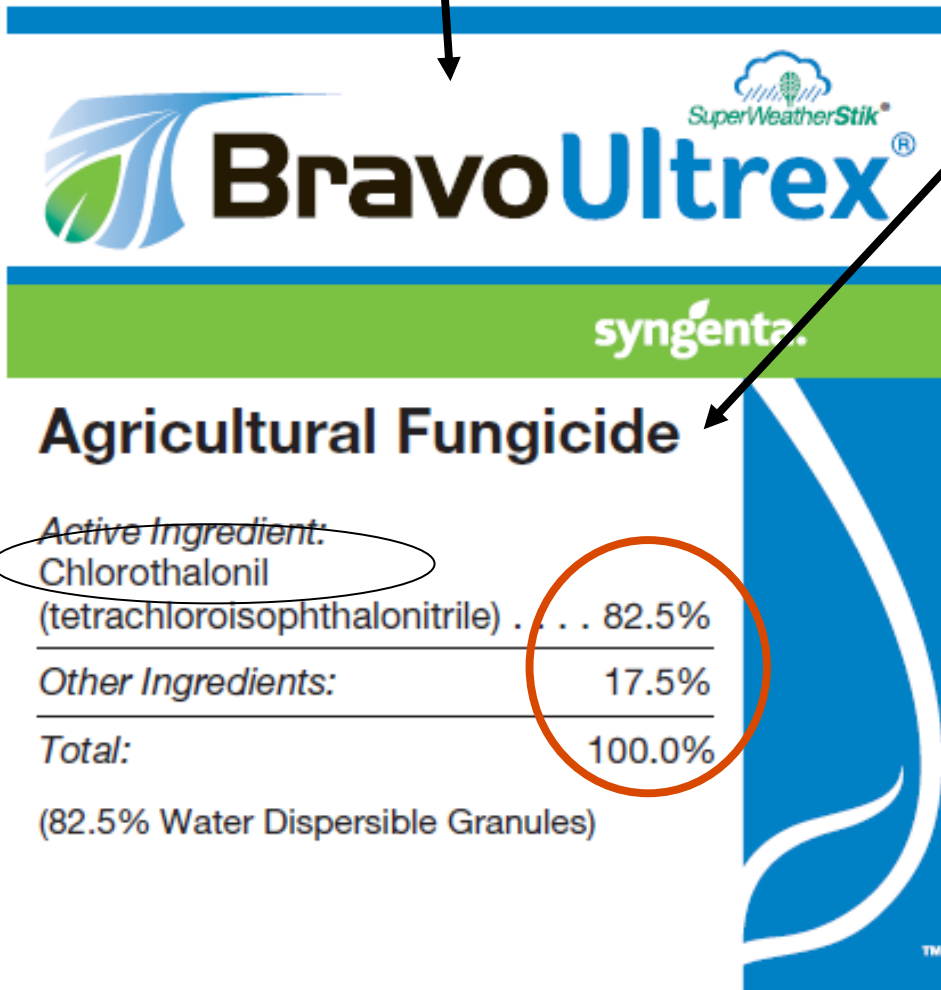
Signal Word

- * Danger
- * Warning
- * Caution

Brand Name, Ingredients and Type of Pesticide

Signal Word

- * Danger
- * Warning
- * Caution



KEEP OUT OF REACH OF CHILDREN.
DANGER/PELIGRO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See additional precautionary statements and directions for use inside booklet.

EPA Reg. No. 50534-201-100

EPA Est. 50534-TX-001

SCP 50534-201A-L1F 0112
4010723

Statement of Practical Treatment and Precautionary Statement

**Bravo
WeatherStik**

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

CAUTION

Harmful if swallowed, absorbed through skin, or inhaled. Causes moderate eye irritation. Avoid contact with skin, eyes, or clothing. Avoid breathing spray mist. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

Personal Protective Equipment (PPE)

Some materials that are chemical-resistant to this product are made of any waterproof material. If you want more options, follow the instructions for Category A on an EPA chemical resistance category selection chart.

Mixers, Loaders, Applicators and all other handlers must wear:

- long-sleeved shirt and long pants
- chemical-resistant gloves made of any waterproof material
- shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

A dust/mist filtering respirator must be worn if the mixer/loader/applicator uses a high-pressure, hand wand sprayer.

continued...

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

DANGER/PELIGRO

Corrosive. Causes irreversible eye damage. May be fatal if inhaled. Causes skin irritation. Do not get in eyes, on skin, or on clothing. Do not breathe dust. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

Personal Protective Equipment (PPE)

Some materials that are chemical-resistant to this product are made of any waterproof material. If you want more options, follow the instructions for Category A on an EPA chemical-resistant category selection chart.

Mixers, loaders, applicators, and all other handlers must wear:

- Coveralls over short-sleeved shirt and short pants
- Chemical-resistant gloves made of any waterproof material - Category A (e.g., barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinyl chloride (PVC) or Viton®)
- Chemical-resistant footwear plus socks
- Protective eyewear

- Chemical-resistant headgear for overhead exposure
- Chemical-resistant apron when cleaning equipment, mixing, or loading.
- And NIOSH approved dust/mist filtering respirator (MSHA/ NIOSH approval number prefix TC-21C) or a NIOSH approved respirator with any N, R, P or HE filter

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. DO NOT reuse them. Follow manufacturer's instructions for cleaning/ maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Control Statements

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

Ultrex

Bravo WeatherStik

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

PRECAUTIONARY STATEMENTS (continued)

Engineering Control Statements

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

Environmental Hazards

This product is toxic to aquatic invertebrates and wildlife. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift and runoff may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment wash water or rinsate.

This chemical is known to leach through soil into groundwater under certain conditions as a result of label use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.

This chemical can contaminate surface water through spray drift. Under some conditions, it may also have a high potential for runoff into surface water for several days to weeks after application. These include poorly draining or wet soils with readily visible slopes toward adjacent surface waters, frequently flooded areas, areas over-laying extremely shallow ground water, areas with infield canals or ditches that drain to surface water, areas not separated from adjacent surface waters with vegetated filter strips, and areas over-laying tile drainage systems that drain to surface water.

is product. Wash soon as possible, changing. Get clothes and equipment inside. Then

wildlife. DO NOT water is present or mark. Drift and neighboring areas. equipment wash-

to under the water table on.

Ultrax

Bravo WeatherStik

FIRST AID

If swallowed	<ul style="list-style-type: none">• Call a poison control center or doctor immediately for treatment advice.• Have person sip a glass of water if able to swallow.• Do not induce vomiting unless told to do so by a poison control center or doctor.• Do not give anything by mouth to an unconscious person.
If on skin or clothing	<ul style="list-style-type: none">• Take off contaminated clothing.• Rinse skin immediately with plenty of water for 15-20 minutes.• Call a poison control center or doctor for treatment advice.
If inhaled	<ul style="list-style-type: none">• Move person to fresh air.• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth to mouth, if possible.• Call a poison control center or doctor for further treatment advice.
If in eyes	<ul style="list-style-type: none">• Hold eye open and rinse slowly and gently with water for 15-20 minutes.• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.• Call a poison control center or doctor for treatment advice.

NOTE TO PHYSICIAN

Persons suffering with temporary allergic skin reactions may respond to treatment with oral antihistamines and topical or oral steroids.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

HOT LINE NUMBER

For 24-Hour Medical Emergency Assistance (Human or Animal) or
Chemical Emergency Assistance (Spill, Leak, Fire, or Accident),
Call
1-800-888-8372

FIRST AID

If swallowed	<ul style="list-style-type: none">• Call a poison control center or doctor immediately for treatment advice.• Have person sip a glass of water if able to swallow.• Do not induce vomiting unless told to do so by a poison control center or doctor.• Do not give anything by mouth to an unconscious person.
If on skin or clothing	<ul style="list-style-type: none">• Take off contaminated clothing.• Rinse skin immediately.• Call a poison control center or doctor for treatment advice.
If inhaled	<ul style="list-style-type: none">• Move person to fresh air.• If person is not breathing, use rescue breathing, preferably mouth to mouth, if trained.• Call a poison control center or doctor for treatment advice.
If in eyes	<ul style="list-style-type: none">• Hold eye open and irrigate with copious amounts of water or saline solution.• Remove contact lenses, if present and easy to do.• Call a poison control center or doctor for treatment advice.

Persons suffering with temporary allergic reactions should be treated with oral antihistamines and topical or oral steroids.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

For 24-Hour Medical Emergency Assistance (Human or Animal) or Chemical Emergency Assistance (Spill, Leak, Fire, or Accident), Call

Ultrax

NOTE TO PHYSICIAN

Possible mucosal damage may contraindicate the use of gastric lavage; chemical adsorbents are recommended to reduce adsorption of the product. Persons suffering with temporary allergic skin reactions may respond to treatment with oral antihistamines and topical or oral steroids.

If in eyes, the upper and lower lids should be retracted and irrigated, and any particulate matter should be carefully removed from the conjunctival fornix. Irrigation should be continued until the conjunctival sac is neutral on pH testing with universal indicator paper. Fluroscein staining is required to reveal the extent of corneal or conjunctival epithelial loss. Topical antibiotic ointments are indicated when corneal epithelial damage is identified. Use of steroid eye drops is not advocated unless expressly requested by an ophthalmologist.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

HOT LINE NUMBER

For 24-Hour Medical Emergency Assistance (Human or Animal) or Chemical Emergency Assistance (Spill, Leak, Fire, or Accident),
Call
1-800-888-8372

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow workers to enter treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is: coveralls, chemical-resistant gloves made of any waterproof material, shoes plus socks, protective eyewear.

Special Eye Irritation Provisions: Chlorothalonil in this product is a severe eye irritant. Although the restricted entry interval expires after 12 hours, for the next 6.5 days entry is permitted only when the following safety measures are provided:

- (1) At least one container designed specifically for flushing eyes must be available in operating condition at the WPS required decontamination site intended for workers entering the treated area.
- (2) Workers must be informed, in a manner they can understand:
 - that residues in the treated area may be highly irritating to their eyes
 - that they should take precautions, such as refraining from rubbing their eyes to keep the residues out of their eyes
 - that if they do get residues in their eyes, they should immediately flush their eyes using the eyeflush container that is located at the decontamination site, or using other readily available clean water
 - how to operate the eyeflush container

Special Eye Irritation Provisions: Chlorothalonil in this product is a severe eye irritant. Although the restricted-entry interval expires after 12 hours, for the next 6.5 days entry is permitted only when the following safety measures are provided:

(1) At least one container designed specifically for flushing eyes must be available in operating condition at the WPS-required decontamination site intended for workers entering the treated area.

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- that residues in the treated area may be highly irritating to their eyes
- that they should take precautions, such as refraining from rubbing their eyes, to keep the residues out of their eyes
- that if they do get residues in their eyes, they should immediately flush their eyes using the eyeflush container that is located at the decontamination site or using other readily available clean water
- how to operate the eyeflush container



Name and Address of Manufacturer

- last page of label
- on container itself



©2012 Syngenta

For non-emergency (e.g., current product information) call
Syngenta Crop Protection at 1-800-334-9481.

Manufactured for :
Syngenta Crop Protection LLC
P.O. Box 18300
Greensboro, North Carolina 27419-8300
SCP 50534-201A-L1F 0112
4010723

Cranberry?

Bravo WeatherStik

Cranberry	Fruit rots Lophodermium leaf/twig blight (<i>L. hypophyllum</i>)	4 to 6 ¹ / ₂ (3.0 to 4.9)	Apply at early bloom and repeat at 10 to 14 day intervals (the minimum re-treatment interval is 10 days). Under severe disease conditions, use the 6 ¹ / ₂ pint per acre rate on a 10 day schedule. Apply by ground, air or chemigation. When applying by chemigation, use 300 gallons of water per acre through solid set systems only.
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CROP	DISEASES (Pathogen)	PTS. PRODUCT/A (lbs. a.i./A)	APPLICATION DIRECTIONS
Cranberry (continued)	Upright dieback (<i>Phomopsis vaccinii</i>)	4 to 6 ¹ / ₂ (3.0 to 4.9)	Apply in sufficient water to obtain coverage of uprights and runners. Make the first application before bloom, at the time shoots begin growth in the spring. Make additional applications at 10 to 14 day intervals. Apply by ground, air or chemigation. When applying by chemigation, use 300 gallons of water per acre through solid set systems only.

Specific Use Restrictions:

- Do not apply more than 20 pints of Bravo Weather Stik (15 lbs. a.i.) per acre during each growing season.
- Do not apply within 50 days of harvest.
- Do not apply to beds when flooded or allow release of irrigation water from beds for at least 3 days following application.

Bravo Ultrax

CROP	DISEASES (Pathogen)	Lbs. Product/A (lbs. a.i./A)	APPLICATION DIRECTIONS
Cranberry	Fruit rots Lophodermium leaf/twig blight (<i>L. hypophyllum</i>)	3.8 to 6.0 (3.1 to 5.0)	Apply at early bloom and repeat at 10- to 14-day intervals (the minimum retreatment interval is 10 days). Under severe disease conditions, use 6.0 pounds of Bravo Ultrax (5.0 lbs. a.i.) per acre rate on a 10-day schedule. Do not apply Bravo Ultrax more than 3 times per season. Apply by ground, air, or chemigation. When applying by chemigation, use 300 gallons of water per acre through solid set systems only.

Specific Use Restrictions:

- Do not apply more than 18.2 pounds of Bravo Ultrax (15 lbs. a.i.) per acre during each growing season.
- Do not apply within 50 days before harvest.
- Do not apply to beds when flooded or allow release of irrigation water from beds for at least 3 days following application.

Resistance Management

New Section in Chart Book

IRAC

Categories of Insecticides

FRAC

Fungicides or Herbicides

HRAC

...

Resistance Action Committee



iii Resistance Management

Resistance Management

Prepared by Martha M. Sylvia

In an effort to manage resistance with our pesticides, many labels now come with a “group” number assigned to them. The group ID is specific among insecticides, herbicides and fungicides. Most of our cranberry pesticides are in their own group with the exception of organophosphates and neonicotinoids. The following 3 pages show the groupings for our cranberry pesticides. The goal in resistance management is for growers to not repeatedly use compounds that fall within the same group. Resistance management may include alternating products with different modes of action or limiting the total number of applications per season.

Fungicide Resistance Action Committee (FRAC) <http://www.frac.info/frac/index.htm>

The group for fungicide resistance is the Fungicide Resistance Action Committee (FRAC). Their goal is to prolong the effectiveness of fungicides that are likely to encounter resistance problems and to limit crop losses should resistance appear. For cranberry, Ridomil and Abound (and potentially Indar) are fungicides that are at high risk for resistance development. They should not be used repeatedly and should be carefully alternated with other fungicides from other groupings. See grouping of cranberry fungicides on page vi. Only a few of our cranberry fungicides are labeled for resistance, but for those that are, a box like this would appear on the front of the label:

GROUP

11

FUNGICIDES

Ridomil and Abound are at high risk of developing resistance

COMMON NAME	TRADE NAME	FRAC CODE	comments
metalaxyl	Ridomil	4	High Risk
azoxystrobin	Abound	11	High Risk
fenbuconazole	Indar	3	Medium Risk
fosetyl-Al aluminum-tris	Aliette Legion	33	Low Risk
phosphorous acids and salts	Phostrol ProPhyt	33	Low Risk

Fungicides

s)	Champ	M1	Low Risk
	ferbam	Ferbam	M3 Low Risk
	mancozebs	Manzate Dithane Penncozeb	
	manebs	Maneb	M3 Low Risk
	chlorothalonil	Bravo Echo Equus	M5 Low Risk

Insecticides

Insecticide Resistance Action Committee (IRAC) <http://www.irc-online.org/>

An Insecticide Resistance Action Committee (IRAC) has been formed to assemble the information for insecticides. Their goal is to manage resistance to keep agriculture sustainable. For cranberry, organophosphates and neonicotinoids are our biggest concern. We are reliant on several compounds in these groupings. As long as growers remember to alternate between groupings and not repeat same mode-of-action compounds over and over, we should be able to keep newer compounds viable for decades. See Cranberry Insecticides by grouping on next page. Insecticides are grouped clearly by chemical makeup and most insecticide labels now included markings such as this:

Group

5

INSECTICIDE

GROUP 1	ORGANOPHOSPHATES AND CARBAMATES Acetylcholine esterase inhibitor	Diazinon Imidan Lorsban Orthene Sevin	diazinon phosmet chlorpyrifos acephate carbaryl
GROUP 3	PYRETHRINS Sodium channel modulators	Pyreth-It Pyganic	pyrethrin pyrethrin
GROUP 4	4A NEONICOTINOIDS Nicotinic Acetylcholine receptor agonists	Actara Admire Assail Belay	thiamethoxam imidacloprid acetamiprid clothianidin
GROUP 5	SPINOSYNS Nicotinic Acetylcholine receptor allosteric activators	ENTRUST Delegate SpinTor	spinetoram spinosad
GROUP 11	Microbial disruptors of insect midgut membranes	Dipel, Xentari Biobit	<i>Bacillus thuringiensis</i>
GROUP 12	Inhibitors of mitochondrial ATP synthase	Nexter	propargite
GROUP 18	Ecdysone agonists / molting disruptors	Confirm Intrepid	tebufenozide methoxyfenozide
GROUP 22	Voltage-dependent sodium channel blockers	Avaunt	indoxacarb
GROUP 23	Inhibitors of acetyl CoA carboxylase	Oberon	spiromesifen
GROUP 28	DIAMIDES Ryanodine receptor modulators	Altacor	chlorantraniliprole

Resistance Management

Delegate and Intrepid

Gregory Comeau
Dow AgroSciences

Use Labeled Rates

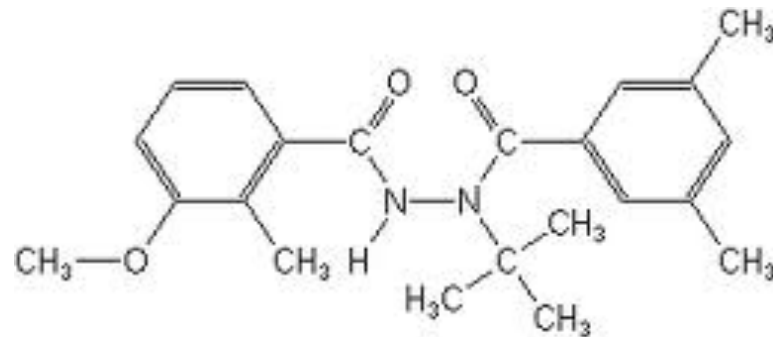
4 Keys to Success

- Rates
- Coverage
- Rotation
- Timing



Dow AgroSciences IRAC

- Group 5 Nicotinic Acetylcholine Receptors
 - Chemical Class
 - Spinetoram
 - Spinosad
 - Entrust
- Group 18 Ecdysone antagonist
 - Diacylhydrazine
 - Confirm
 - Intrepid



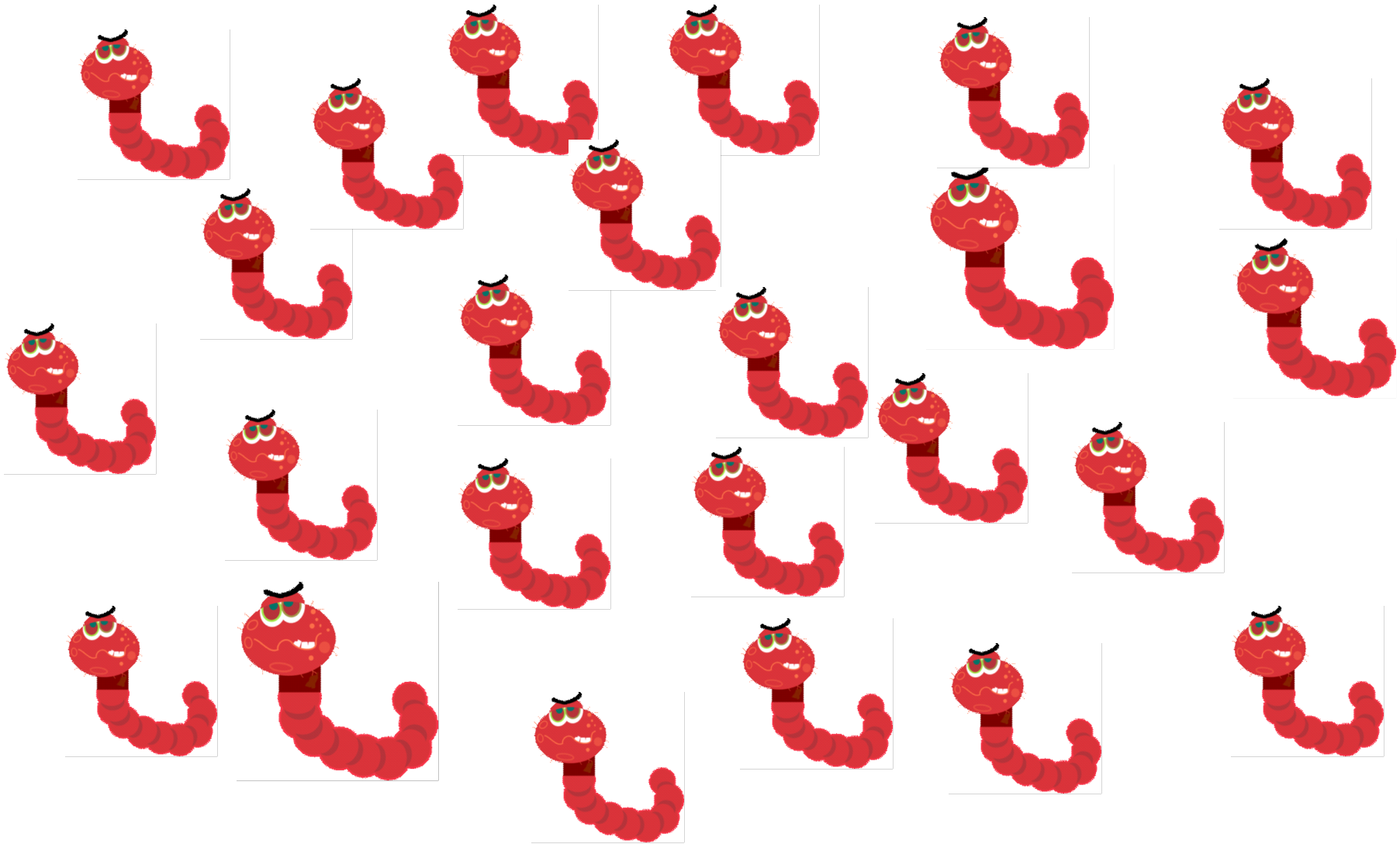
READ THE LABEL!!!

Spintor/ Delegate

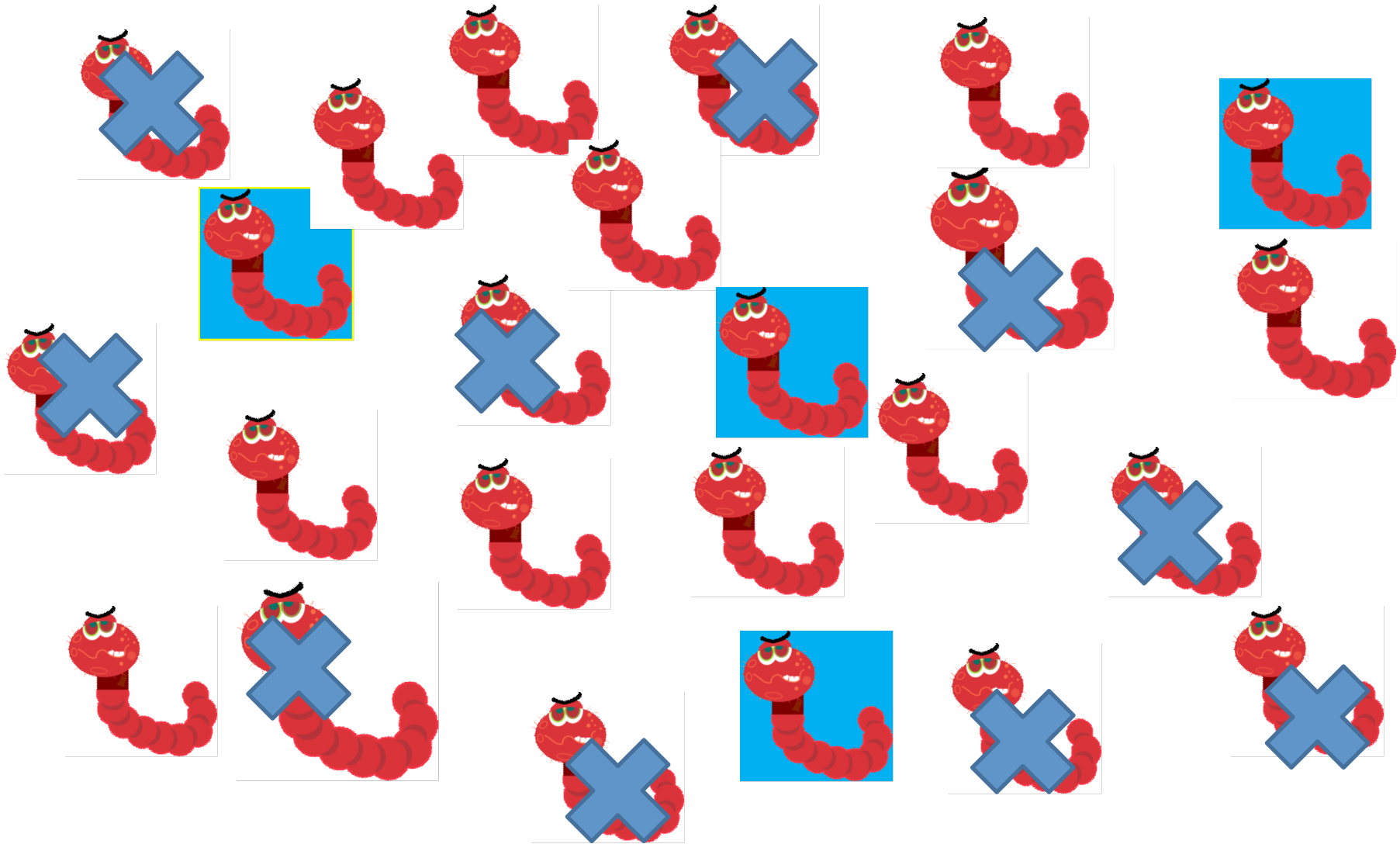
- See resistant management section
- Rotate Class 5 Chemistry after 2 application
- No more than 3 applications per season
- 3-6 oz rate depending on size of pest and infestation
- 19.5 oz allowed per season



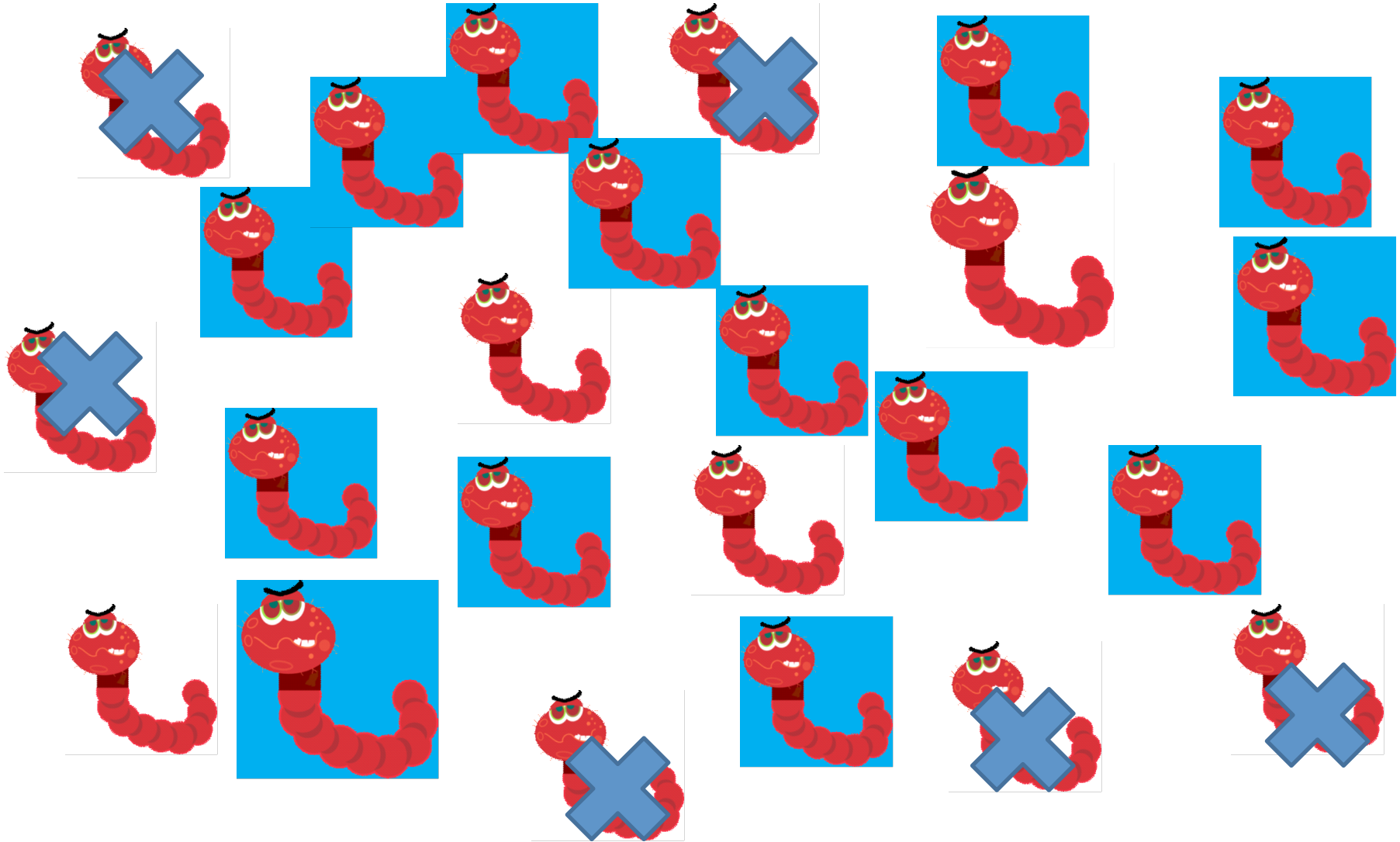
Festering Worm Population



Reduced Rates Selects for Resistance



Full Blown Resistance



Rotate Chemistry

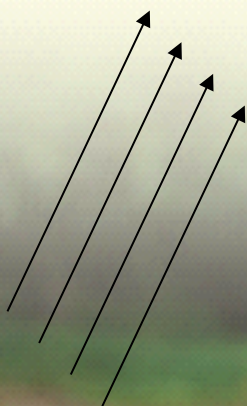
- IRAC
 - Insect
 - Resistance
 - Action
 - Committee
- IRAC Online.org



Delegate and Intrepid are the *Perfect* Rotational Tools

IRAC Mode of Action Groups

Rotate between
(not within) circles



Group 1A

Guthion
Imidan

Group 5

Delegate

Group 3

pyrethroids

Group 18

Intrepid®

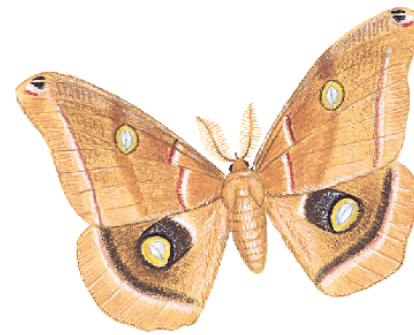
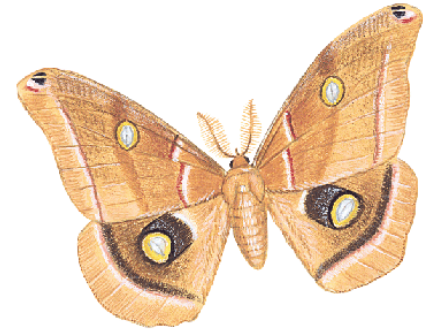
Group 4A

Assail
Calypso

Take Home

- Switch up chemistries
- Don't use same compounds for spring and summer populations

- Spring Summer
- Delegate Diazinon
- Intrepid Delegate
- Avaunt Actara



Reducing the risk to bees

- mass-flowering crops SHOULD NOT be sprayed at bloom with bee toxins
- keep in mind that native bees are active in landscapes all season
- insecticide choice is biggest consideration

Be careful with new chemistries

- Check the label for bee toxicity warnings
- ‘Reduced risk’ and ‘OP replacement’ compounds
 - Very low human toxicity does not always = low bee toxicity
 - e.g for neonicotinoids and spinosyns
- Huge variation in bee toxicity among new chemistries

IN
THE
CHART
BOOK
AT END
OF
INSECT
SECTION

INSECTICIDE TOXICITY TO HONEYBEES		
Admire	imidacloprid	super toxic
Actara	thiamethoxam	
Belay	clothianidin	
Nexter	pyridaben	
Delegate	spinetoram	
SpinTor/Entrust	spinosad	
Lorsban	chlorpyrifos	highly toxic
Avaunt	indoxacarb	
Diazinon	diazinon	
Imidan	phosmet	
Orthene	acephate	
Sevin	carbaryl	
Altacor	chlorantraniliprole	practically non-toxic
Assail	acetamiprid	
Intrepid	methoxyfenozide	
Confirm	tebufenozide	

Altacor: new caterpillar compound (diamide group)



SAFE--no bee warning on label:

ENVIRONMENTAL HAZARDS

This pesticide is toxic to aquatic invertebrates, oysters, and shrimp.

Do not apply directly to water.

Drift and runoff may be hazardous to aquatic organisms in water adjacent to use sites.

Entrust: organic formulation of spinosad (spinosyn group)



TOXIC: strongest bee warning on label

ENVIRONMENTAL HAZARDS

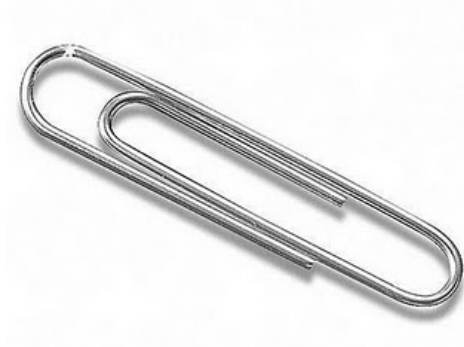
This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds .

Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area . This product is toxic to wildlife and highly toxic to aquatic invertebrates .

Imagining lethal dose

Bee data : expressed in $\mu\text{g}/\text{bee}$

- 1 microgram = $1 \mu\text{g}$ = 1 millionth of a gram



1 gram

Acute contact LD₅₀:
some **neonicotinoids** are very toxic to bees



compound	µg/bee
Sevin	1.3
Guthion	0.063
Admire (neonic)	0.018

worse

Marked under other names--Advantage,
Merit, Premise, Gaucho



Neonicotinoid toxicity to bees: acute contact LD₅₀

clothianidin	.014 µg	Poncho, Acceleron, Belay, Clutch, Celero, Arena
imidacloprid	.018 µg	Admire, Advantage, Merit, Premise, Gaucho
thiamethoxam	.030 µg	Actara, Platinum, Cruiser
dinotefuran	.075µg	Venom, Safari
acetamiprid	7.1µg	Assail, Tristar
thiacloprid	14. 6µg	Calypso

Imidacloprid

- Probably most widely used broad spectrum insecticide: soil, seed, timber, animal
- Turf and landscape
- Crops (140)
 - Cereals, cotton, rice pome fruits, vegetable
- Diverse application modes
- Safe to humans, livestock, pets

TOXIC: strongest bee warning on label

ENVIRONMENTAL HAZARDS

This product is highly toxic to bees exposed to direct treatment, drift or residues on blooming plants. Do not apply this product or allow it to drift to blooming plants if bees are visiting the treatment area. This product is harmful to parasitoids and predatory mites and slightly harmful to foliage-dwelling predators. Care should be taken when using this product in an integrated pest management program where users are relying on the presence of beneficial arthropods.

Update of New Compounds

Review of Compounds

- Altacor
- Avaunt
- Delegate
- Intrepid
- Actara
- Admire
- Assail
- Belay
- Sevin
- Diazinon
- Lorsban
- Orthene



1988

- Diazinon
- ~~Guthion~~
- Lorsban
- ~~Malathion~~
- Orthene
- ~~Parathion~~
- Sevin
- ~~Omite~~

2000

- BT products
- Confirm
- Nematodes
- Pyrenone
- ~~Sprayable~~
~~pheromones~~
- Diazinon
- ~~Guthion~~
- Lorsban
- Orthene
- Sevin

2012

- Actara
- Admire
- Assail
- Belay
- Avaunt
- Diazinon
- Lorsban
- Orthene
- Imidan
- Sevin
- Altacor
- BT products
- Confirm
- Intrepid
- Nematodes
- Pyrenone
- Nexter
(Pyramite)
- Delegate
- Spintor
- Entrust

Full Labels -- Section 3

- Altacor (chlorantraniliprole) 2012
- Belay (clothianidin) **NeoNic4** 2010
- Assail (acetamiprid) **NeoNic3** 2008
- Delegate (spinetoram) 2008
- Avaunt (indoxacarb) 2007
- Actara (thiamethoxam) **NeoNic2** 2005
- Intrepid (methoxyfenozide) 2004
- Admire (imidacloprid) **NeoNic1** 2004
- Spintor (spinosad) 2002
- Nexter, Pyramite (pyridaben) 2001

- Actara
- Admire
- Assail
- Belay

• Avaunt

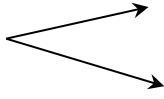
- Diazinon
- Lorsban
- Orthene
- Imidan
- Sevin

- Altacor
- BT products
- Confirm
- Intrepid
- Nematodes
- Pyrenone

• Nexter
(Pyramite)

- Delegate
- Spintor
- Entrust

Neonicotinoids Neurotoxins

- Already labelled 
 - Actara (thiamethoxam)
 - Admire (imidacloprid)
- BELAY
 - More active than Actara
 - IR4 Cranberry residues done in 2005
 - Registered 2010
 - Handler restricted due to residues
- ASSAIL (NEO B)
 - tolerance on cranberry granted in 2008
 - First tolerance granted through berry grouping
 - Residue work 2012 to support export
- NEO C widely used in other crops
 - IR4 residue 2008
 - Likely labelled 2013

***Flea Beetle
Cranberry Weevil***

Spinosyns

Gives us help with resistant populations

- **Delegate** — spinetoram
 - Derived from fermentation of soil bacterium
 - Longer residual than SpinTor
 - Broader spectrum
- **Spintor** — spinosad
 - Short lived
 - Organic formulation

Anthranilic diamides

- Ryania (plant extract) has been used as an insecticide for about 50 years
- The extract contains several structurally-related compounds, including ryanodine
- Ryanodine causes paralysis in insects by sustained contraction of muscles
- targets the calcium channel
- Ryanodine activates the calcium release channel of the sarcoplasmic reticulum

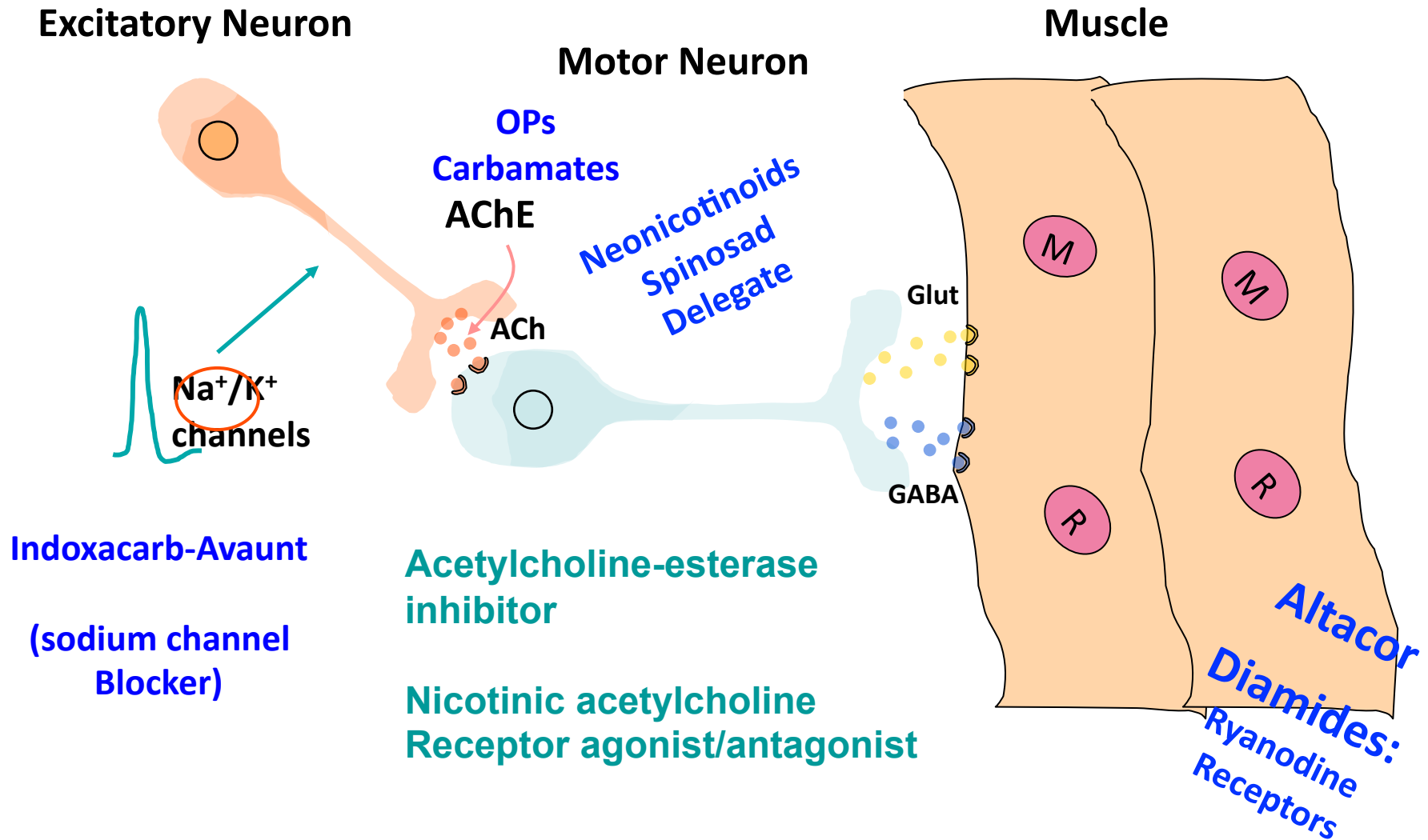
Overview, new compounds

- Different chemistries!
- Usually reduced risk
 - Very low mammalian toxicity
 - Low ecotoxicity
 - Low application rate
 - Selectivity
- Often good residual, often systemic

Overview

- Activity!
- Mode of action >> target site in pest
- Nerve/muscle systems targeted by most of the new compounds we're looking at:
 - Nervous
 - Neonicotinoids
 - Avaunt
 - Spinosyns (Delegate)
 - Muscular
 - Diamides (newer chemistry)

Insecticide Neuromuscular Targets



UMass Cranberry Station Research Update
Plymouth, MA January 18, 2012

Winter Moth and Why You Should Worry!



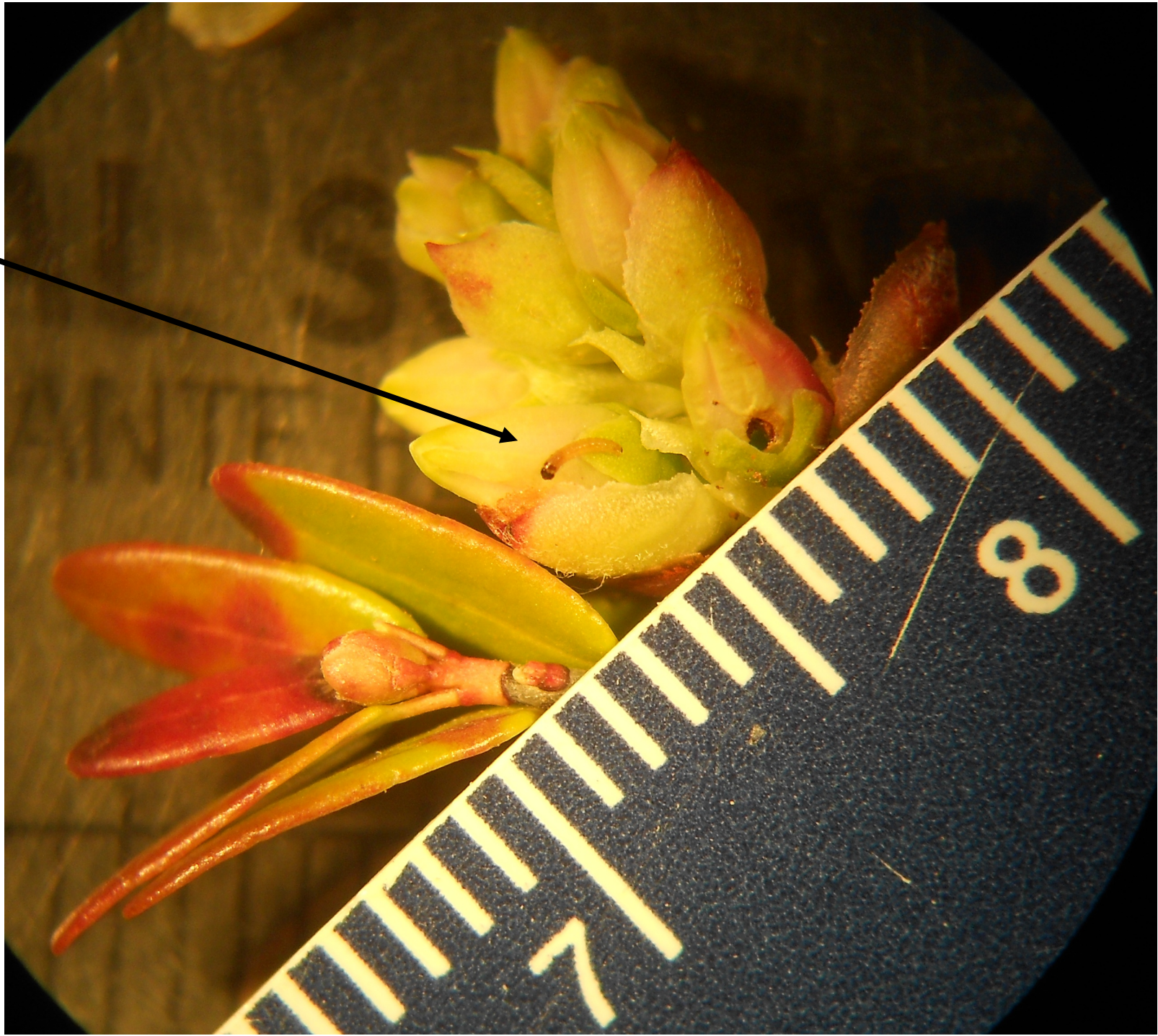
Martha Sylvia
Entomology Lab
Cranberry Station
UMass Amherst

Thanks to
Robert D. Childs and Joe Elkington
Plant, Soil, and Insect Sciences Dept.
University of Massachusetts, Amherst

It's all bad news:

- Astronomical populations
- Permanent outbreak phase
- A bad winter moth year
- Polyphagous (feed on many host plants)









Into May

NOTE THE

- Size of bud
- Size of larvae



- Looping
- Bigger than bud
- Dark head but not black anymore



Winter Moth: where did it come from?



- **Native to Europe**
 - including England
- **Has been in Nova Scotia for decades**
 - (1949) in apples and oaks
- **British Columbia (Vancouver 1976)**
- **Only other finds in USA:**
 - Washington state and Oregon
 - in commercial blueberries
- **Now, well-established in eastern MA and RI**

Life Cycle



Eggs over-winter,
larvae hatch early
spring - April



Larvae feed all
spring and pupate in
late May



Pupae in soil
all summer
and fall until
adult
emergence



Adults emerge
November-December,
mate, lay eggs and die

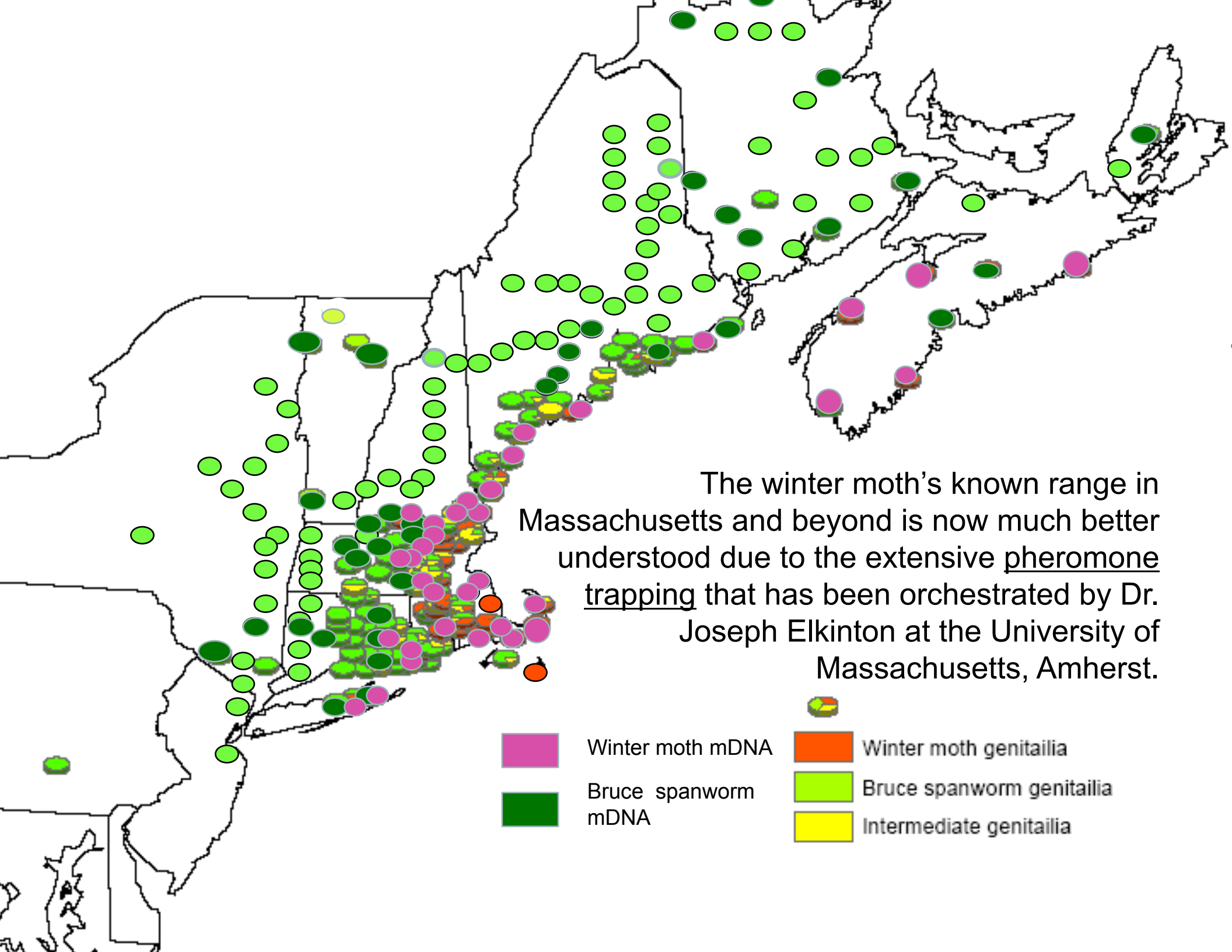


Slide courtesy of Dr. Joseph Elkinton

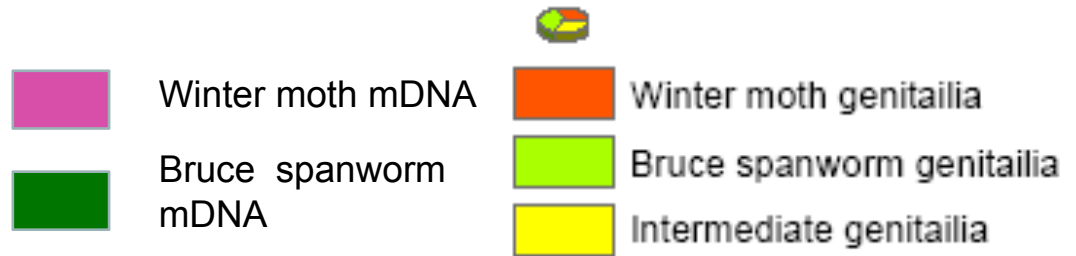
Winter Moth Life Cycle

- Eggs hatch approximately mid-April
- Larvae weasel into buds and feed
 - Very hard to detect
- Become free-feeders once buds open
- Larvae drop to the soil to pupate late May into early June in MA.
- Adult moths start to appear from Thanksgiving.....into January.





The winter moth's known range in Massachusetts and beyond is now much better understood due to the extensive pheromone trapping that has been orchestrated by Dr. Joseph Elkinton at the University of Massachusetts, Amherst.



Potential Host Plants

Winter Moth

- Oaks
- Maples
- Birches
- Crabapples
- Apple
- Blueberry
- Cranberry...



- Polyphagous (feed on many host plants)

WINTER MOTH Management

- Sampling is difficult
- Hard to detect when small
- Very similar to black-headed fireworm when tiny!
- Treat earlier than later!

All effective

- Intrepid
- Delegate
- Avaunt

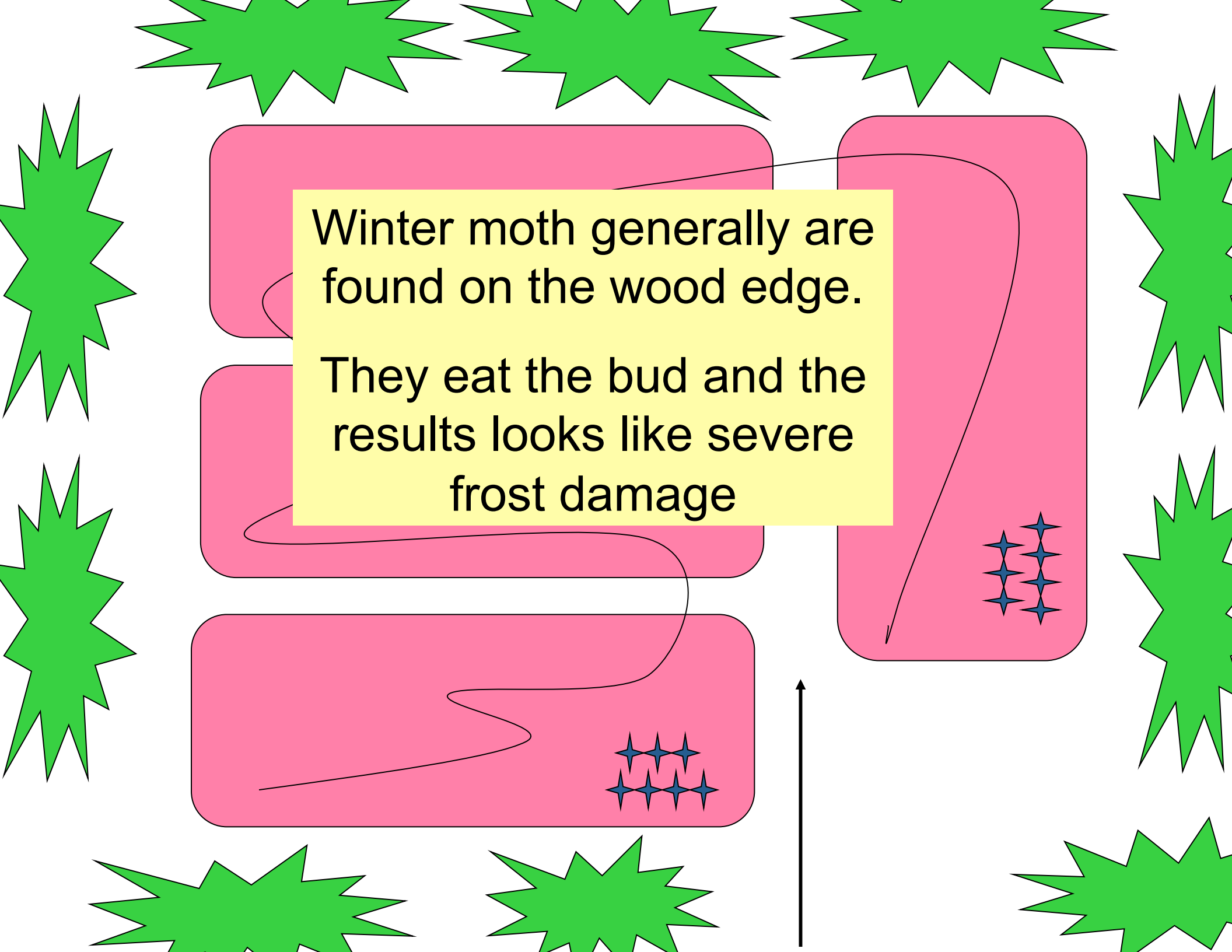
Winter moth is a green spanworm.

Winter moth is an inchworm.

Winter moth is a geometrid.

Winter moth is ***Operophtera brumata***.





Winter moth generally are found on the wood edge. They eat the bud and the results looks like severe frost damage

WINTER MOTH Management

- Sampling is difficult
- Hard to detect when small
- Very similar to black-headed fireworm when tiny!
- Treat earlier than later!

Winter moth is a green spanworm.

Winter moth is an inchworm.

Winter moth is a geometrid.

Winter moth is *Operophtera brumata*.

All effective:

- **Intrepid**
- **Delegate**
- **Avaunt**

Orthene



Cyzenis albican



- A fly specific only to winter moth
- The fly sprays tiny “micro-eggs” on leaves that are eaten by the winter moth caterpillar during the spring.
- When the eggs are consumed, along with leaves, the eggs hatch inside the caterpillar and the larvae consume the caterpillar from within, eventually causing the moth to die.
- The fly pupates inside the carcass of the caterpillar and, the following spring, emerges as an adult fly to mate and begin the cycle again.

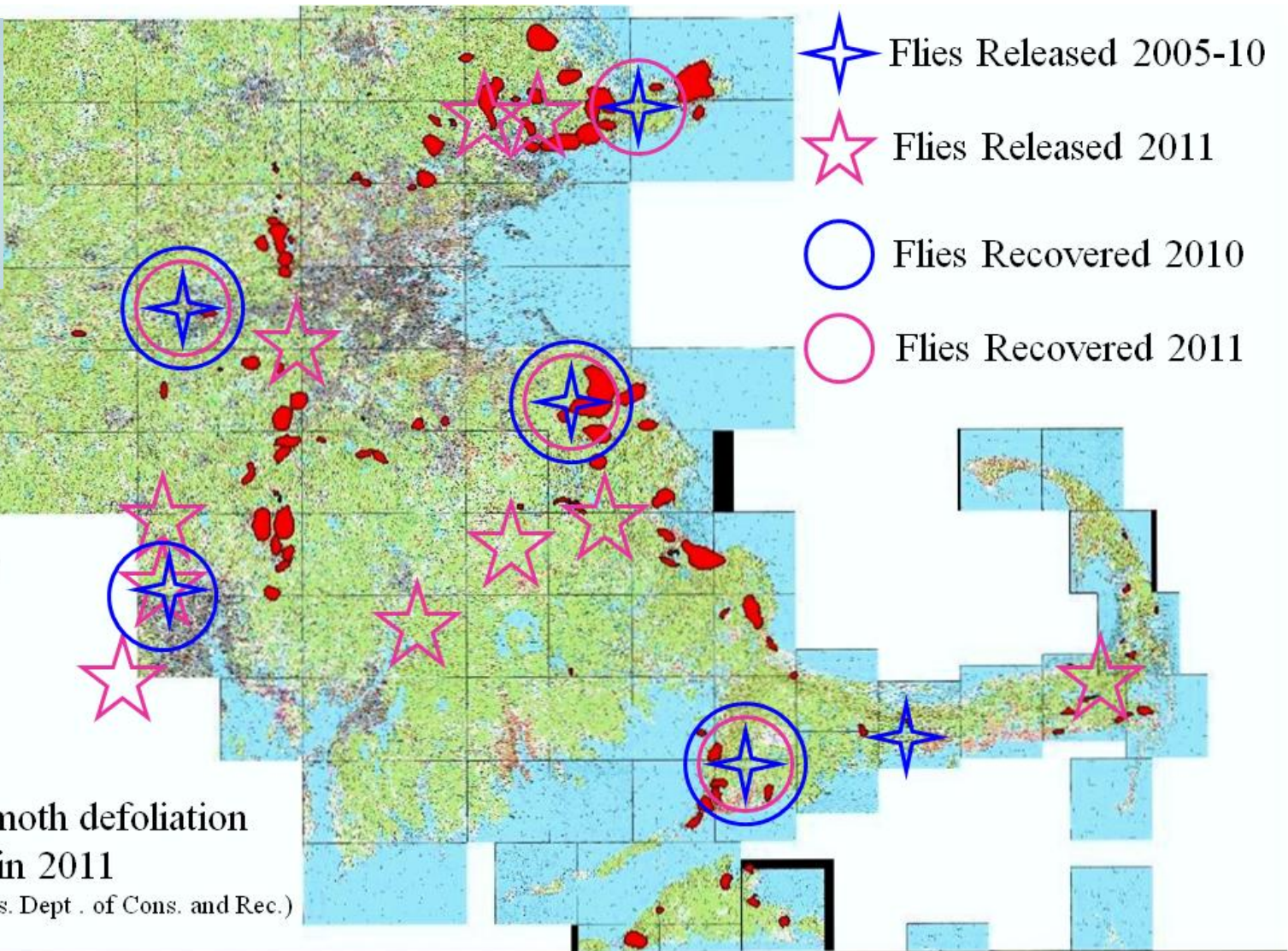


Cyzenis albicans
**Release and
Recovery Sites
2005-2011**



Winter moth defoliation
in 2011

(courtesy of Mass. Dept. of Cons. and Rec.)



- ★ Flies Released 2005-10
- ★ Flies Released 2011
- Flies Recovered 2010
- Flies Recovered 2011

End of April, beginning of May,
Medium Dunkin Donuts coffee cup

