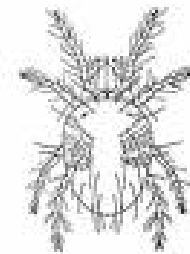
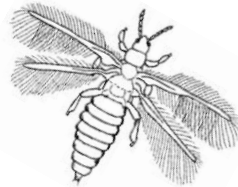


June 9, 2010

Umpqua Valley Grape Day

LIVE Biodiversity Panel

**Increasing Diversity in the Vineyard
and Biological Control of Pests**



Plant Diversity Inside
and Outside the Vineyard:

Cover crops
and

Riparian areas/Wooded habitat

Cover Crop Case Studies:

Do cover crops improve biological control in perennial crops?

1) Cover crops in orchards:

Lygus bug

2) Cover crops in vineyards:

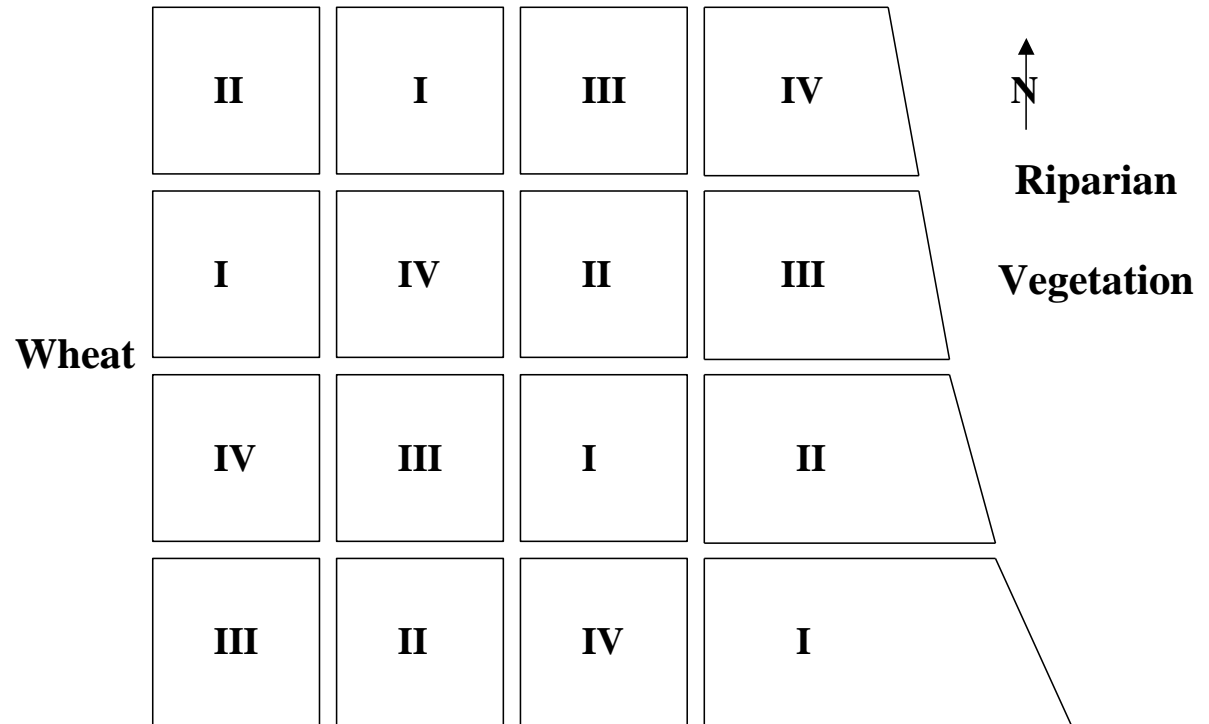
Grape leafhopper

Survey of IPM Orchards–Insects in the Groundcover (# per 50 sweeps)

2000	Early season	Mid-season	Late season
<u>Pest true bugs</u>			
<i>Lygus</i> nymphs	2.81	20.21	26.92
<i>Lygus</i> adults	0.81	7.38	7.80
<i>Calocoris</i>	0.11	0.38	0
Stink bugs	0.03	0.25	0.13
<u>Natural enemies</u>			
<i>Nabis</i>	0.53	3.88	7.14
<i>Orius</i>	0.22	4.21	3.54
<i>Geocoris</i>	0	0.44	0.54
Soldier beetle	0	0	0
Lady beetles	0.61	1.46	0
Lacewings	0.03	0.17	0.08
Earwigs	0	0.02	0

Groundcover Research Plot — Comparing four types of groundcovers

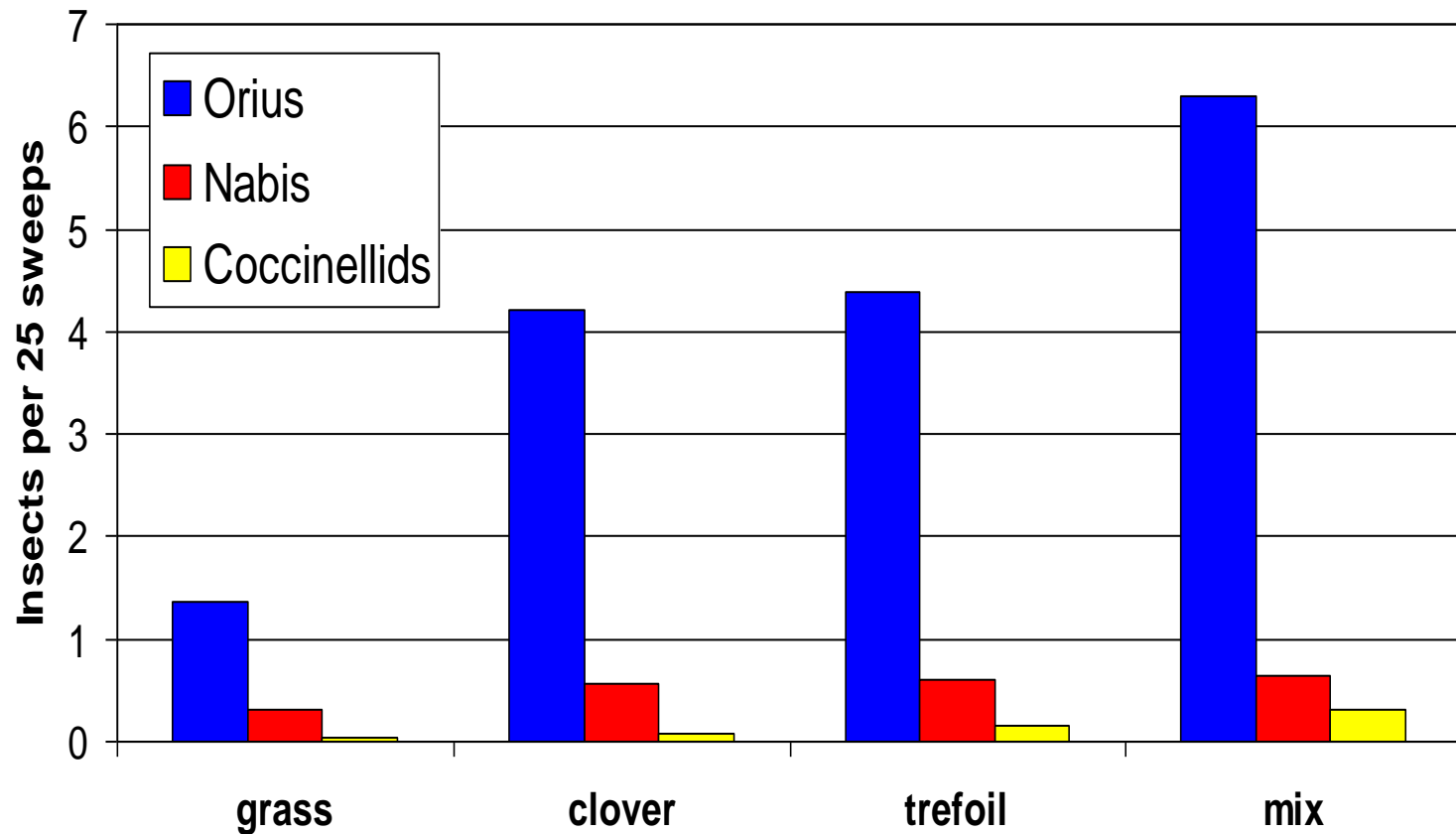
Existing Pear Orchard



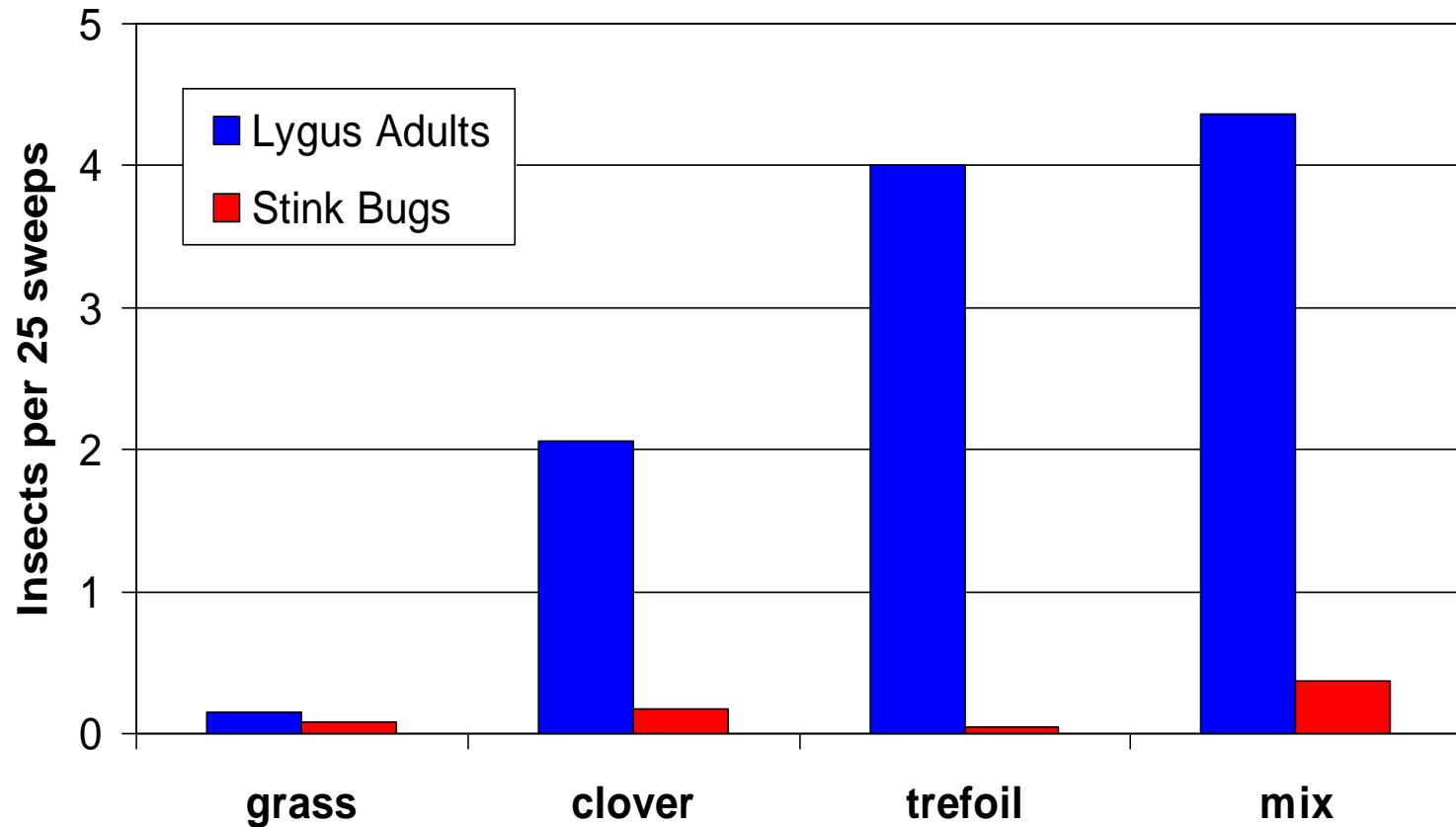
Alfalfa

- I—grass sod (fine fescue and perennial ryegrass)
- II—grass sod + white clover
- III—grass sod + birdsfoot trefoil
- IV—grass sod + clover + trefoil + ‘good bug blend’

Orius, *Nabis*, and Coccinellid Adults Collected in Sweep Net Samples from Groundcover Plot in 2001



Lygus Adults and Stink Bugs Collected in Sweep Net Samples from Groundcover Plot in 2001



Vineyard pests that can build up in a diverse groundcover:

Western Flower Thrips



Minute pirate bug
Orius feeding on thrips



Spider Mites



Willamette mite



Pacific mite



2-spot mite

What is the effect of a covercrop on grape leafhopper?



(Daane and Costello 1998)

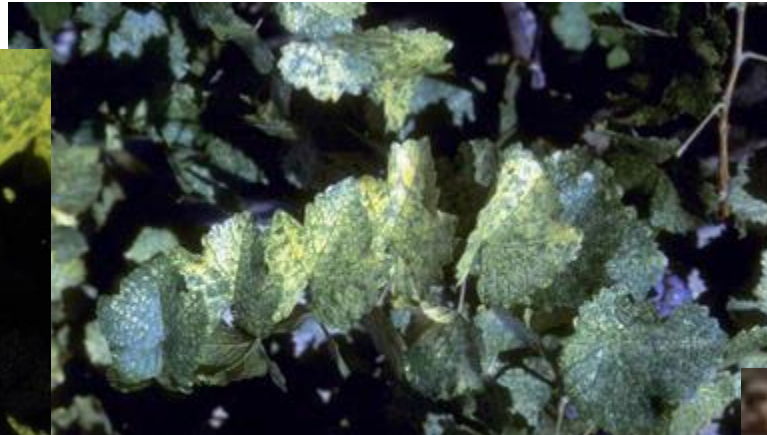
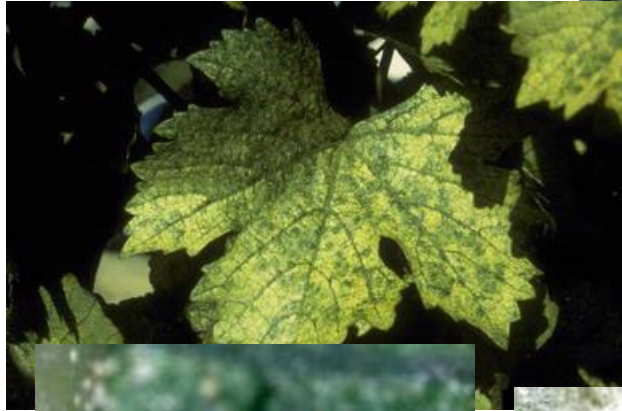
What is the effect of a covercrop on grape leafhopper?



- 1) Covercrops in vineyards reduced the numbers of grape leafhoppers**
- 2) Lower numbers of leafhoppers was not the result of more predators**
- 3) Grapevine growth and plant vigor is lower when a covercrop is planted**
- 4) Fewer leafhoppers are found on low vigor grapevines**

(Daane and Costello 1998)

Effect of surrounding vegetation on pest levels: grape leafhopper



Anagrus epos
egg parasitoid



Effect of surrounding vegetation on pest levels: grape leafhopper

- 1) More leafhopper problems in the central valley grape-growing areas than in the coastal valley areas of California
- 2) *Anagus epos* is a key parasitoid and needs habitat and an alternate host outside the vineyard to overwinter
- 3) Blackberries in riparian areas harbored an appropriate alternate host and were widely distributed in the coastal valleys resulting in good biocontrol of grape leafhopper in those areas but were not present in the central valley
- 4) Attempts to plant blackberries or other host plants to encourage biological control have had mixed success

Example of a pest that can come from surrounding wooded habitat:

Branch and twig borer

Branch and twig borer



Example of a pest that can come from surrounding wooded habitat:

- 1) Branch and twig borers are native insects that infest dead and dying wood but can occasionally attack live wood through wounds such as those caused by pruning**
- 2) Borers can move out of surrounding wooded habitat and woodpiles and can infest nearby vineyards, without proper management the borers have been known to cause extensive damage to grapevines**
- 3) Good sanitation with prompt removal or destruction of prunings and elimination of any infested vines is usually sufficient to effectively manage this occasional pest**

Conclusions

- A greater diversity of plant and floral resources will generally lead to greater diversity and numbers of natural enemies but, in some cases, can also lead to increased pest levels
- Cover crops can influence both pest and natural enemy populations via indirect effects relating to crop growth and microclimate
- Habitat modification with the aim of increasing biological control requires proper plant selection and site specific management