



Monitoring and Control of Armyworm in Vegetable Crops

Tim Waters

WSU Extension
Commercial Vegetable Production

PNVA General Session

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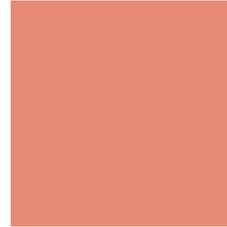
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What is an armyworm?

Kingdom	Animalia – Animal, animaux, animals
Subkingdom	Bilateria
Infrakingdom	Protostomia
Superphylum	Ecdysozoa
Phylum	Arthropoda – Artrópode, arthropodes, arthropods
Subphylum	Hexapoda – hexapods
Class	Insecta – insects, hexapoda, inseto, insectes
Subclass	Pterygota – insects ailés, winged insects
Infraclass	Neoptera – modern, wing-folding insects
Superorder	Holometabola
Order	Lepidoptera – butterflies, moths, papillons, papillons de nuit, Borboleta, Mariposa
Superfamily	Noctuoidea Latreille, 1809
Family	Noctuidae Latreille, 1809 – cutworms, dagger moths, noctuid moths, owlet moths, underwings, noctuelles, noctuidés, phalènes, vers gris

Around 12,000 species worldwide, several are significant crop pests

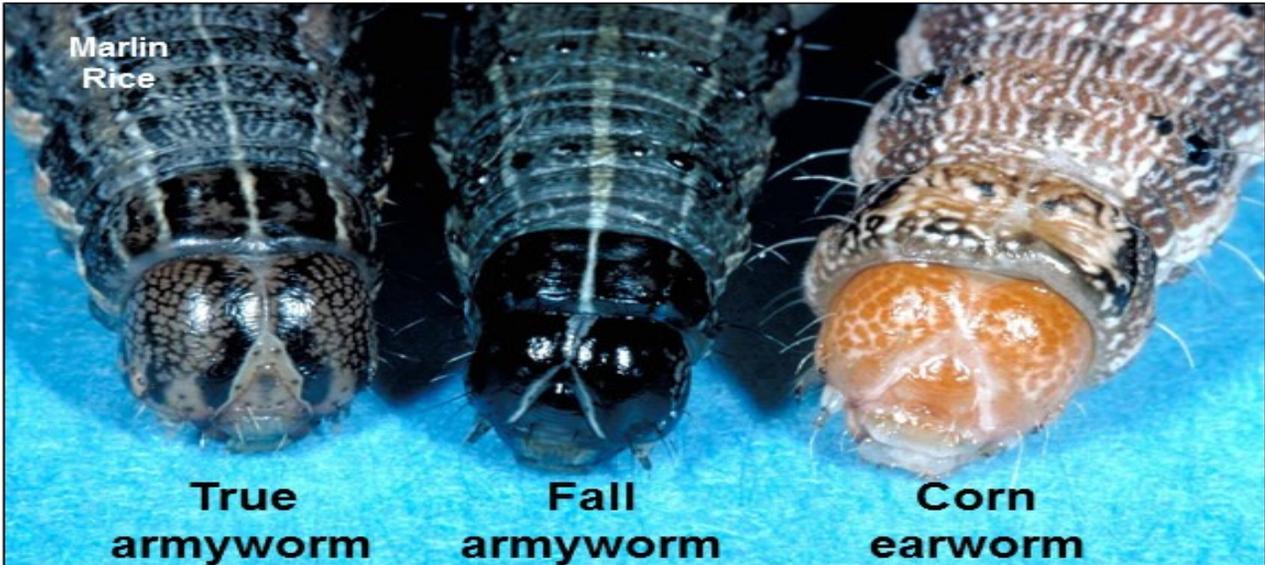
Noctuid Crop Pests



- Armyworm-fall, western yellow stripe, beet...
- Cutworm
- Cotton Bollworm
- Corn Earworm
- Tomato Fruitworm
- Sorghum headworm



Corn earworm and fall armyworm (“headworms”)





How to identify them- why nobody (mostly) wants to work with these things

- Adults generally look the same
- Larvae can vary a lot in the same species
- **Phylogenetic relationships of Acronictinae with discussion of the abdominal courtship brush in Noctuidae (Lepidoptera)**

• [JADRANKA ROTA, BRIGETTE V. ZACHARCZENKO, NIKLAS WAHLBERG, REZA ZAHIRI, B. C. SCHMIDT, DAVID L. WAGNER](#)

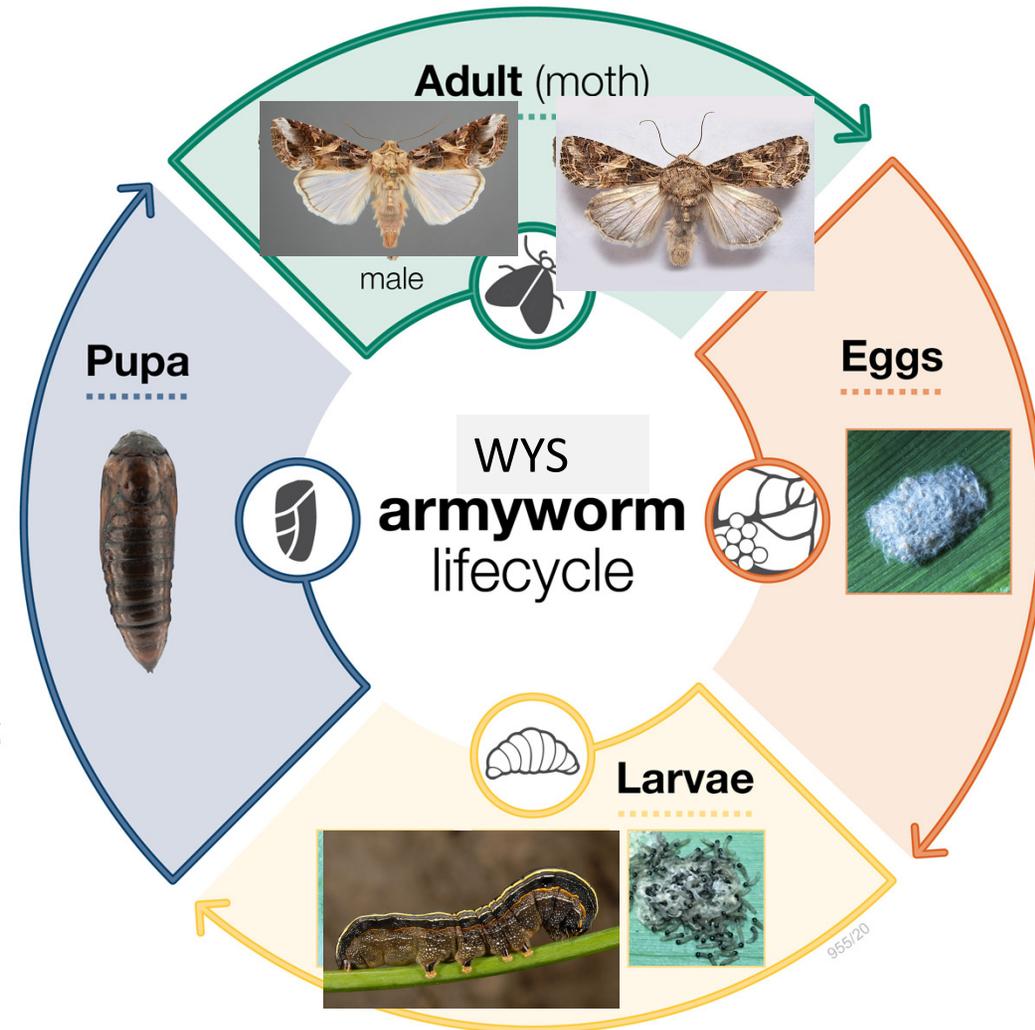
Western Yellow Striped Armyworm *Spodoptera praefica* (Grote)

- 3 – 4 generations per year.
- Caterpillars of the last generation overwinter in the soil as pupae.
- Moths fly at night, mating and egg-laying occur between dusk and midnight
- The eggs are greenish to pinkish brown in color and bear 45 to 58 small ridges.
- In shape, the egg is a slightly flattened sphere, measuring 0.46 to 0.52 mm in diameter and 0.38 to 0.40 mm in height.
- Females typically deposit clusters of 200 to 500 eggs, usually on the underside of leaves.



Western Yellow Striped Armyworm

- Moths fly from March – May and lay clusters of eggs on upper leaf surfaces.
- **Adults from the second generation fly from July and caterpillars feed from July – August.**
- Eggs hatch in 3 – 6 days and caterpillars (larvae) feed for 2 – 3 weeks.
- There are usually 6 larval stages; larvae grow from 2.0 – 35 mm long.
- Larvae initially are gregarious in behavior, but as they mature they disperse, sometimes spinning strands of silk upon which they are blown by the wind.
- Coloration is variable, but mature larvae tend to bear a broad brownish band dorsally, with a faint white line at the center. More pronounced are black triangular markings along each side, with a distinct yellow or white line below. A dark line runs laterally through the area of the spiracles, and below this is a pink or orange band. The head bears a light-colored inverted V on the face.
- **Pupae:** Larvae pupate in the soil within a cell containing a thin lining of silk. Duration of the pupal stage is nine to 22 days
- The entire life cycle takes about 4 – 6 weeks.



WYSAW Host Range

- This is a **very general feeder**, reportedly damaging many crops.
- Among vegetable crops injured are asparagus, bean, beet, cabbage, cantaloupe, carrot, corn, cucumber, lettuce, onion, pea, potato, rhubarb, rutabaga, salsify, sweet potato, tomato, turnip, and watermelon.
- Other crops damaged include alfalfa, blackberry, cotton, clover, grape, lentil, peach, rape, raspberry, sorghum, soybean, sugarbeet, sweetclover, sunflower, tobacco, wheat, and several flower crops.
- Some of the weed species known to be suitable hosts are castorbean, *Ricinus communis*; dock, *Rumex* sp.; gumweed, *Grindelia* sp.; horse nettle, *Solanum carolinense*; horseweed, *Erigeron canadensis*; jimsonweed, *Datura* sp.; lambsquarters, *Chenopodium album*; morningglory, *Ipomoea* sp.; plantain, *Plantago lanceolata*; prickly lettuce, *Lactuca scariola*; and redroot pigweed, *Amaranthus retroflexus*.
- **In many cases, yellowstriped armyworm develops first generation on weed or rangeland plants, with subsequent generations affecting crops.**



How do we manage these sporadic pests?

- Monitor and Respond Appropriately
- They do not occur in every field every season
- Spraying on a prophylactic basis is not cost effective or warranted in most crops



Respond to larva detection?

- No
- Difficult to find
- Nocturnal, mostly
- Crawl into cracks and crevices during the day
- The larger they get, the more difficult and expensive they are to control
- In other words, by the time you find them, they are probably large in stature and population and will be difficult and expensive to control, if you are not already too late



Phenology

- Timing is key for protecting your crop once moths arrive.
- Consider how you manage CEW
- Females lay eggs on fresh green silks. Fresh silks need to be protected with insecticide before eggs hatch, so larvae contact it and die before entering the husk. This means prompt, well-timed insecticide applications are key for avoiding wormy corn.
- Check traps, use moth population to determine when control window starts and how frequently you need to spray
- This is slightly different for WYSAW



Armyworm life table

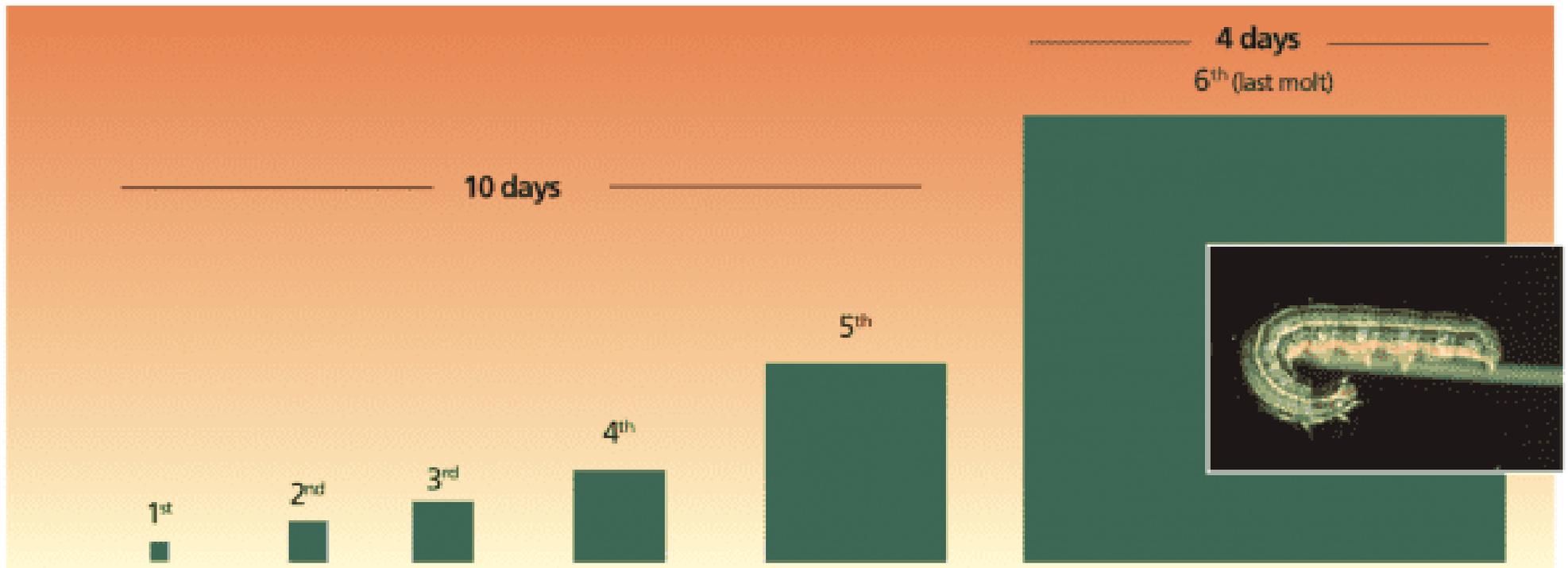
- ¹After Guppy, J.C. 1951. Three-year average in an Ontario, Canada environment (1957-1959).

²Adapted from Mukerji, M.K. and J.C. Guppy (1970) Estimated individual instar values determined from measurement of the manuscript's graphic data.

Life stage	Avg days / life stage ¹	Corn foliage consumption (mg) ²	Percent of total foliage consumption ²
ADULT (female)			
Egg-laying	8.7		
Total	17.2		
EGG	7.5		
Larva			
1st instar	4.8	1	0.1
2nd instar	3.3	1.5	0.2
3rd instar	3.3	6	1.2
4th instar	3.8	21	4.2
5th instar	4.4	75	14.9
6th instar	10.3	400	79.3
Total larva	29.9		
PUPA	18.3		
TOTAL	72.9	504.5	100.0



Relative amounts of food eaten by a fall armyworm caterpillar during each growth stage. In summer, a caterpillar feeds for about 14 days, **but most of the food is consumed in the last four days**



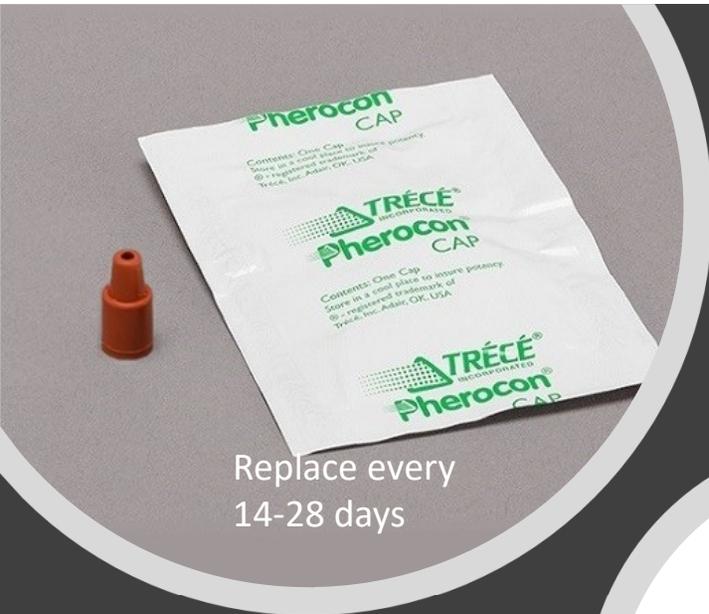
Scouting for Armyworms

- Larvae- physical inspection of plant parts looking for damage, insects or frass, or looking on the ground and in foliage for critters

Sweep netting

- Adults-
 - Pheromone trap
 - Light trap
 - Sweep net



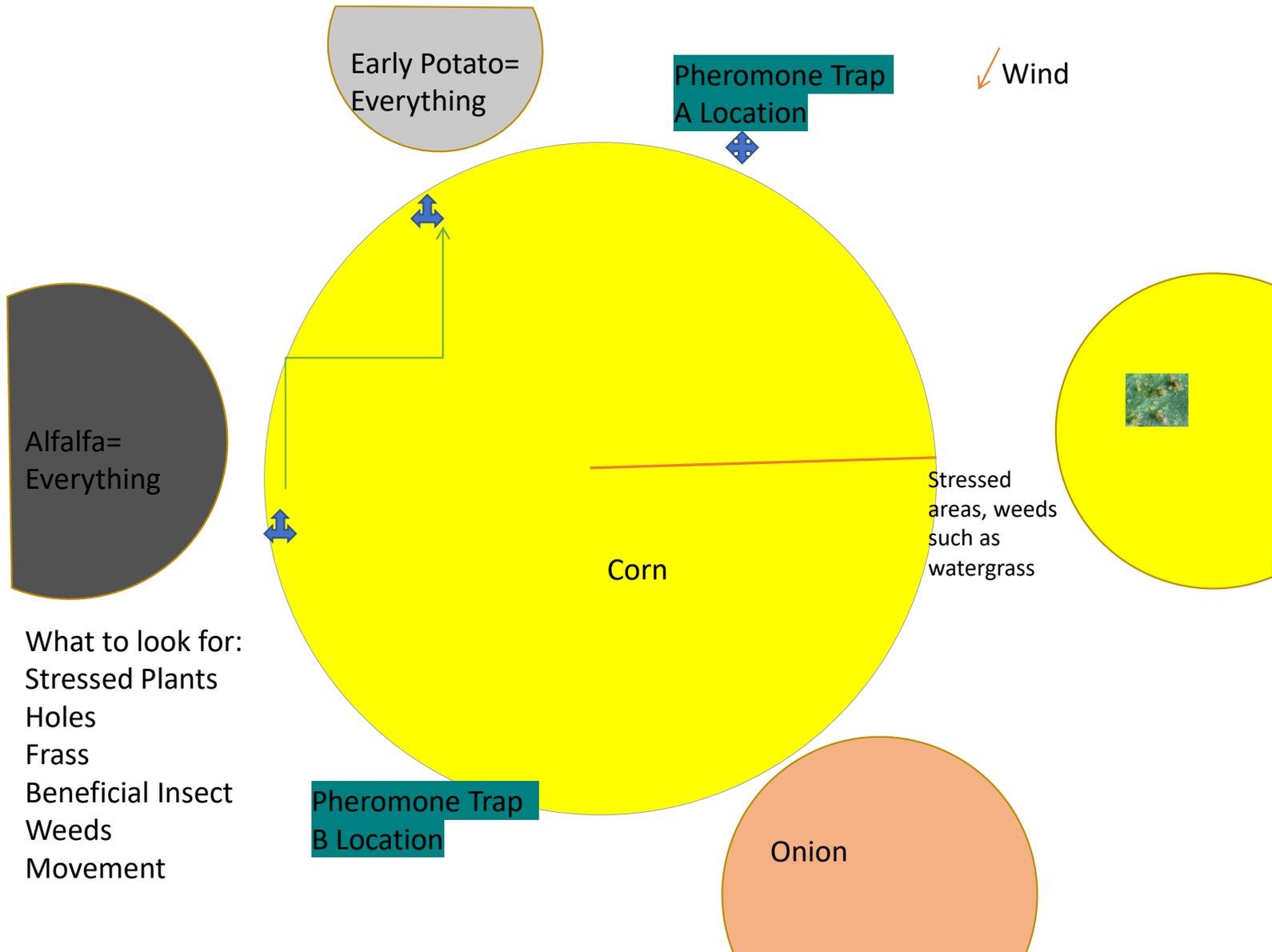


Replace every
14-28 days



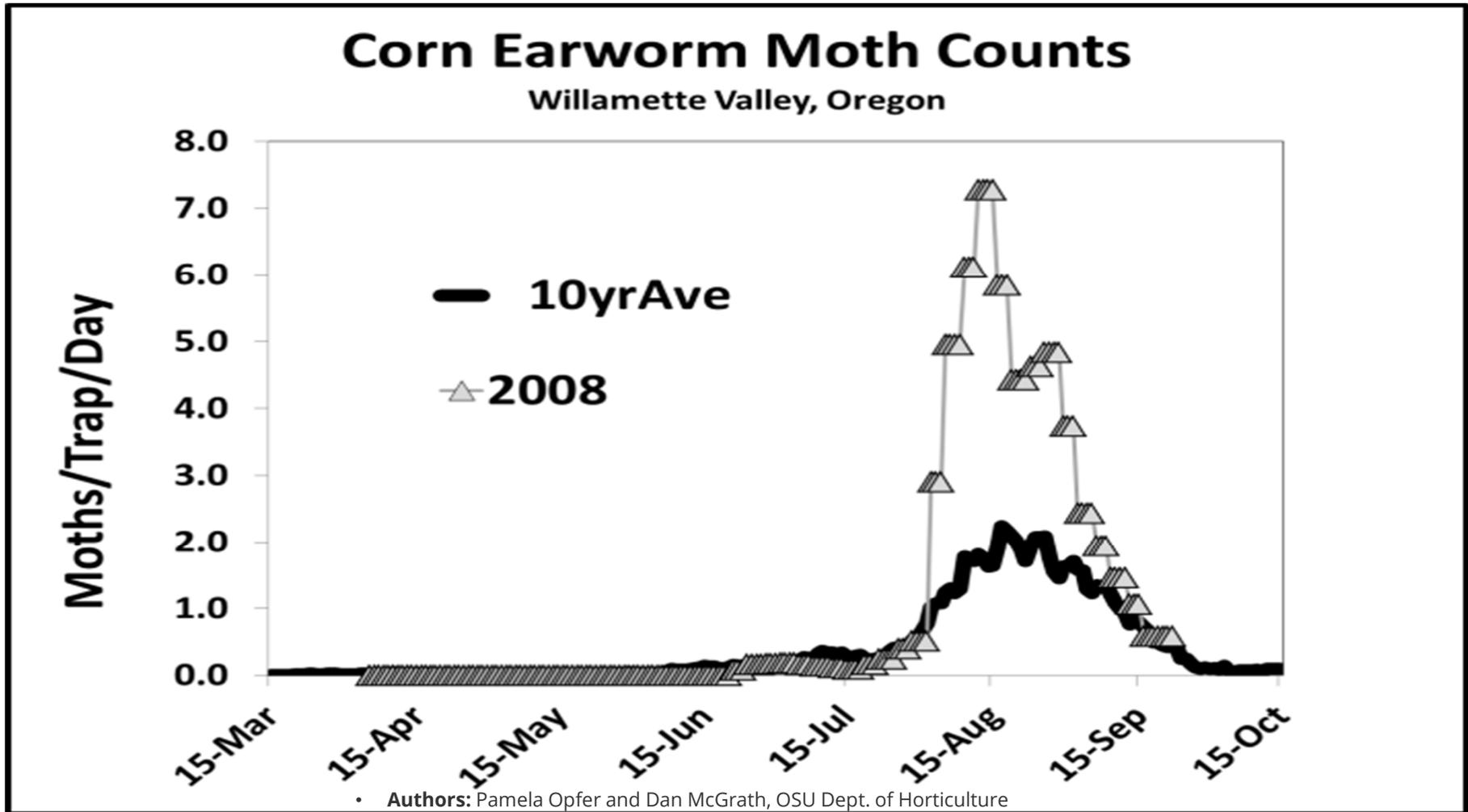
Pheromone traps

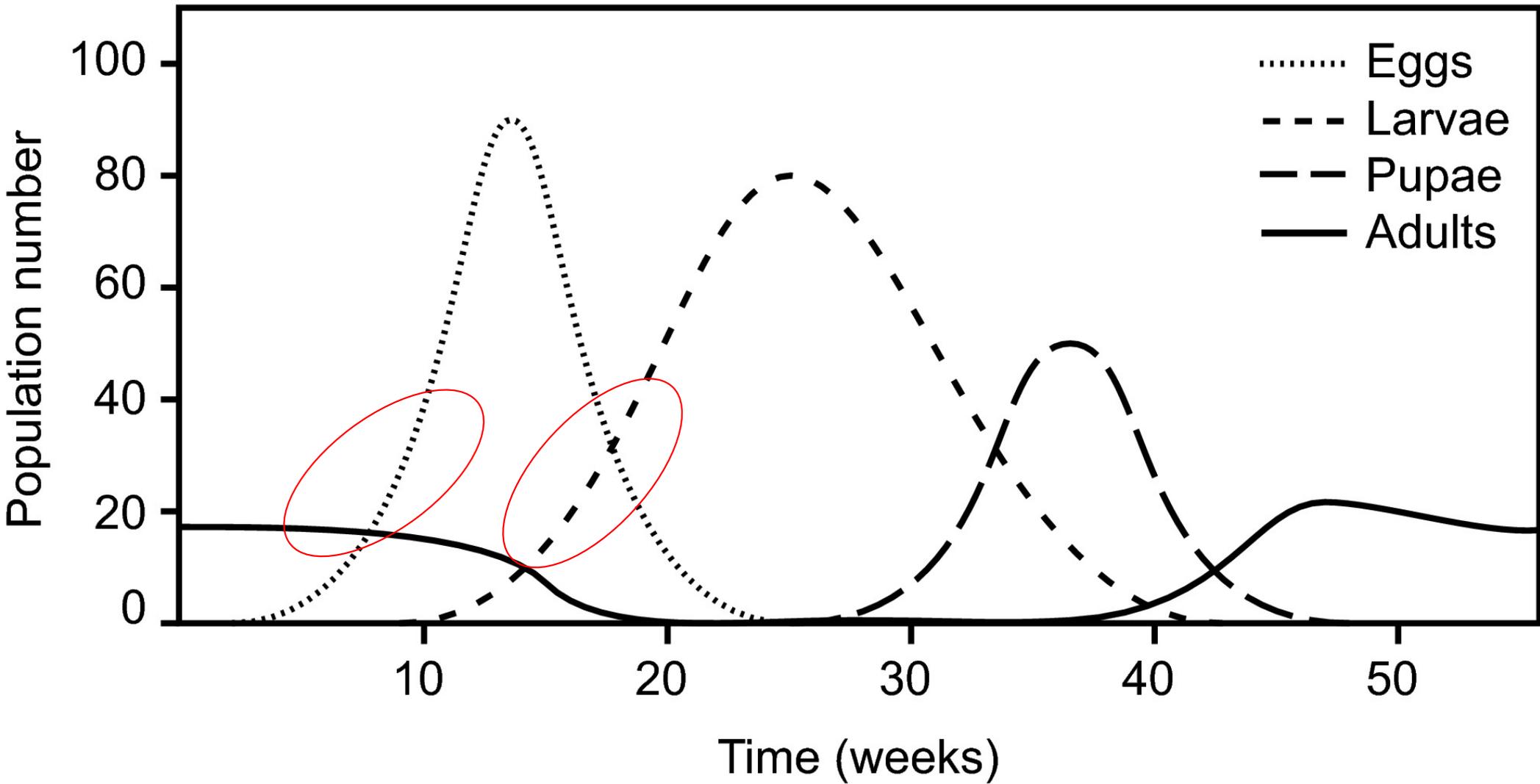
- How do they work
- How to use them
- What do the trap counts mean
- How valuable are they?
- Check them at least weekly
- How soon after you find moths will you find eggs? Within 3-5 days (generally)



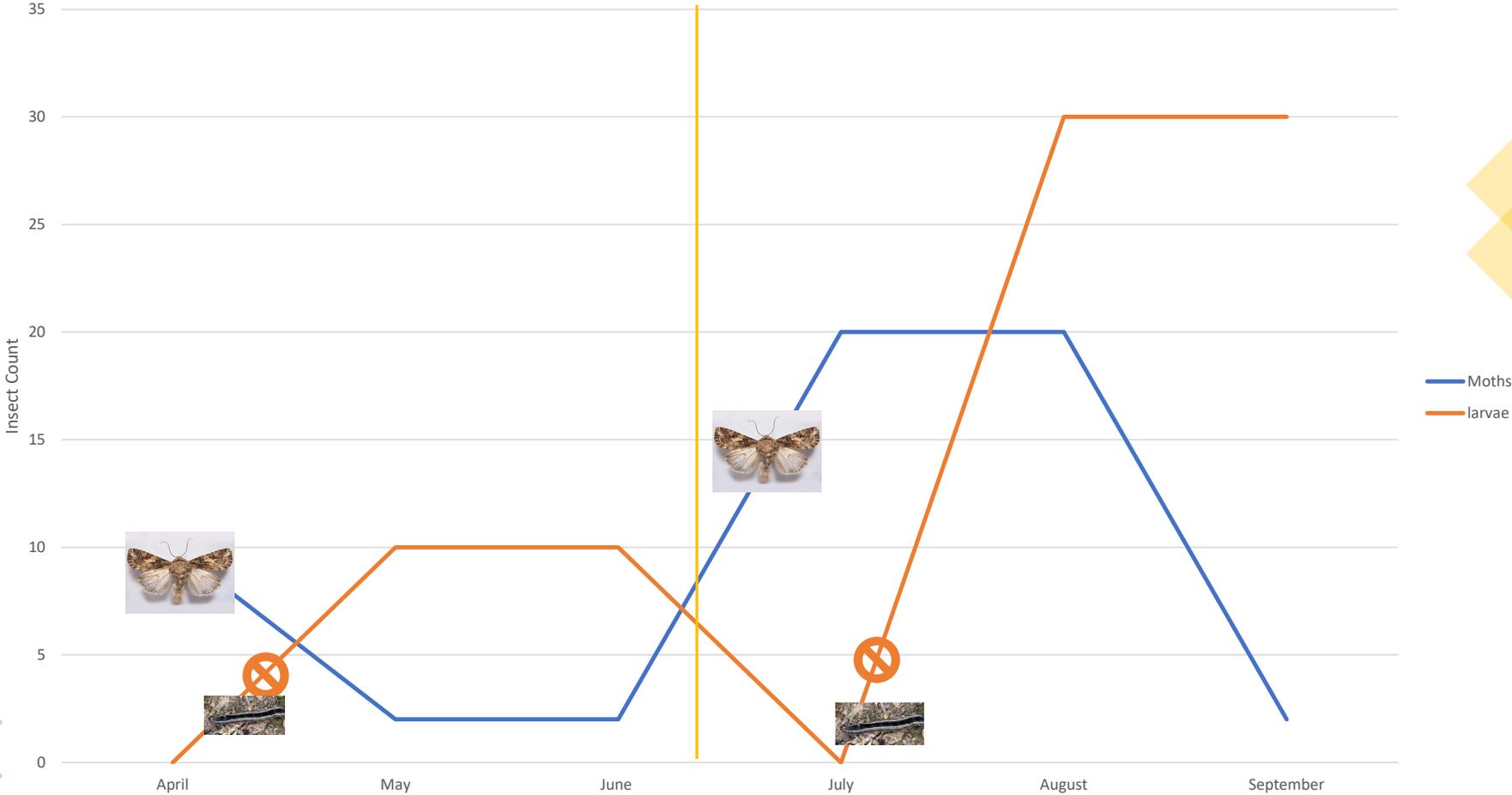
- What to look for:
- Stressed Plants
 - Holes
 - Frass
 - Beneficial Insect
 - Weeds
 - Movement

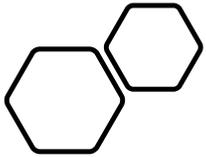
What pheromone traps tell us





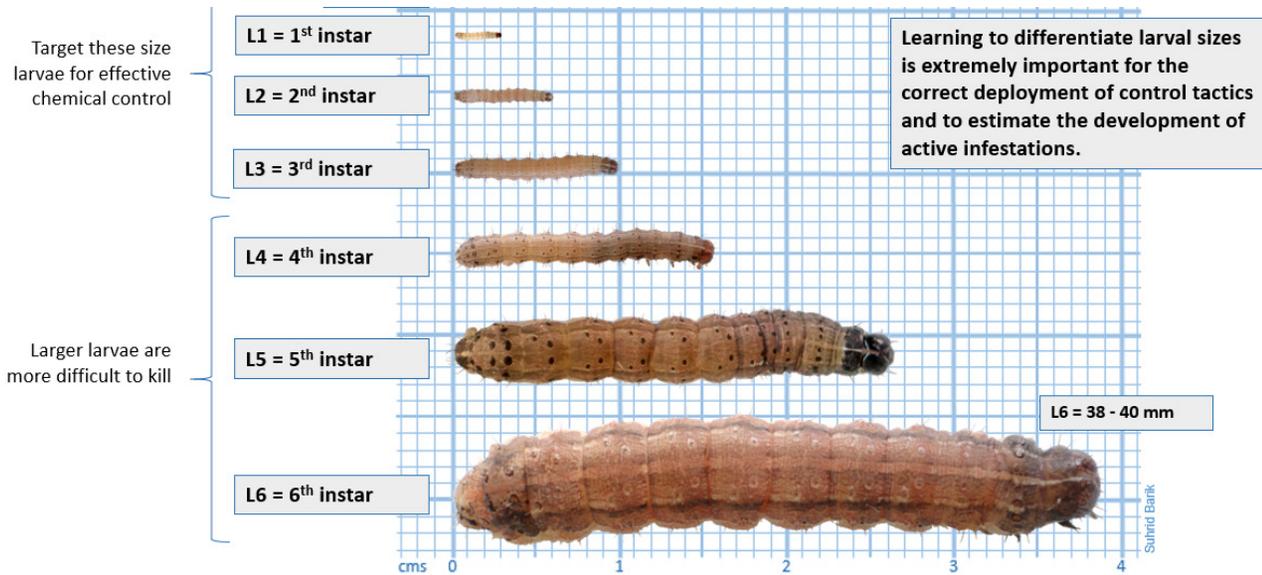
WYSAW Simulation





In Practical Terms

- Understand the implication of the pest population and life stage in relation to the crop
- Bigger they are the more difficult and expensive to control
- Is physical avoidance playing a role
- Difference in behavior or CEW and WYSAW





Control of Armyworms

- Biological- parasitoids and parasitic flies, generalist natural enemies, birds, mice
- Cultural- control of weeds, crop rotation
- Chemical- most responsive and effective when warranted



Insecticide Control-Crop dependent

Trade Name	Active Ingredient	Corn	Bean	Pea	Carrot	Grass Hay	Alfalfa	Potato
Coragen/ Vantacor	chlorantraniliprole	x	x	x	x		x	x
Entrust	spinosad	x	x	x	x	x	x	x
Radiant	spinetoram	x	x	x	x			x
Baythroid	Beta-cyfluthrin	x	x	x	x	x	x	x
Warrior II	Lambda-cyhalothrin	x	x	x		x	x	x
Mustang	Zeta-cypermethrin	x	x	x	x	x	x	x
Permethrin	Permethrin						x	x
Tombstone	cyfluthrin	x	x	x	x	x	x	x
Steward	Indoxacarb	x	x				x	
Lannate	Methomyl	x	x	x	x		x	x
Rimon	Novaluron	x	x					x

Summary

- Armyworm may continue to be a problem in a variety of crops
- If you have experienced issues, consider deploying pheromone traps
- Use pheromone trap data counts along with crop phenology to determine if spraying is appropriate
- When spraying consider which application method may be best for your specific situation
- Keep fields free of weeds
- Do not forget about other problematic species of noctuids
- Always read and follow label directions

To be determined

- Species of Armyworm that is most prevalent
- That will determine the appropriate pheromone lure
- Extent of damage to crops and which crops are most severely affected
 - Corn, Potato, hay crops

Disclaimer



- Not all compounds tested are currently registered for use on Onions in Washington State.
- Do not use unregistered compounds
- Consult your local Extension office and read and follow label directions.
- Oregon and Washington labels (PICOL):

<http://cru66.cahe.wsu.edu/LabelTolerance.html>



Tim Waters, Ph. D.

Regional Vegetable Specialist Franklin & Benton Co.

Commercial Vegetables

twaters@wsu.edu

<http://benton-franklin.wsu.edu/agriculture/commerveg.htm>

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