Cover crops: Inviting Natural Enemies into Your Orchard

WASHINGTON STATE UNIVERSITY
World Class. Face to Face.

NRCS Training Session
Cover Crops in Orchards and Vineyards
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Quincy Fire Hall, Quincy, WA

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Possible Roles of Cover Crops

- Soil Erosion/Stability
- Nitrogen source
- Habitat for Natural Enemies (nectar & pollen, alternate prey, refuge)

Cover Crops – A Mixed Blessing?

- Harbors pest arthropods (e.g., Horton et al., Lygus, stink bugs, spider mites)
- Increases disease or vole problems
- Interferes with orchard operations (irrigation, weed spraying, mowing, harvest)
- Compete with trees for water and nutrients

Some potential experimental difficulties

- Ground cover fails to establish
- No increase in predators
- No decrease in pest

- Plot size adequate?
- Study period adequate?
- Sampling method representative?
- Microclimate changes?

***In most commercial orchards, must limit pest damage

Tree Fruit Cover Crops: Case Histories

- **Fye 1983: cover crops in pear**
  - **Sampled 9 pear orchards, compared cover crop (sweep net) arthropods to trees (beating tray)**
  - **Planted wheat or barley in a 0.4 ha pear block (difficulty with establishment; too much growth or didn't survive)**
  - **Ashfall from Mt. St. Helen's eruption in May of 1981 may have influenced experiment**
  - **Lots of predators in cover crops, but not pear psylla predators**
  - **Pesticides used in the blocks may have reduced predators**

Tree Fruit Cover Crops: Case Histories

- **Meagher & Meyer 1990 – peach ecosystem**
  - **Tree growth, yield better in bare ground plots**
  - **Higher injury from catfacing insects in weedy plots**

Tree Fruit Cover Crops: Case Histories

- **Horton et al.: 2009: Immunomarking in pear orchards**
  - **1 ha 'Bartlett' orchard; three cover crops; plots 4 aisles x 40 m long**
  - **Egg white marker sprayed with a boom sprayer**
  - **>90% of insects from cover crop were marked**
  - **About 20% of the tree-collected Heteroptera were marked; overall % marking for specimens was 17-29%**

Habitat preference

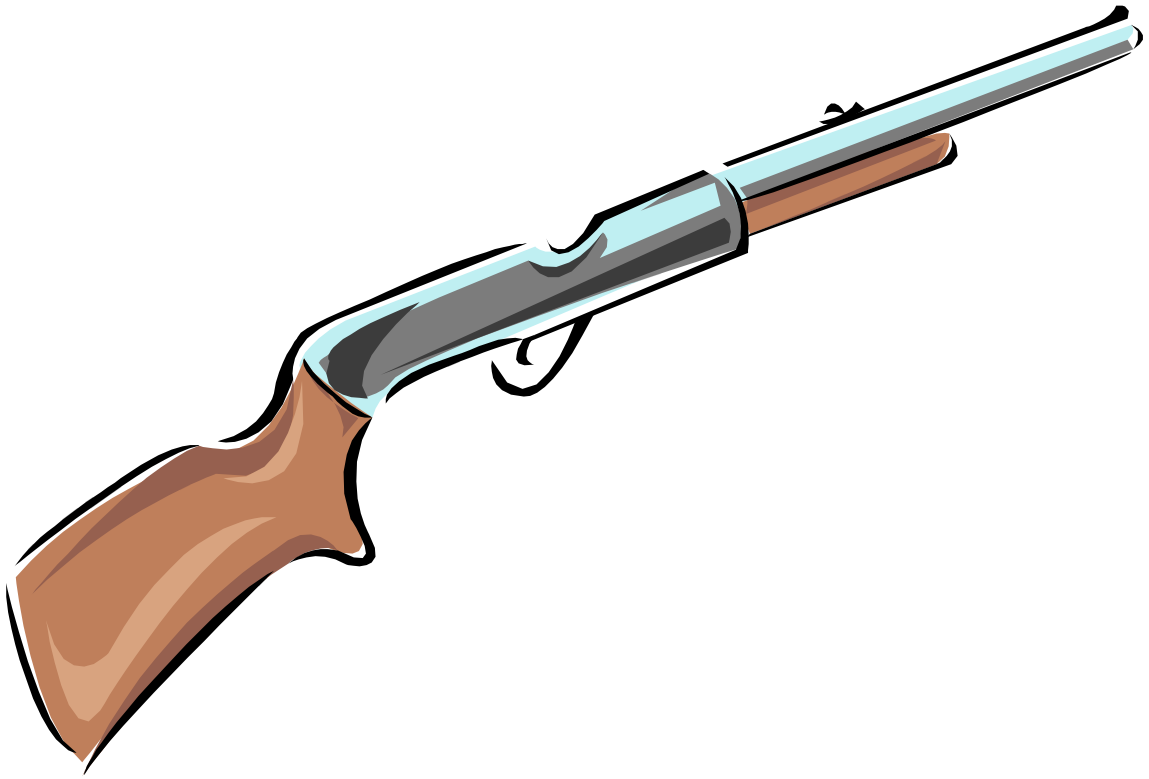
Table 1. Number of generalist predators collected in cover crop (by sweep net) and tree canopy (by beating tray), and apparent habitat preferences based upon numbers in each habitat

TAXON	No. collected in		Apparent habitat preference		
	Cover crop	Tree	Cover crop	Tree	Generalist
HETEROPTERA					
Orius tristicolor	662*	24*	X		
Geocoris spp.	329*	0	X		
Nabis sp.	99*	8	X		
Deraeocoris brevis	59*	1159*		X	
Anthocoris tomentosus	10*	459*		X	
CHRYSOPIDAE					
Chrysopa oculata	194*	3	X		
Chrysoperla plorabunda	132*	155*			X
Eremochrysa sp.	33	111			X?
Chrysopa coloradensis	13	5*			X?
Chrysopa nigricornis	4	47*		X	
COCCINELLIDAE					
Hippodamia convergens	382*	15*	X		
Coccinella septempunctata	127*	118*			X
Coccinella transversoguttata	116*	36			X?
Hyperaspis lateralis	112	95			X
Harmonia axyridis	11*	159*		X	

*, asterisks indicate that the samples included immatures (identified to species by rearing in the laboratory, as necessary).

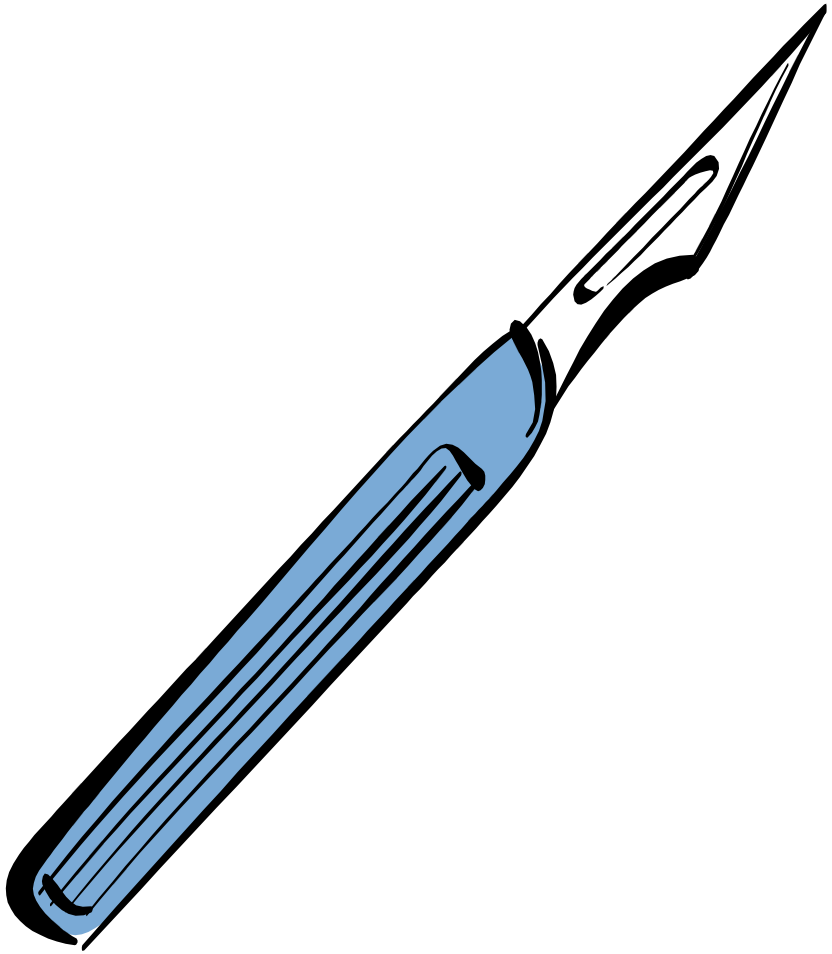
Data ex Horton et al. 2009

The “Shotgun” Approach



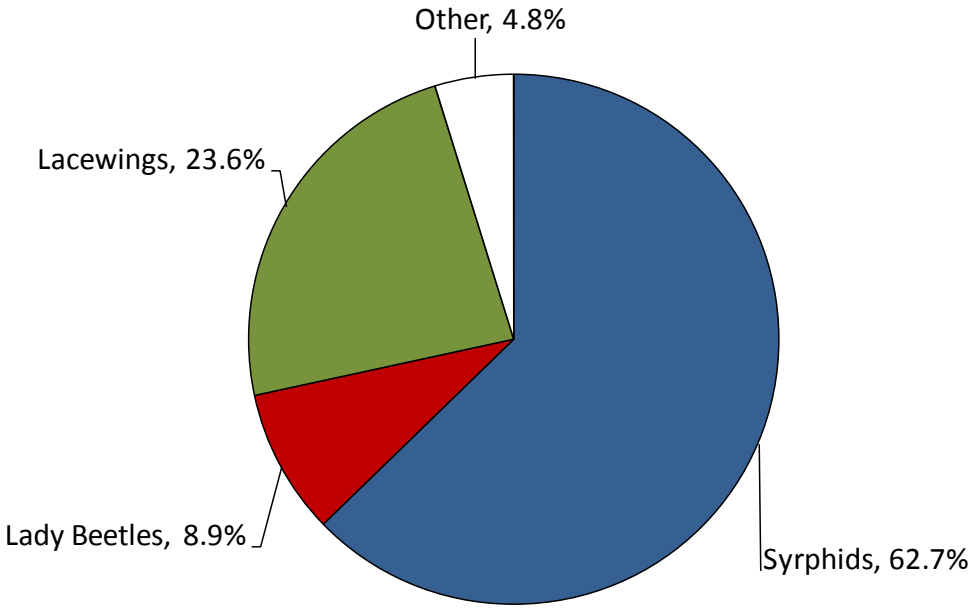
Plant a bunch of stuff, hope something does some good

The scalpel approach



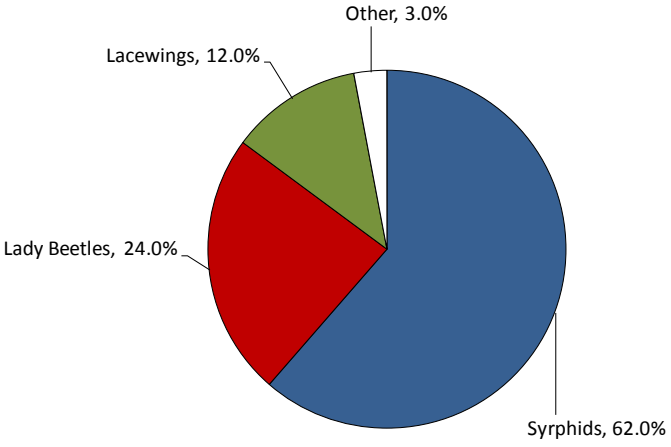
Determine key natural enemy for important prey species, and a missing resource in a predator/prey (or host/parasitoid) system, and supply it

WAA Natural Enemies - Survey

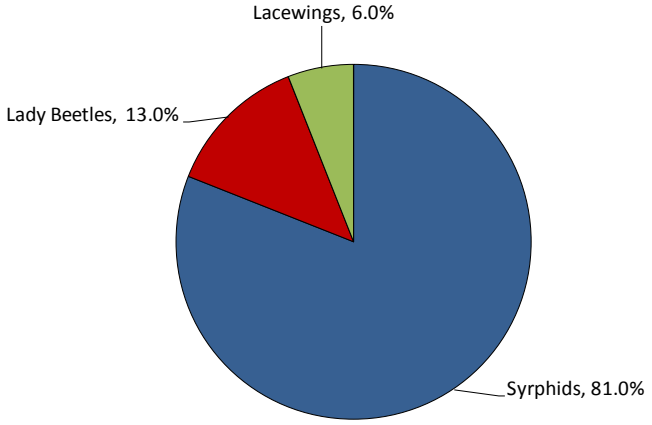


2008

***Aphelinus mali* only parasitoid found**



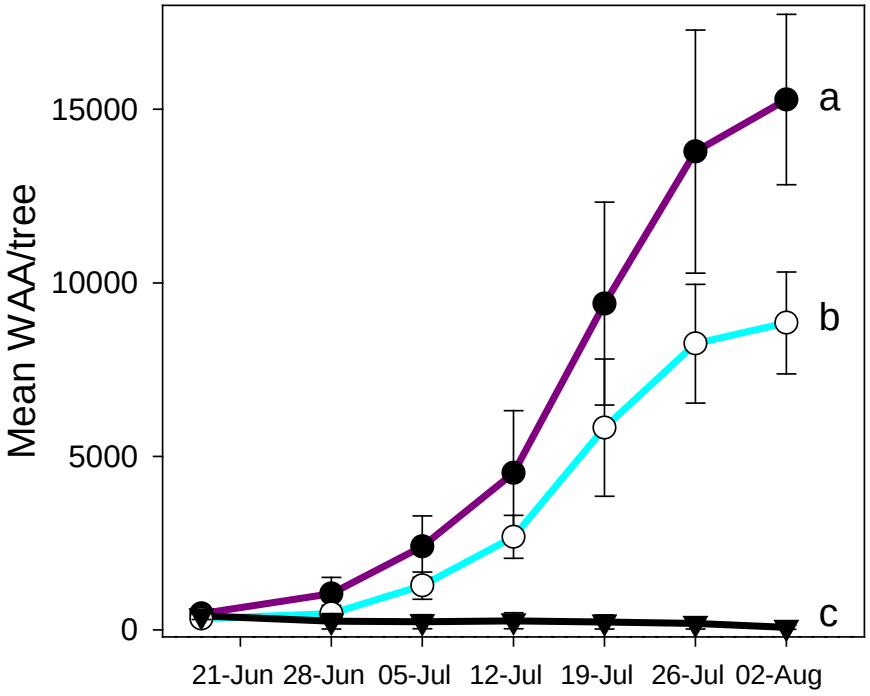
2006



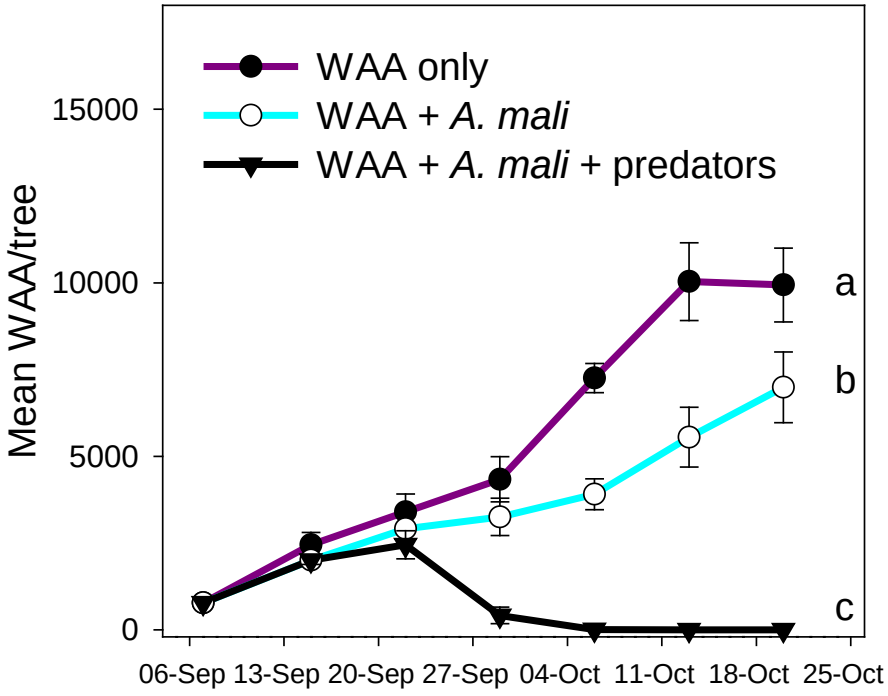
2007

Relative impact of predators and parasitoids

Mid-summer



Fall



Screening of flowering plants to attract syrphids

Sweet Alyssum

Buckwheat

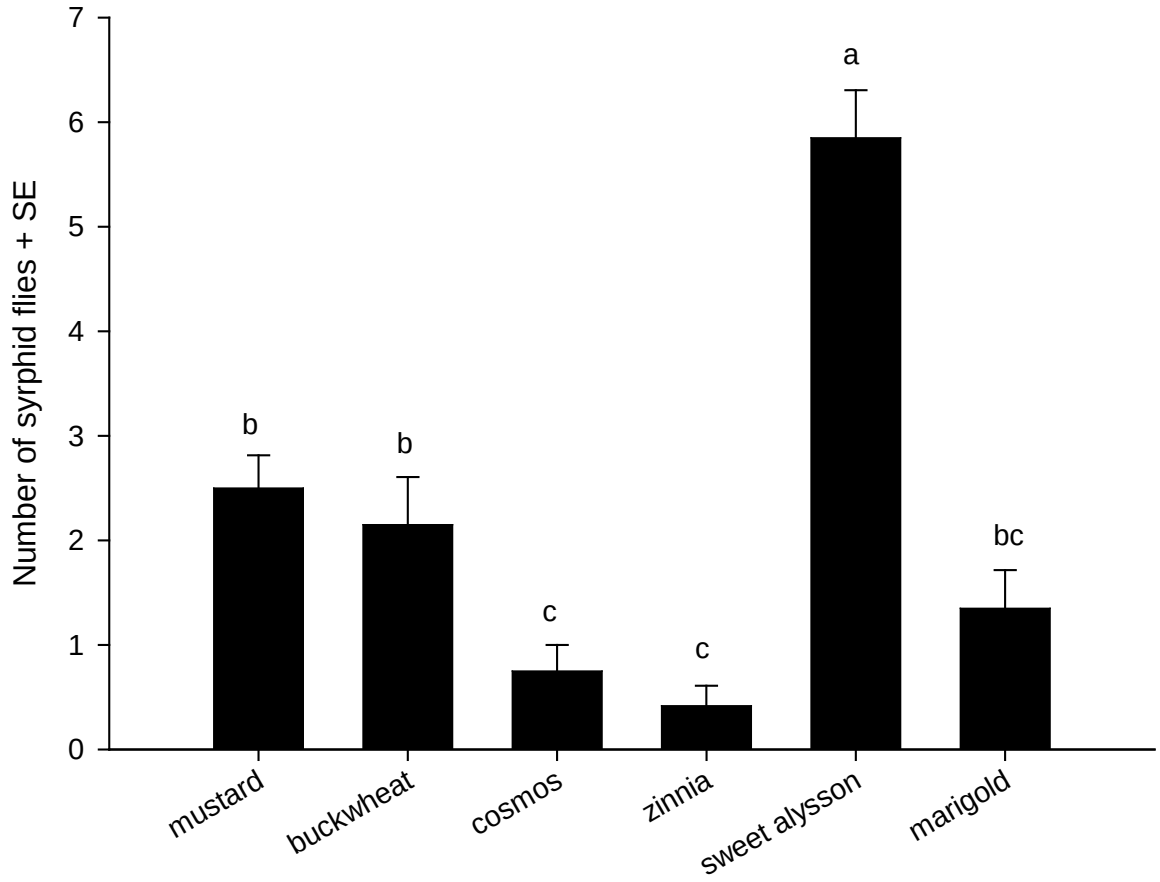
Mustard

Cosmos

Marigold

Zinnia

Attractiveness of different flowering plants species



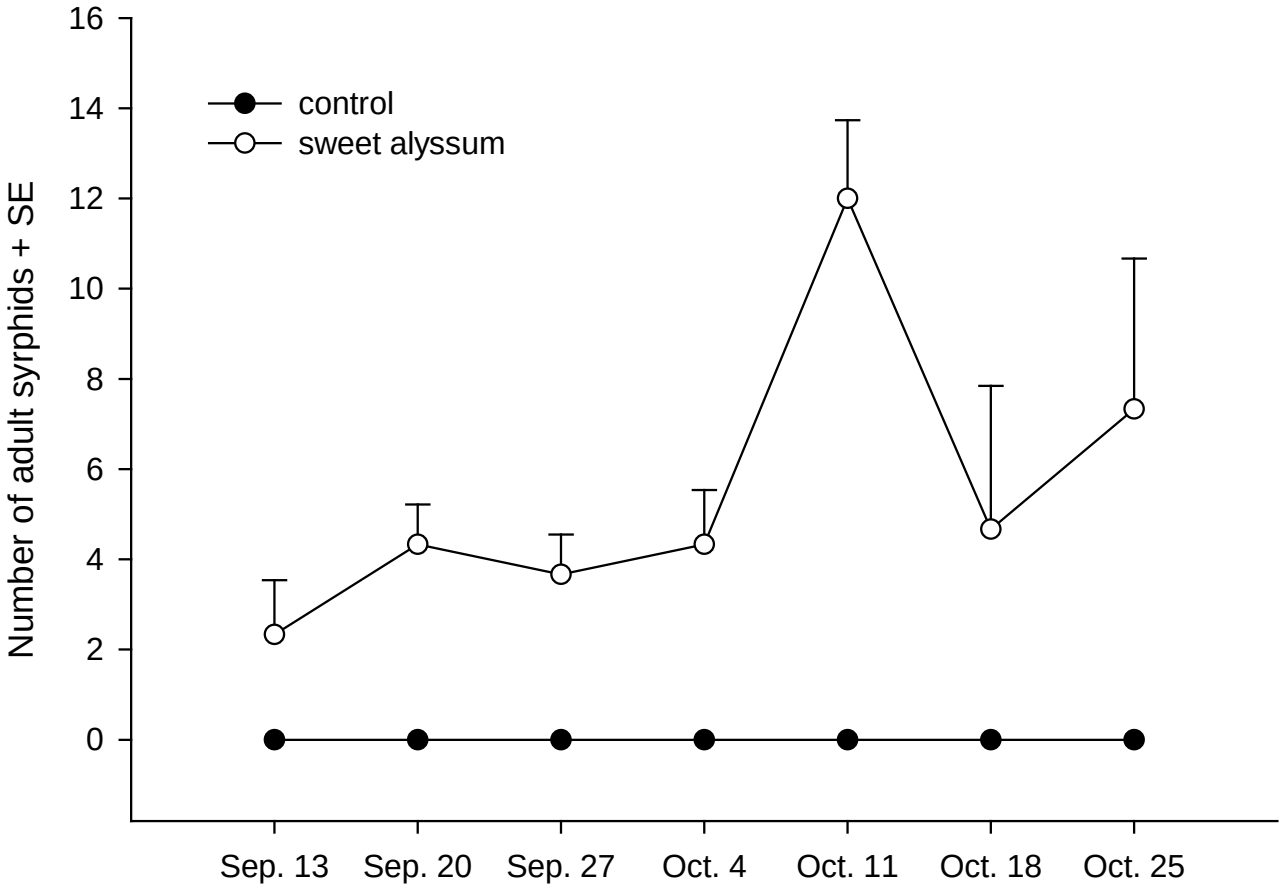
Alyssum Field Experiment

Control (grass)

Sweet Alyssum

Results

Number of syrphid flies observed in a 2-minute count



Alyssum – does it improve biocontrol of woolly apple aphid?