

Evaluating “softer” insecticides for aphid control in Oregon, USA

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Outline

- ▶ Screening trial 2016- Review some relatively unknown products. Initial results and review product costs.
- ▶ **2017 Trial- continue product testing and chance to assist with adding Christmas trees to product label.**
- ▶ Brief review of trials with beneficial insect releases and habitat plantings.





Killing Aphids “Softly”... WHY ???

➤ Why

- Little known and little used among Christmas tree growers
- Low toxicity
- “Caution” label
- Safer around beneficial insects?
- Some with organic certification

➤ Why not

- Little residual control
- Not systemic
- Many are more expensive
- A few have shorter storage life and do not mix well

Investigate softer and little known products

- **M-Pede** (Potassium Salts) Potassium Salts of Fatty Acids designed for soft bodied pests with minimal toxicity to non target pests. Produced by the Gowan Company. OMRI listed
- **Endeavor** (Pymetrozine) A pesticide from Syngenta designed as a selective feeding inhibitor in target species.
- **Aza-Direct** (Azadirachtin) Neem oil derivative from the Gowan Company. Product works through inhibiting molting in pest insects along with suppressing feeding.
- **Botanigard** (Beauveria Bassiana) Entomopathogenic Bacterium produced by BioWorks in emulsified solution.
- **Grandevo** (Chromobacterium Subtsugae Strain PRAA4-1) An isolated strain of Entomopathogenic Bacterium from Marrone Bio Innovations
- **W-E 440** (superior crop oil)



“Traditional” Products

- **Lorsban** (Chlorpyrifos) An organophosphate based insecticide from Dow Chemical Group currently used as the standard for aphid control in Christmas Trees.
- **Mainspring** (Cyantraniliprole) New product from Dupont designed for use as an insecticide for pest populations that have acquired neonicotinoid resistance.
- **Sivanto prime-** (Flupyradifurone) A Bayer product. Has a Christmas tree label in NC, not in Oregon. IPM use
- **Movento HL** (Spirotertramet) Another Bayer product, also sold under the name Ultor. This is the 2017 formulation, 2X concentration. Requires a MSO surfactant for needle penetration. Highly systemic. IPM use

Product costs- 2016



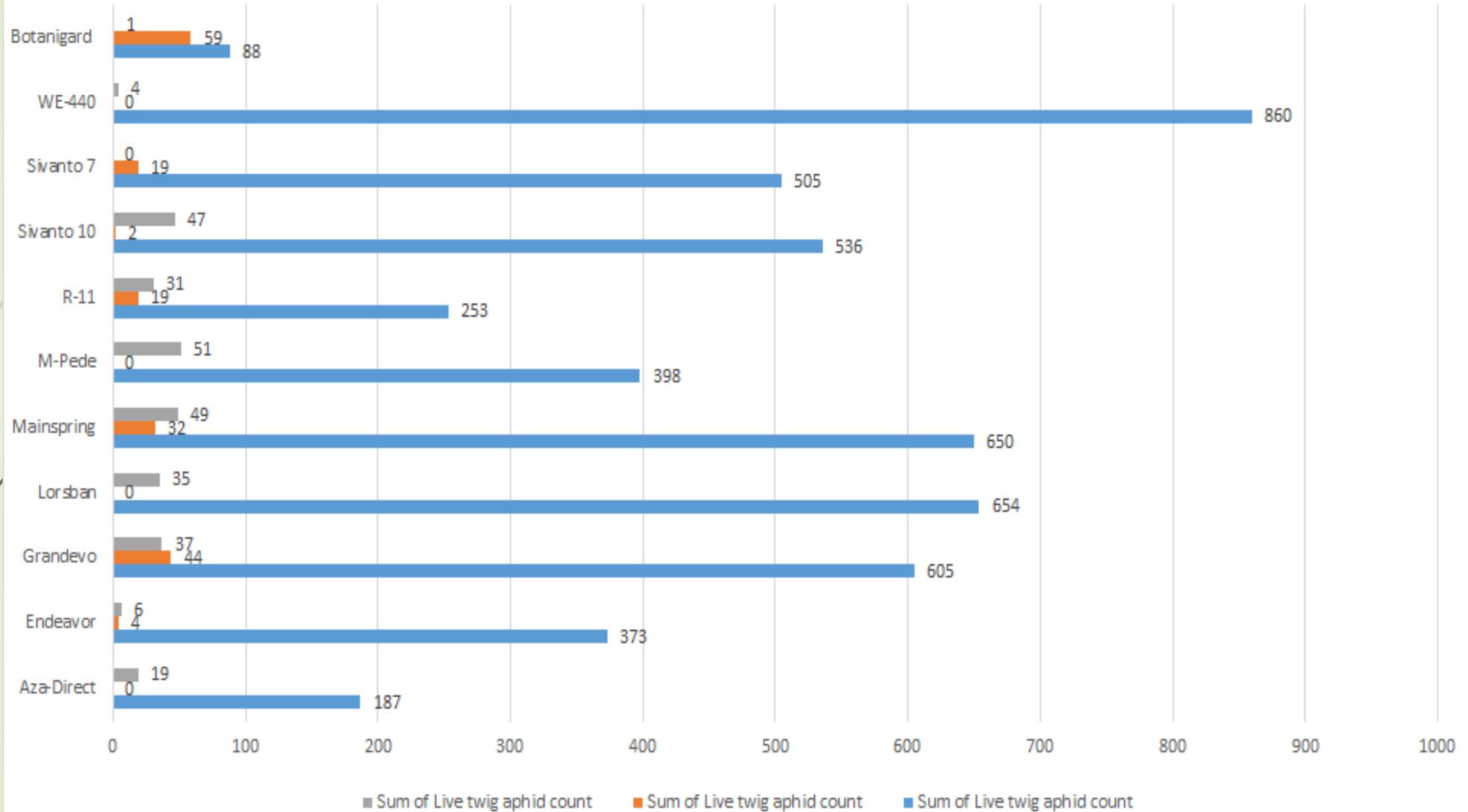
Product	\$/ac
WE-440 oil	\$3.30
Lorsban	\$11.35
Sivanto	\$21.98
M-Pede	\$25.73
Sivanto	\$31.41
Grandevo	\$52.17
AzaDirect	\$55.00
Endeavor	\$117
Mainspring	\$162.00
Botanigard	\$238.14

2016 Screening trial

- ❖ Live aphid counts on branch segments
- ❖ Three evaluation dates- June 8, July 6, July 25
- ❖ Treatments arranged in reps and blocks along tree rows
- ❖ 11 treatments
- ❖ 30 measurement trees/treatment



Aphid Population Graph



7/25/16

7/6/16

6/8/16



Treatments- 2017

“Softer” insecticides

- M-Pede (potassium salts),
- Gandevo (Chromobacterium),
- Wilbur-Ellis 440 (oil)

Traditional insecticides

- Lorsban (Chlorpyrifos),
- Sivanto (Flupyradifurone) at 2 rates
- Movento HL (Spirotetramat).

Treatments/Rates- 2017

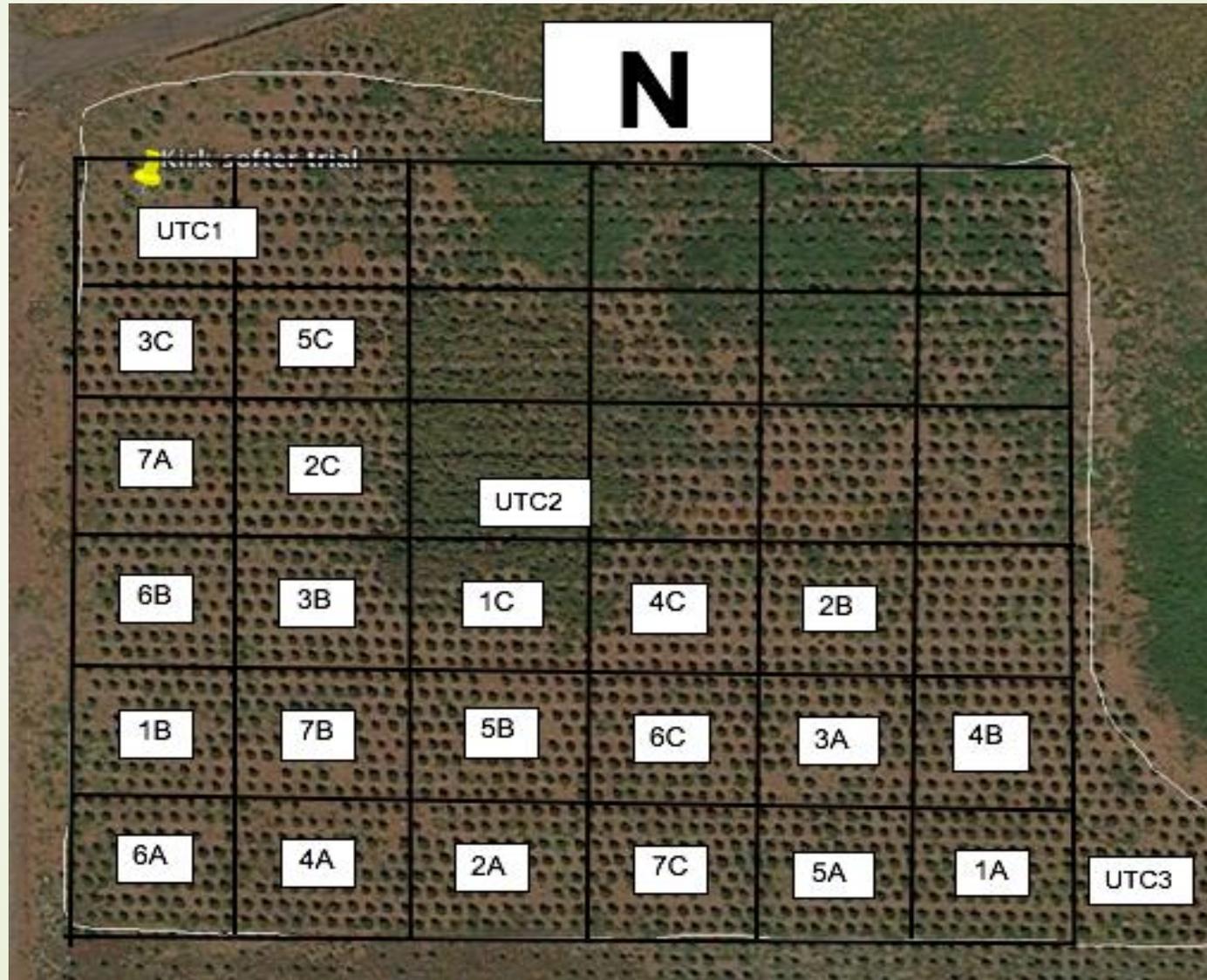
Treatment	Rate/ha (EU)	Rate/A (US)
M-Pede	2% v/v	2% v/v
Movento HL	147 ml	5 fl. oz.
W-E 440 oil	2% v/v	2 % v/v
Grandevo	1.4 kg	3 lbs.
Sivanto 7	207 ml	7 fl oz.
Sivanto 10	295 ml	10 fl oz.
Lorsban	944 ml	32 fl oz.
UTC- Check	0	0

Applications/Timing

- ❖ 6/12/17- Pre treatment evaluation
- ❖ 6/20/17- Spray applications
- ❖ 6/27/17- 1st evaluations
- ❖ 7/21/17- Final evaluation
- ❖ Each treatment- 3 blocks of 80 trees (better than rows)
- ❖ Measurements on 10 inner trees



Test site



Evaluations

Live aphid count- On a selected bottom branch, within a 3.8 cm length.

Whole Tree evaluation

1=	mild to no damage
2=	moderate damage
3=	severe damage



Additional Evaluations

- ✓ Count 20 twigs per tree-
with or without aphid
damage
- ✓ Shake the tree and count
aphids
- ✓ CSNN
- ✓ Phyto
- ✓ Count Beneficial's





Condition before treatments

<i>Pre-spray summary</i>		
	Average Damage ranking	Average live twig aphid count
Treatments		
M-Pede	1.27	7.50
Movento HL	1.17	4.73
W-E 440	1.20	9.17
Grandevo	1.10	5.63
Sivanto 7	1.23	6.53
Sivanto 10	1.23	9.47
Lorsban	1.20	5.87

Results – 31 days after treatment

7/21/17 Summary	Average Damage (1-3)	Average live aphid Count (2 twigs)	Average # of twigs with aphid signs (out of 20)	Average live aphid within tree/shake count	Average CSNN %
Treatments					
Sivanto 10	0.77	0.00	4.07	0.17	0.20
Sivanto 7	0.80	0.00	4.30	0.00	0.87
Movento-HL	0.57	0.00	4.57	0.17	0.30
Lorsban	0.77	0.00	4.67	0.00	0.37
UTC	0.93	0.70	5.23	1.40	0.40
WE440	1.13	0.03	5.30	0.47	0.47
M-Pede	1.00	0.07	6.07	0.53	0.30
Grandevo	1.17	0.03	7.07	1.40	1.00



Results summary- Aphid control

Softer Insecticides

- ▶ Average whole tree aphid damage similar to UTC
- ▶ # of twigs with aphid damage-similar to UTC
- ▶ Grandevo had hi CSNN
- ▶ No phyto

Traditional Insecticides

- ▶ Lower whole tree aphid damage
- ▶ Live aphid counts near 0
- ▶ Fewer twigs with aphid signs
- ▶ Low #'s of aphids after shaking
- ▶ No phyto

Results summary- Beneficial Insects

Treatments	Bee	LB-adult ¹	HF-adult ²	HF-larvae ²	Damsel ³	Assassin ⁴	GLW-adult ⁵	GLW-larvae ⁵	GLW-eggs ⁵	Pirate bugs ⁶	Wasp	Grand Total
M-Pede	1	1	10		1							13
Movento HL		2	1	1					7	1		12
W-E 440	3	1	1		1		1	2			1	10
Grandevo		3	14	1	2	1	2	1	10			34
Sivanto 7	1		8	2	6			2	1			16
Sivanto 10			6	1	1				9			17
Lorsban		1						1	2		2	10
UTC	6				1		1	1	6	12	25	52

Beneficial Insect tally (abundance)

- Spiders
- Hoverfly- adults
- Green Lacewing- eggs
- Wasps
- Pirate bugs
- Damsel bug
- Bees
- Ladybug adults
- Green Lacewing larvae
- Hover fly larvae
- Green Lacewing adults
- Assassin bug





Beneficial Insects-Summary

- ❑ Hard to evaluate 1:1
- ❑ The large number of wasps and bees in the UTC likely a function of honey dew from aphids
- ❑ W-E 440 and Lorsban had lowest total beneficial insect counts
- ❑ Grandevo and UTC had the highest count.



Take home messages

- ✓ The “traditional” insecticides provided lowest aphid counts.
- ✓ Lorsban is a broad spectrum organophosphate in toxicity class II, (Warning) and RESTRICTED USE. Low beneficial insect count.
- ✓ Both Sivanto and Movento are in toxicity class III (Caution). They are also more expensive. Moderate beneficial insect counts
- ✓ Sivanto currently not registered on Christmas trees in Oregon.
- ✓ On this site in this year with pre-harvest trees, sprays likely not needed. Sufficient aphid control with Beneficial's alone.



2013 Trail

Evaluating the release of aphid predators

Five growers/sites had these:

Hatching predatory midges
(*Aphidoletia aphidimyza*)



Lacewing (*Chrysoperla rufilabris*)
eggs on noble fir



Four growers/sites had these:

MeSA (Predalure™) on noble fir



Wasps (*Aphidius matricariae*)





Operational Trial

Targets #/acre

Midges- 10,000 (adults)

Wasps- 2,000 (adults)

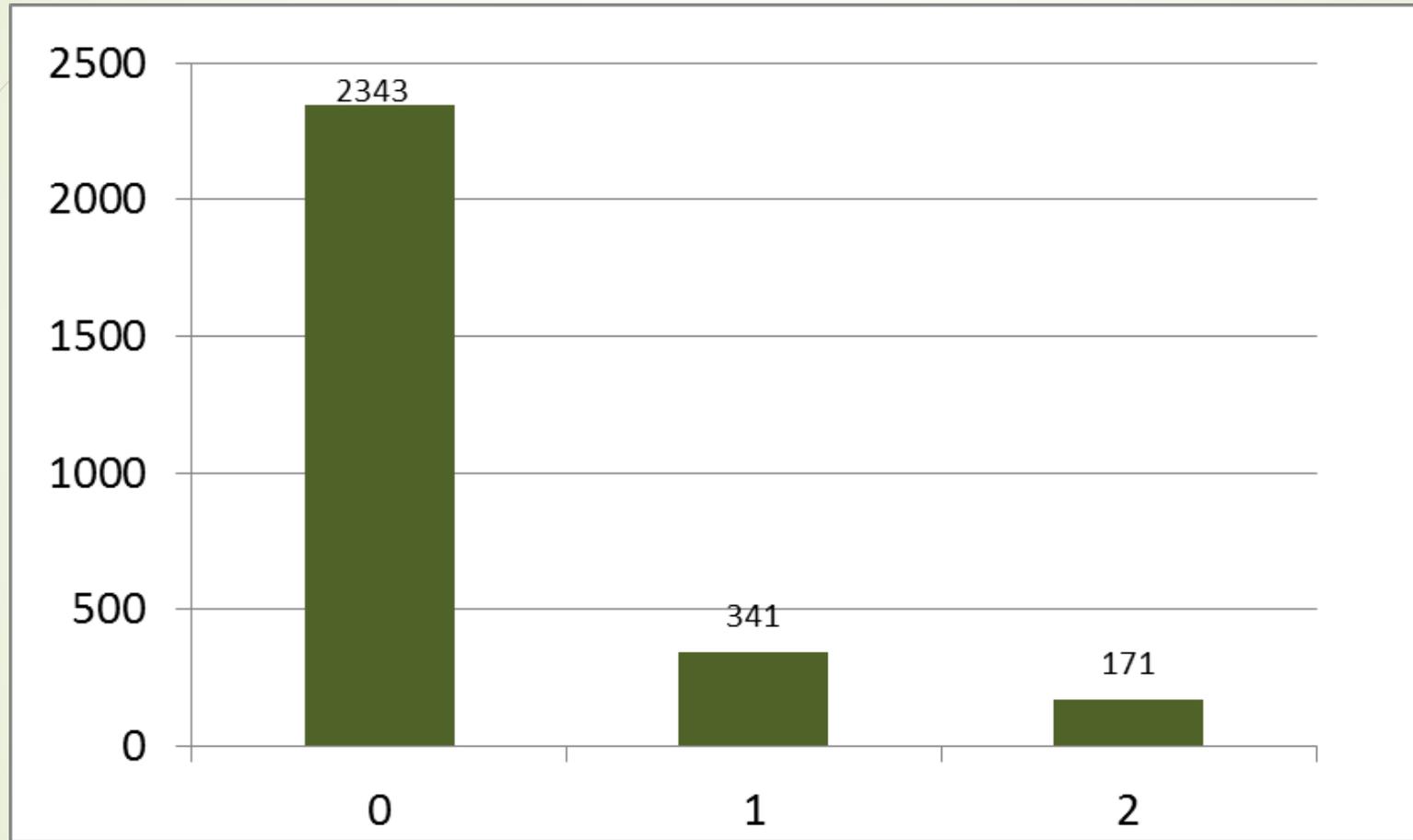
Lacewing-5,000 (eggs)

Predalure- 15 (packets)

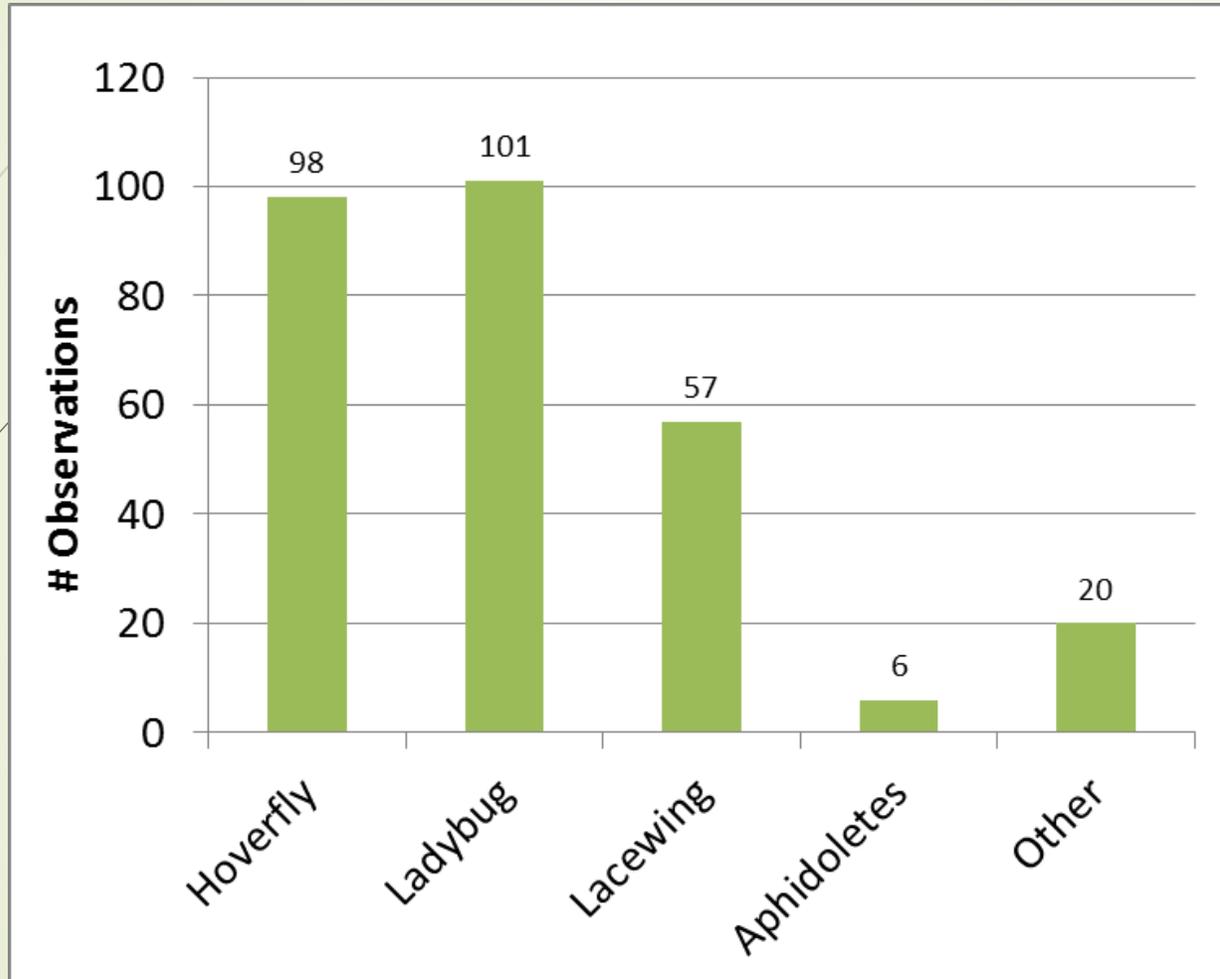
Procedures

- ▶ 9 sites were volunteered; 8 completed the summer evaluations.
- ▶ 3 staged releases conducted from 1st week in May thru early June.
- ▶ From June 8- Aug. 20, on a two week interval, 25 trees/ac were assessed for aphids and any beneficial insects.

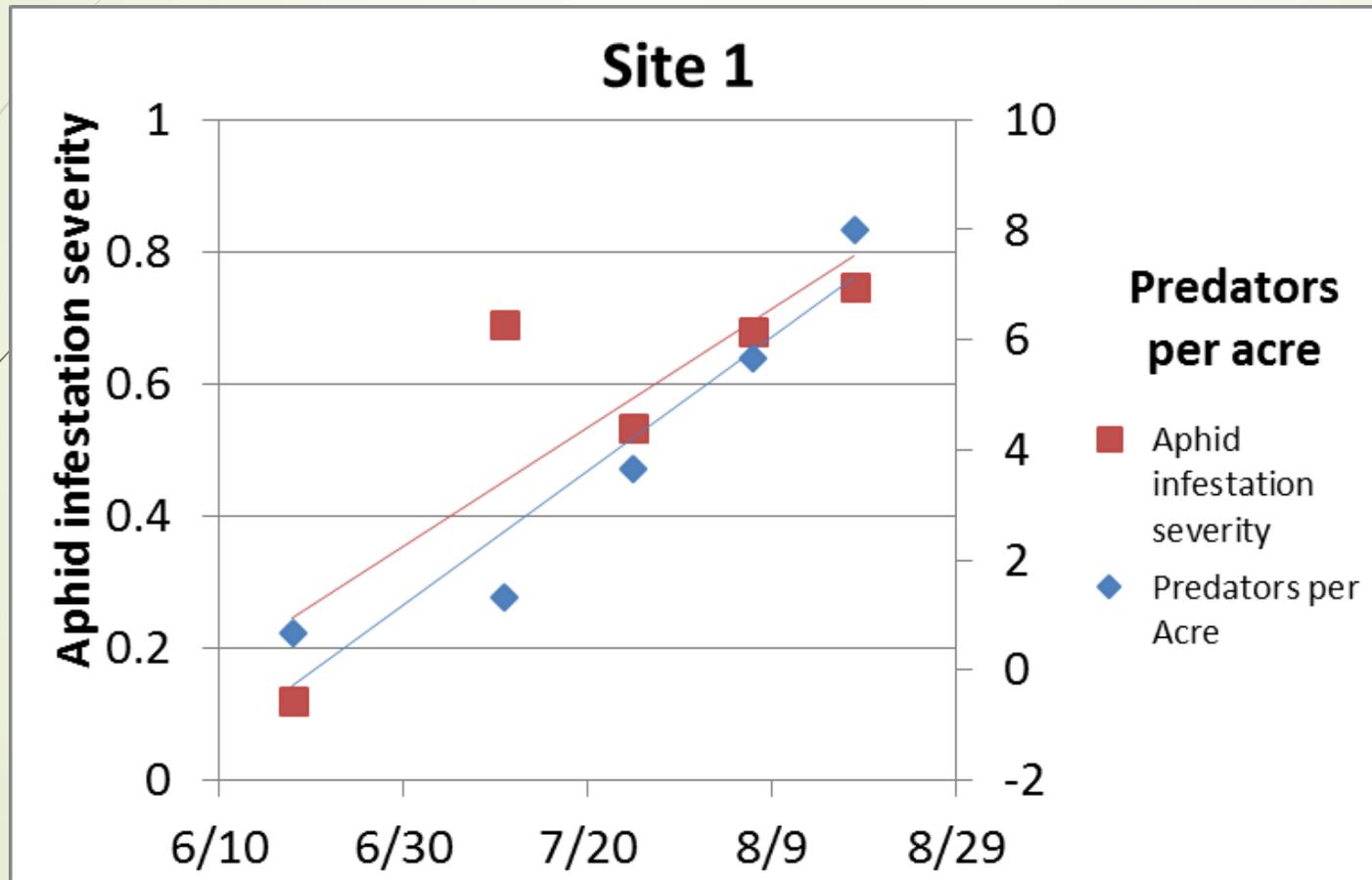
Bottom line- not a good year to test aphid control



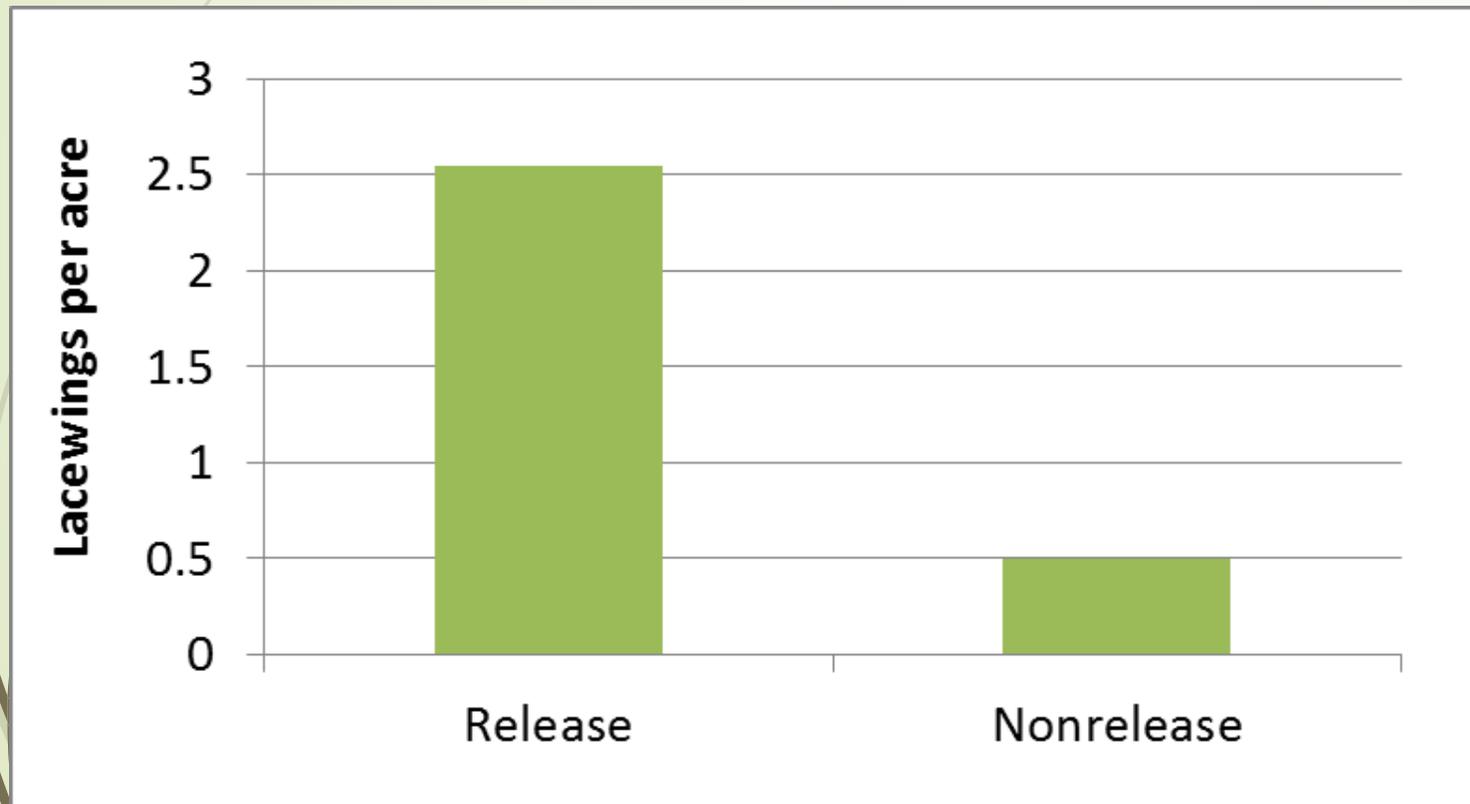
The good bugs we found



Predator #'s increased along with aphids on 3 sites.



Lacewings (but were they ours?)



Costs to purchase alternatives

Biological Control Products	Target #/ac.	Costs/ac	Easy to use
Aphidoletes aphydimyza (predatory midge)	10000	\$268	No
Aphidius matricariae (small parasitic wasp)	2000	\$90	Moderate
Chrysoperla rufilabris (green lacewing eggs)	5000	\$18	Yes
Methyl salicylate (Predalure™)	15 tabs	\$54	Yes
Hippodamia convergens (ladybugs)	35,000	\$100	Yes

Attracting beneficial insects

- ❖ Wide range of cover options- from on purpose to by accident.
- ❖ Even some large firms are trying cover crops- in part because the landowner insists, in part for soil health; rather than beneficial insects.
- ❖ Most covers are hard fescue grasses



Habitat for Beneficial Insects

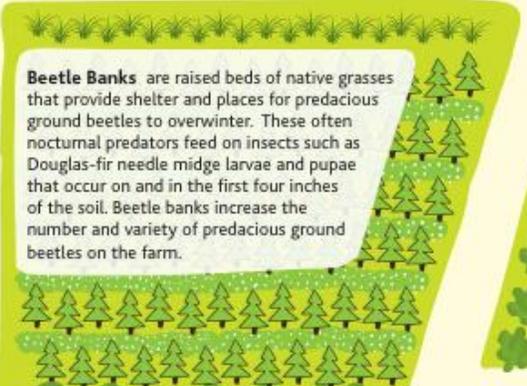
Best Locations on Christmas Tree Farms



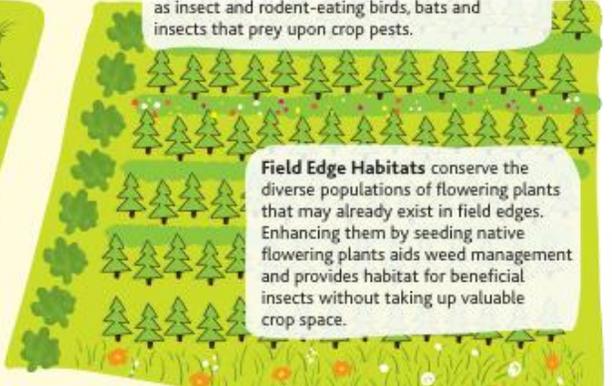
In Field Insectaries are plantings of perennial or annual flowering plants in the crop field. They can be in the crop row, at row ends or between the rows. They provide pollen and nectar as food, shelter from farming practices and places to reproduce and spend the winter for lady beetles, green lacewings and other beneficials.



Remnant Ecosystem Habitats have small patches of original ecosystems such as ash forests or oak savannas that usually contain diverse native flowering plants. Conserving and enhancing these areas increases habitat for beneficials such as insect and rodent-eating birds, bats and insects that prey upon crop pests.



Beetle Banks are raised beds of native grasses that provide shelter and places for predacious ground beetles to overwinter. These often nocturnal predators feed on insects such as Douglas-fir needle midge larvae and pupae that occur on and in the first four inches of the soil. Beetle banks increase the number and variety of predacious ground beetles on the farm.



Field Edge Habitats conserve the diverse populations of flowering plants that may already exist in field edges. Enhancing them by seeding native flowering plants aids weed management and provides habitat for beneficial insects without taking up valuable crop space.



Fence Row Habitats are shrubs and flowering plants in fencerows. Adding native flowering species there can provide hedgerows that flower throughout the season. This provides food and shelter for beneficial insects and helps manage invasive weeds.



Slough/Wetland Habitats are low lying wet areas of the farm. Not farming them decreases poor tree development and increases flowering plant diversity. This creates more habitat for beneficial insects and insect-eating amphibians such as frogs and salamanders.

