



# Biological Control of Pear Psylla

## In Areawide Organic Insect Pest Management

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WSU-TFREC



# Introduction

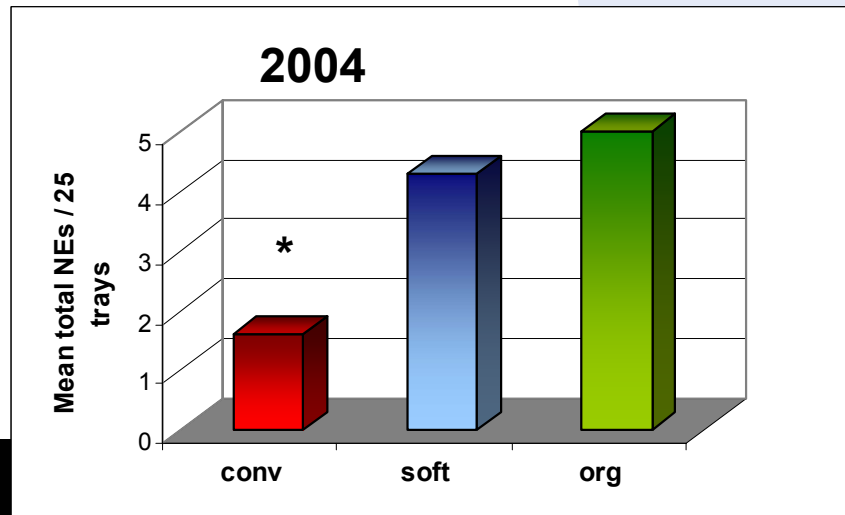
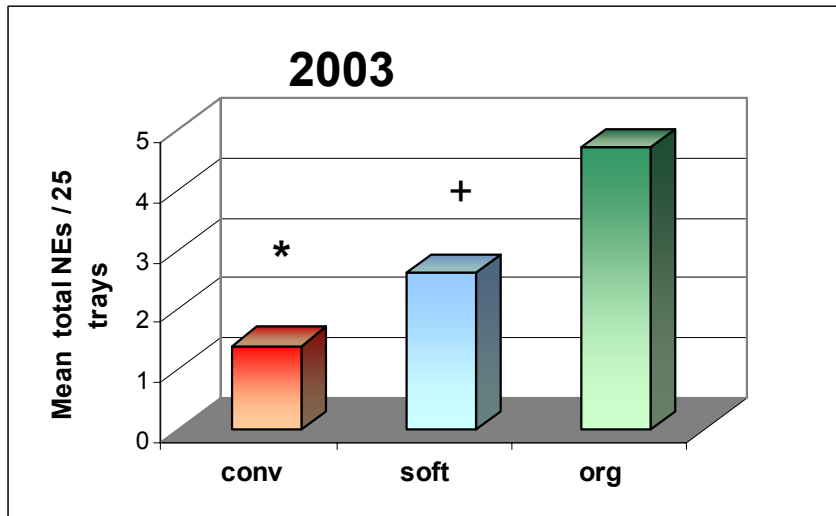
- **The role of predatory arthropods in Organic orchard pest control: the assumptions**
  - Less disruptive pesticides; beneficial insects more common
  - Natural enemies assist softer, less effective chemicals
  - Pest control is achieved by NEs
- **No direct documentation of levels of biological control in pear orchards**
- **Areawide organic pest management**
  - An opportunity to study predation where biological control is most likely to be observed

# Methods

- Pests and predators monitored at a **large scale** in **Peshastin Creek Areawide Organic Project—since 2002**
  - Narrow valley in central WA, ~ 300 ac. pear, surrounded by native veg.
  - Three treatments: Organic, Soft, Conventional
  - Beating tray samples from 41 plots, 2-10 acres each
- NEs monitored on **75 m transects—since 2003**
  - Nine sites, three in each management type (originally)
  - Perpendicular to orchard edge, extend 25 m into surrounding vegetation
  - Beating tray samples, five locations per transect
- Levels of predation monitored with **sentinel prey** on **some transects**
  - Flash-frozen *Ephestia* eggs on 1.5 x 0.75 in. cards
  - Monitored for mortality at 24, 48 and 72 h

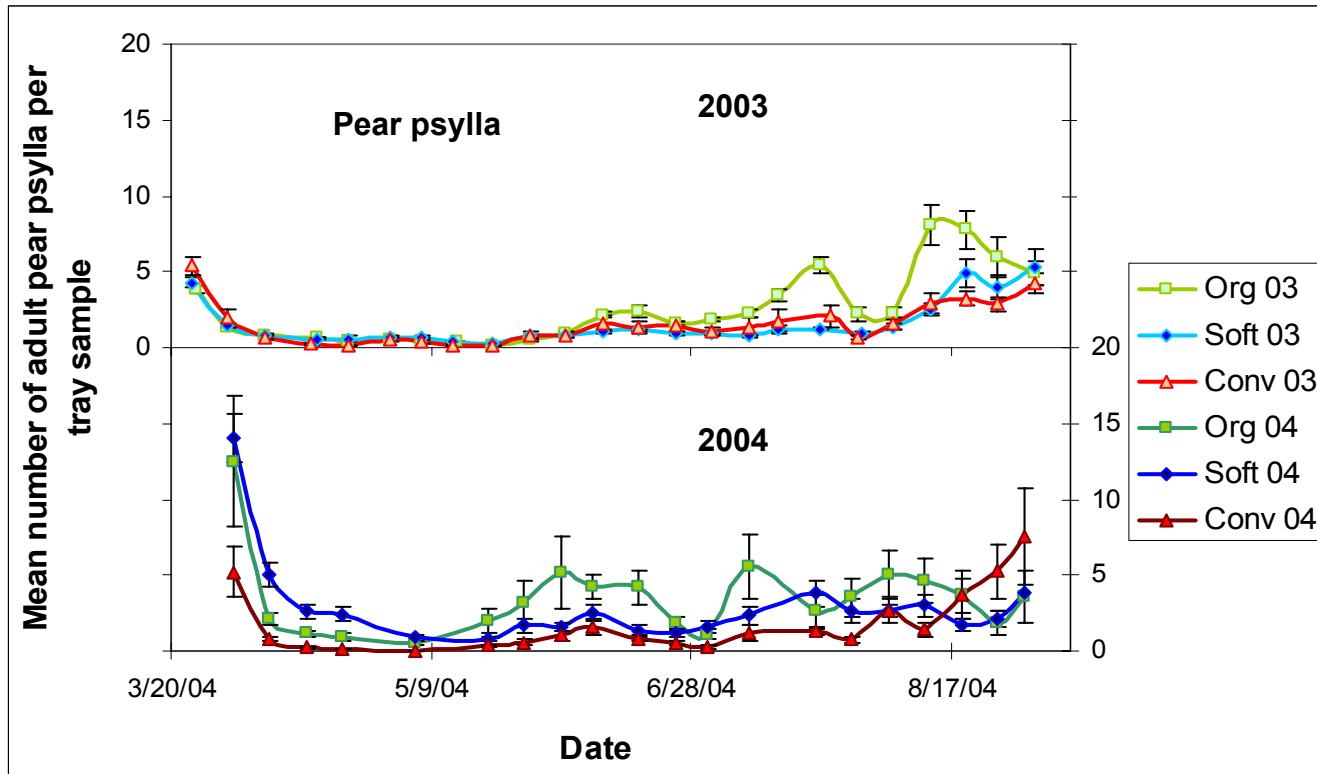
# Large Scale Sampling

- Natural enemy densities in Peshastin Project
- NE densities in Organic and Soft > than Conventional orchards



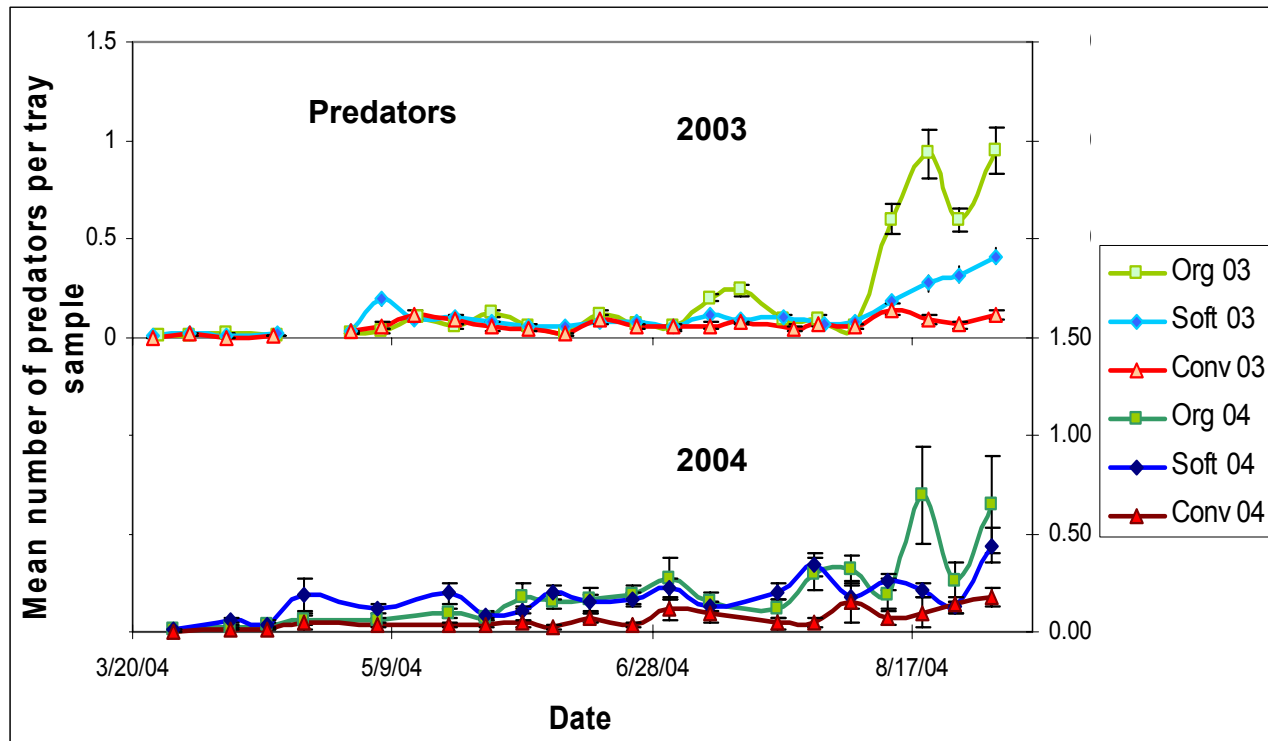
# Large Scale Sampling

- Pear psylla densities in Peshastin project



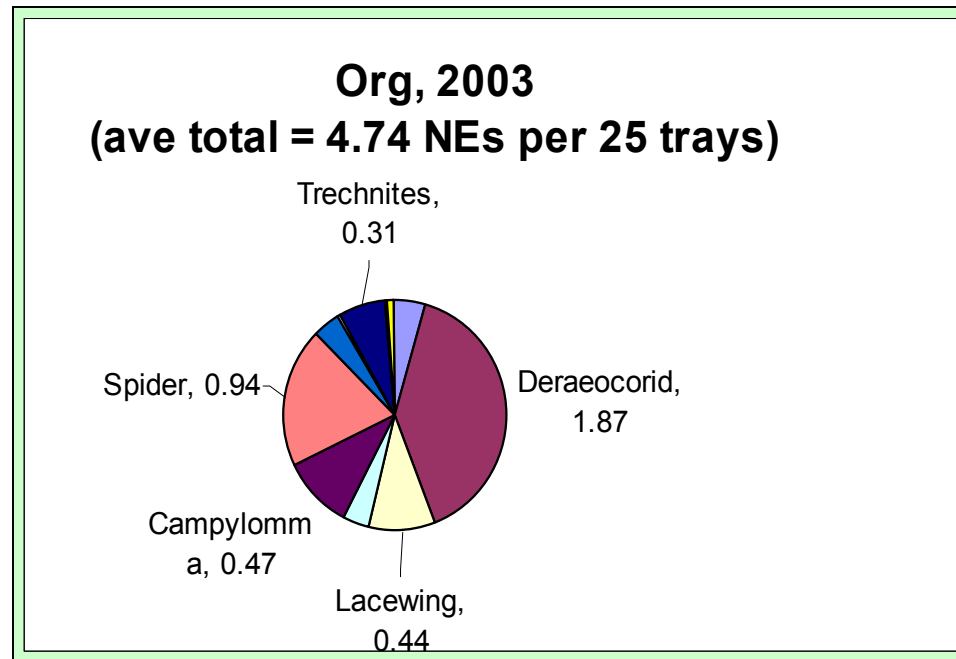
# Large Scale Sampling

- **Natural enemy densities in Peshastin Project**

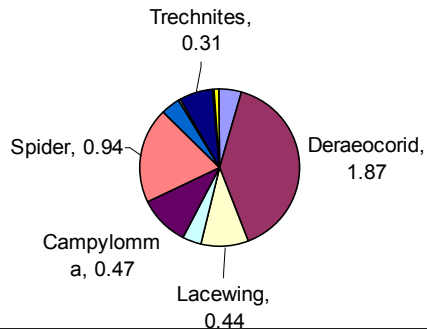


# Large Scale Sampling

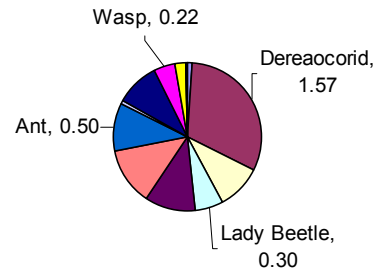
- Spiders, Deraeocorids, most numerous NEs



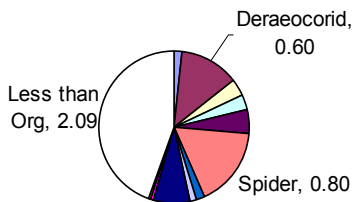
**Org, 2003**  
 (ave total = 4.74 NEs per 25 trays)



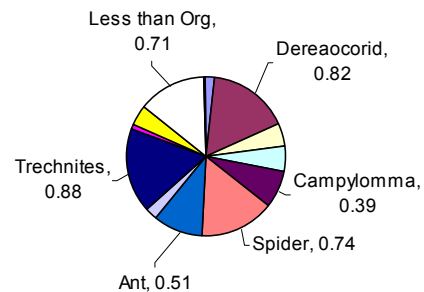
**Org, 2004**  
 (ave total = 4.98 NEs per 25 trays)



**Soft, 2003**  
 (ave total = 2.62 NEs per 25 trays)

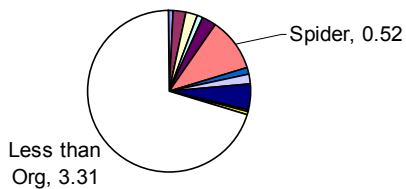


**Soft, 2004**  
 (ave total = 4.28 NEs per 25 trays)

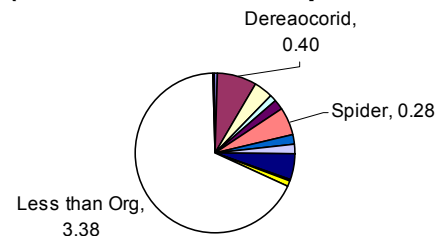


- Anthacorid
- Deraeocorid
- Lacewing
- Lady Beetle
- Campylomma
- Spider
- Ant
- Earwig
- Trechnites
- Wasp
- Snakefly

**Conv, 2003**  
 (ave total = 1.4 NEs per 25 trays)



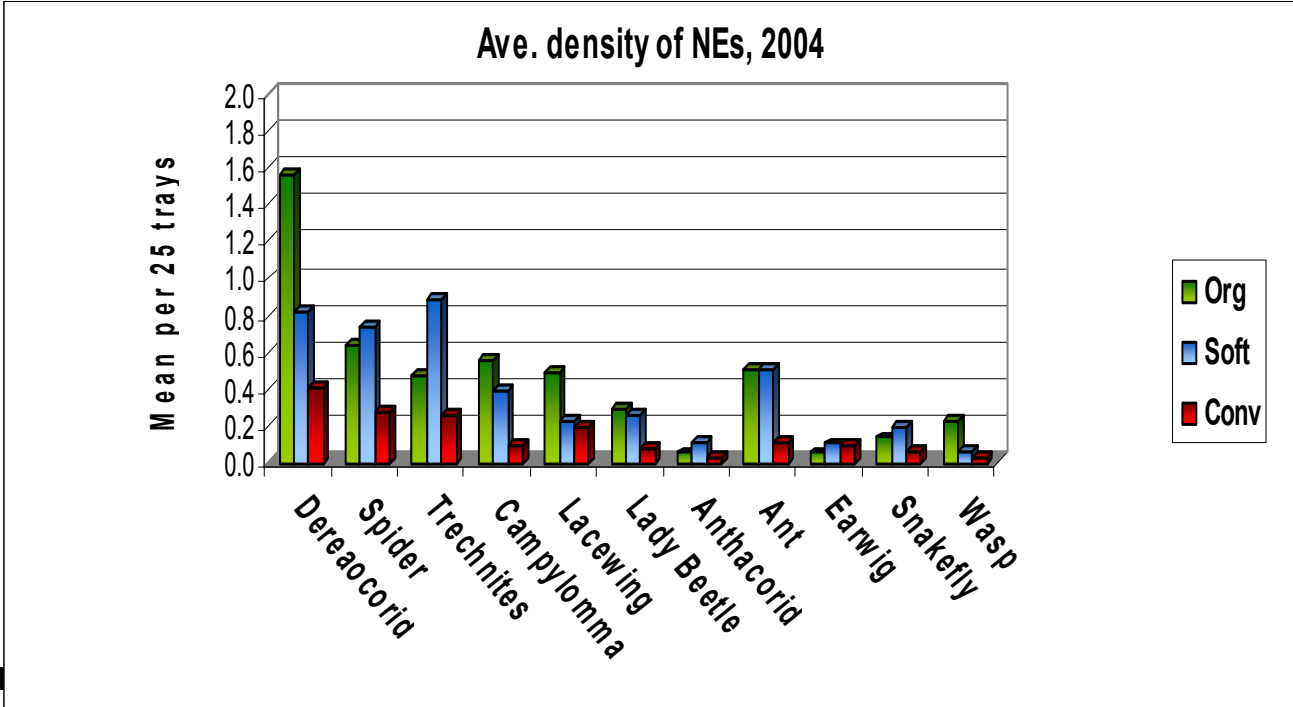
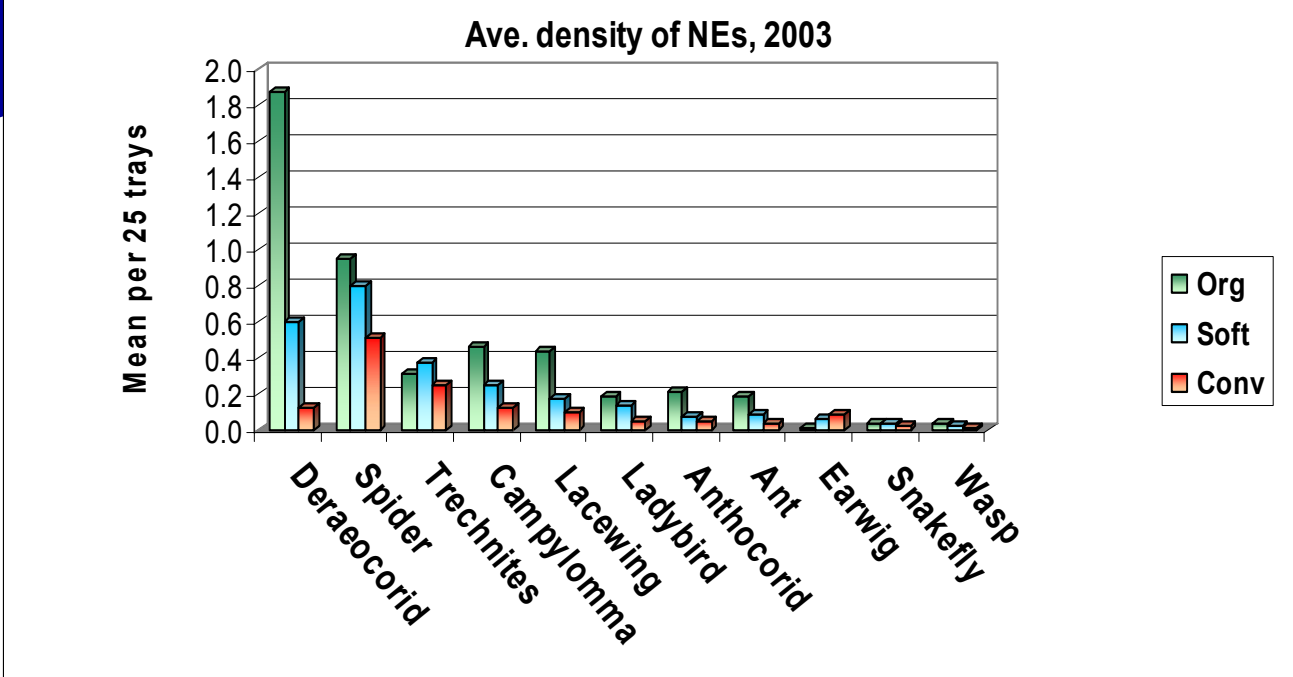
**Conv, 2004**  
 (ave total = 1.61 NEs per 25 trays)





# Large Scale Sampling

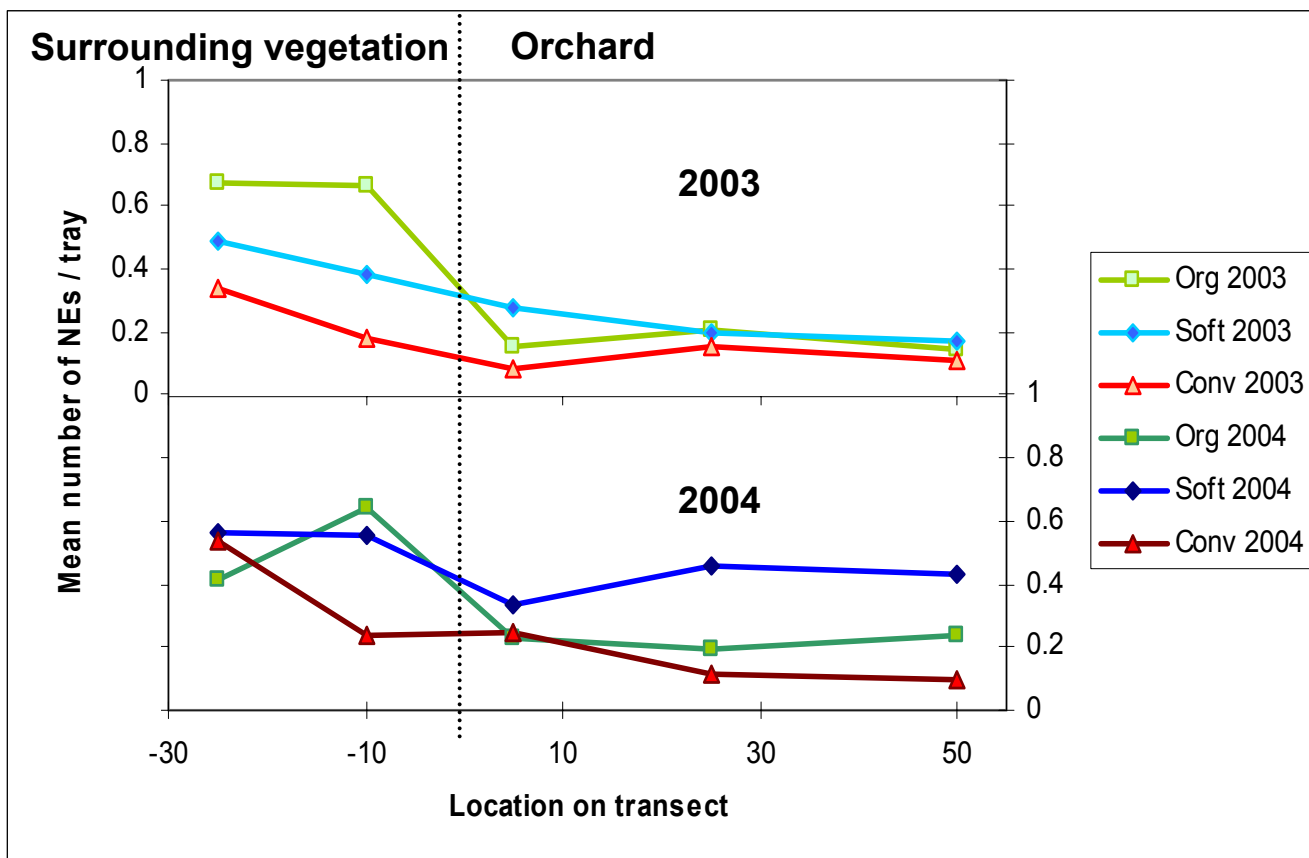
- **Predator composition changed only marginally between years**
- **NE density increased in Soft in 2004**



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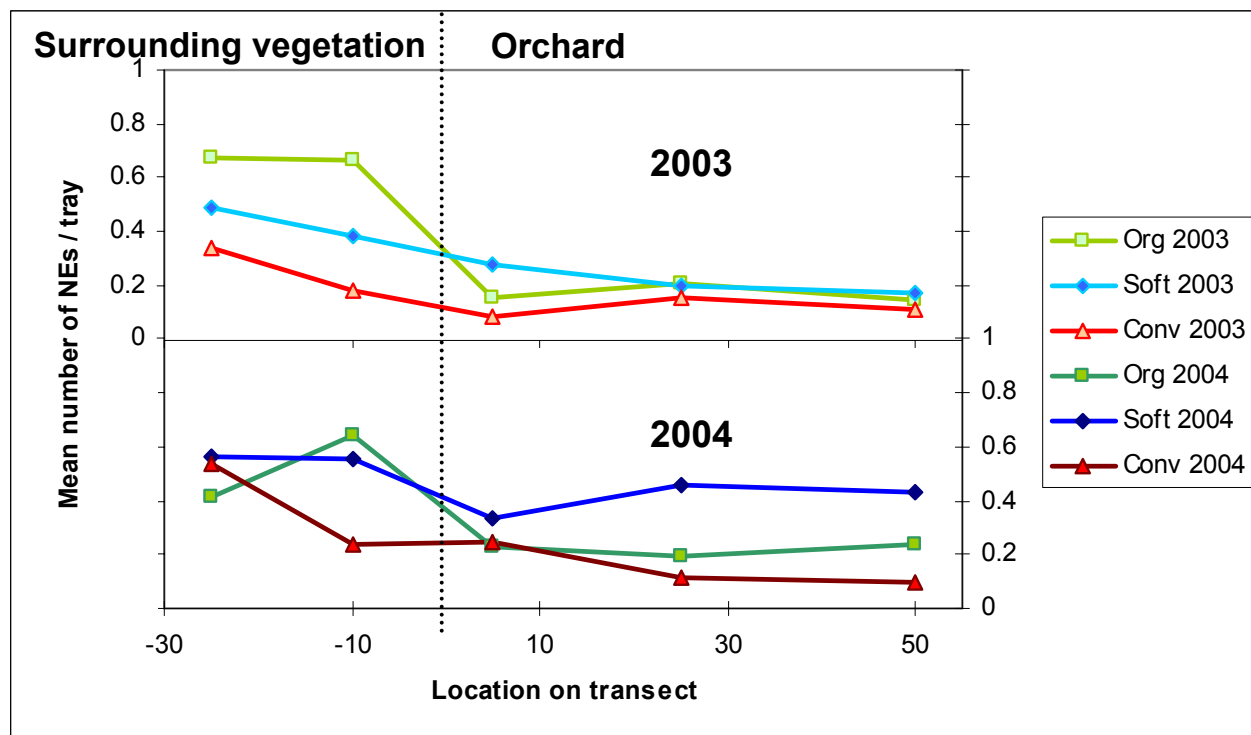
- **NE densities in Organic and Soft > than Conventional orchards**
- **Spiders, Dereacorids, most numerous NEs**
- **Predator composition changed only marginally between years**
- **NEs increased noticeably in Soft in 2004**
- **Soft and Organic pest control means more predators**
  - **Or maybe slightly higher pear psylla density means > NEs**
  - **Or maybe low economic threshold for control of PP limits NEs**
  - **Or maybe decades of chemical control have reduced the potential diversity of NEs permanently**

# Transect Sampling



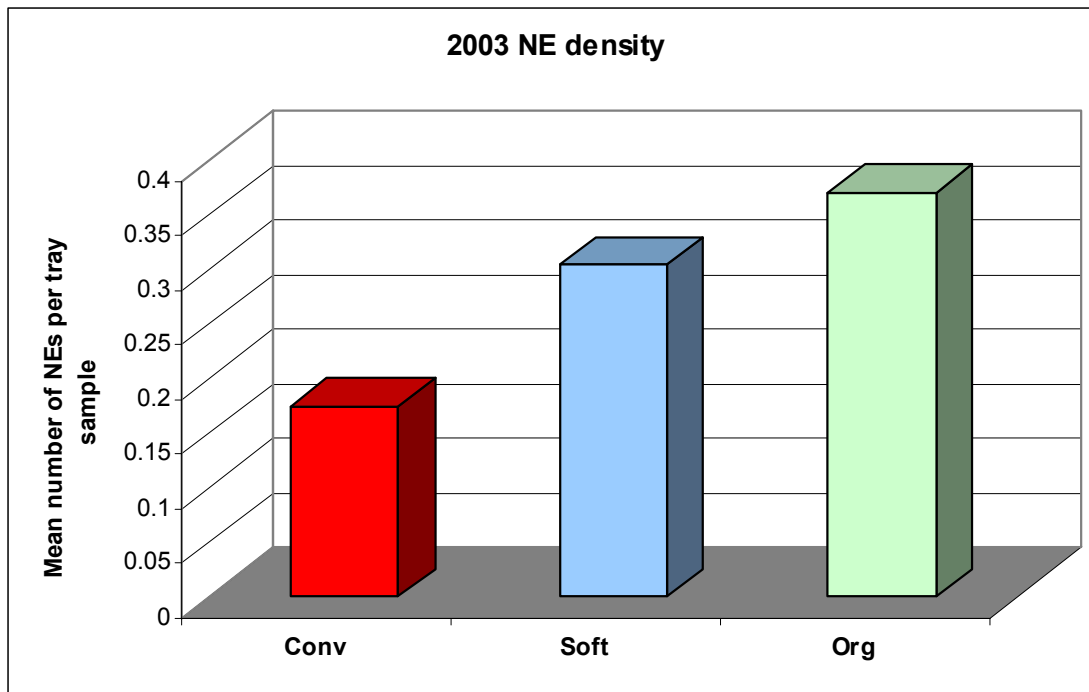
# Transect Sampling

- **Transect sampling reveals an uneven distribution of predators**
  - Consistently higher average densities in surrounding vegetation than within orchards



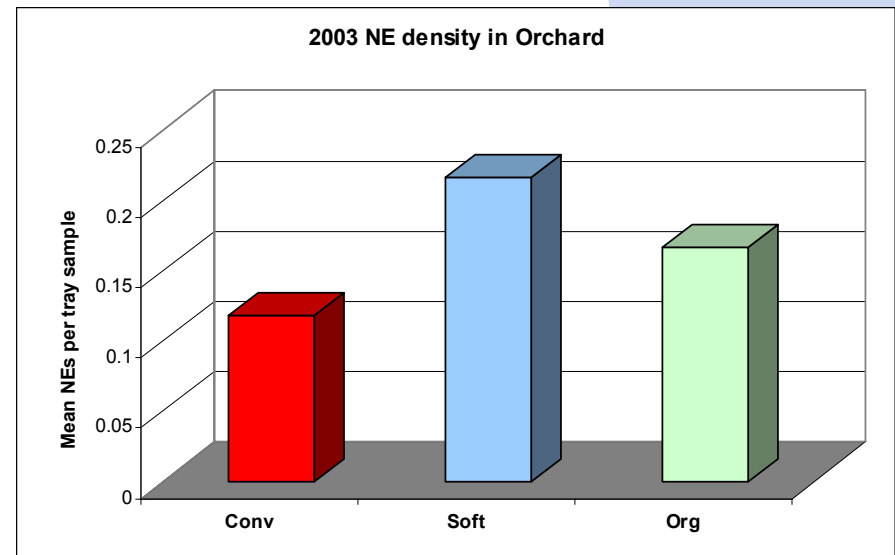
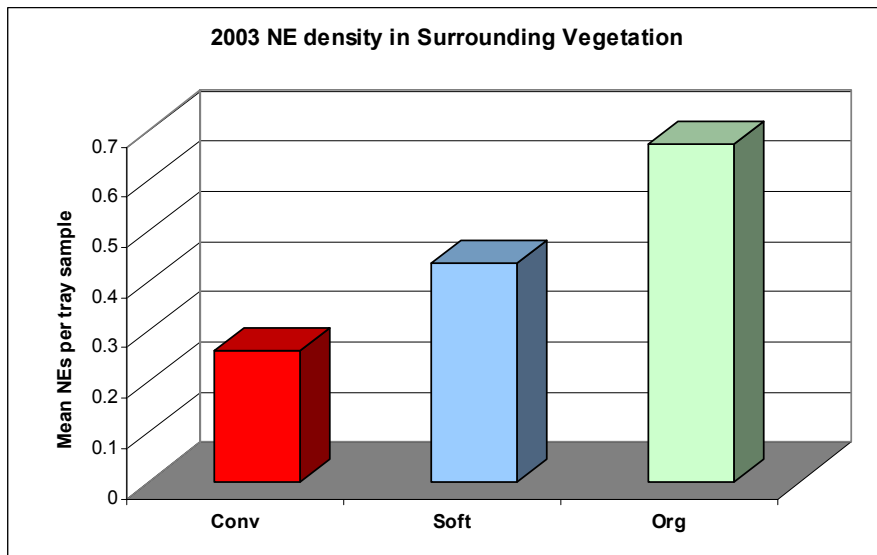
# Transect Sampling

- In 2003, NE densities in management types not significantly different from each other overall



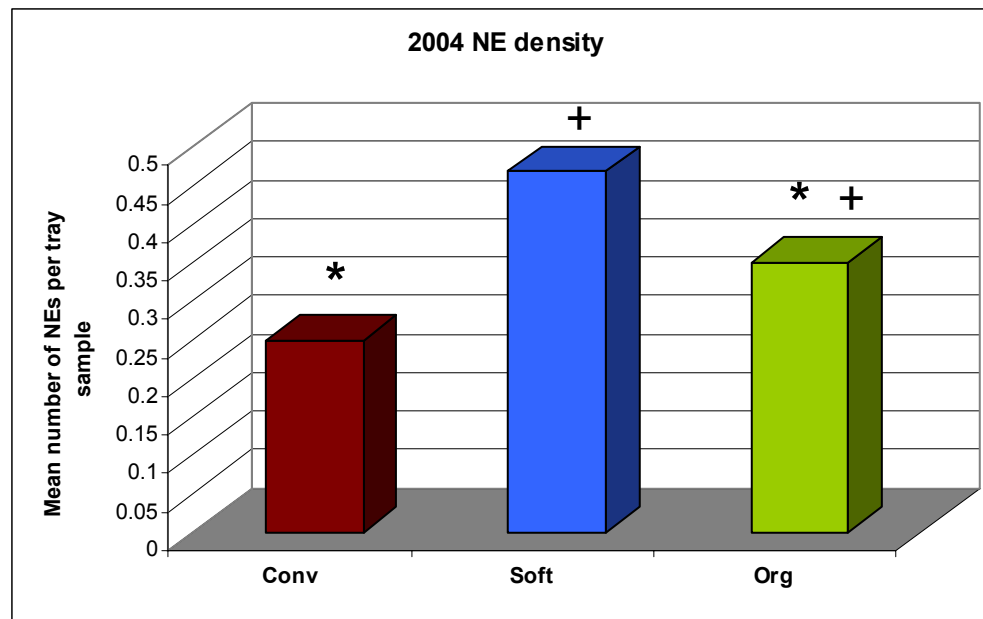
# Transect Sampling

- In 2003, NE densities in management types not significantly different from each other overall
  - In the **surrounding vegetation** levels were highest in Organic treatments and lowest in Conventional
  - In the **orchard**, Soft treatments had higher levels than Conventional treatments, with Organic intermediate



# Transect Sampling

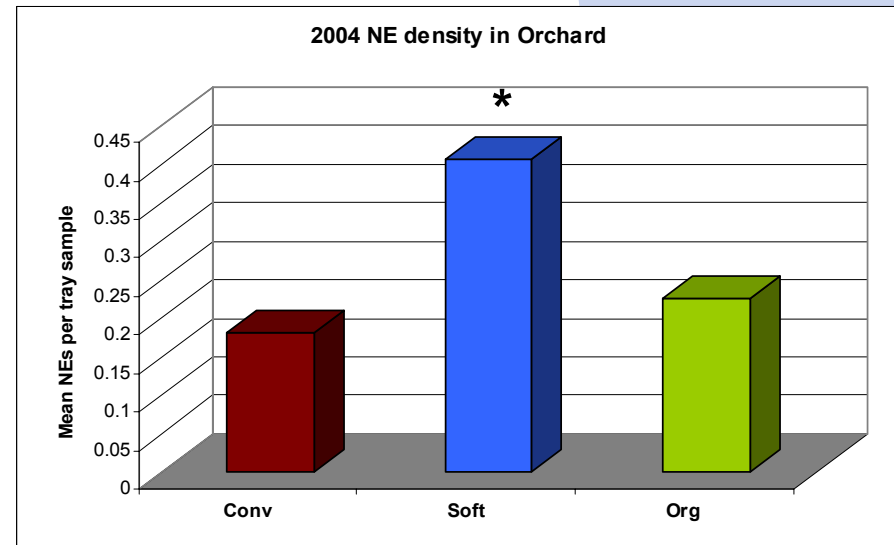
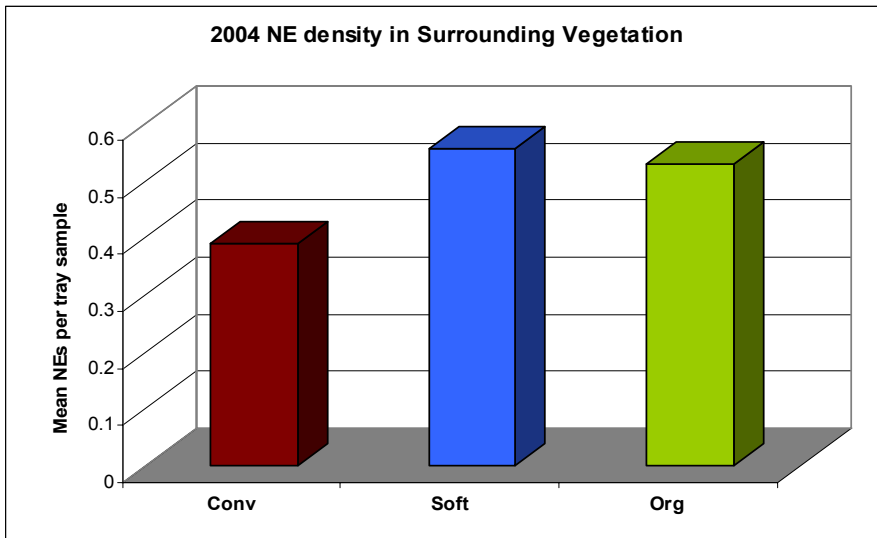
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# Transect Sampling

- In 2003, NE densities not significantly different from each other overall
- In 2004, Soft treatments had more NEs overall than Conventional, with Organic intermediate
  - The **vegetation** showed no differences between treatments
  - In the **orchard**, levels in Soft treatments were significantly higher than in other treatments



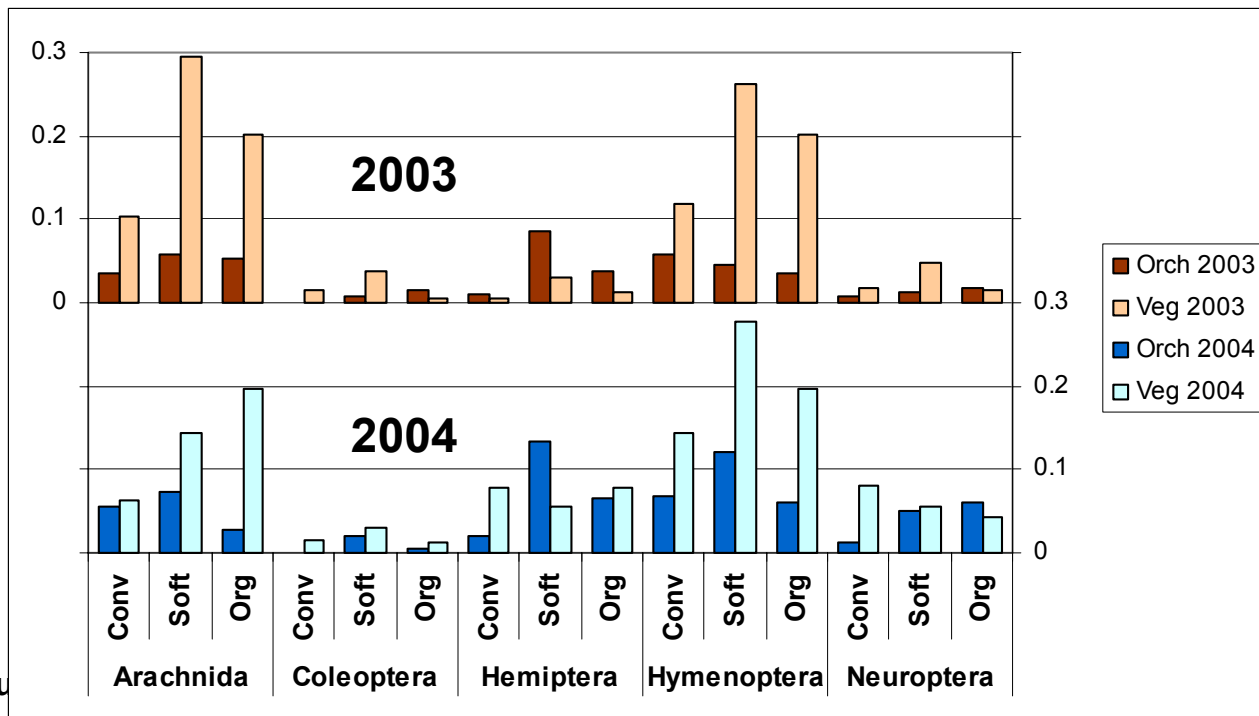
# Transect Sampling

- **The predators tend to vary by habitat type**
  - Spiders were the most common NEs in both habitats
  - Dominant NEs in the Orchard were
    - Green lacewings
    - *Deraeocoris*
    - *Trechnites*
  - The Surrounding Vegetation supported
    - more ants
    - Ladybird beetles
    - Snakeflies
    - *Geocoris*
    - *Nabidae*



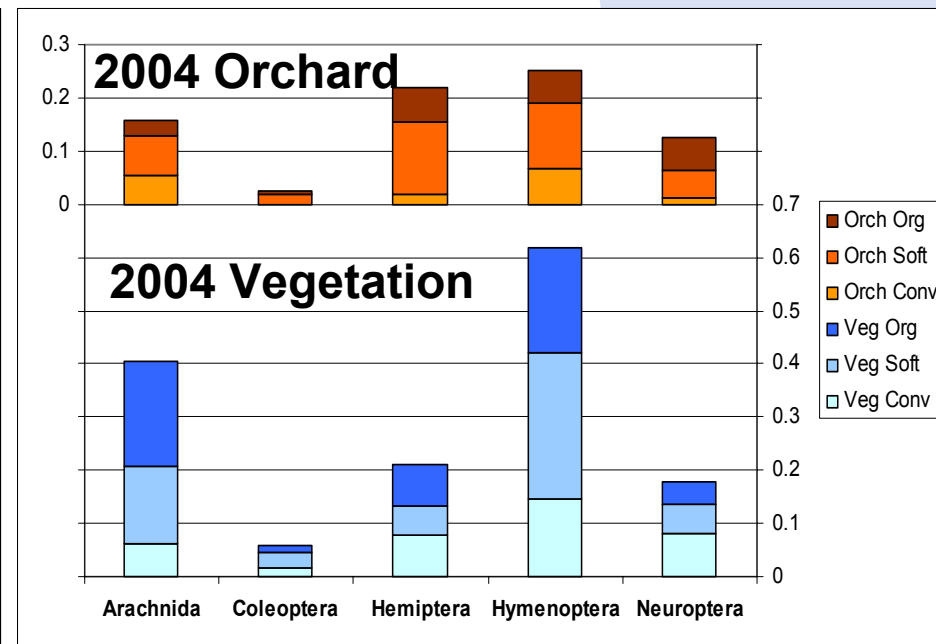
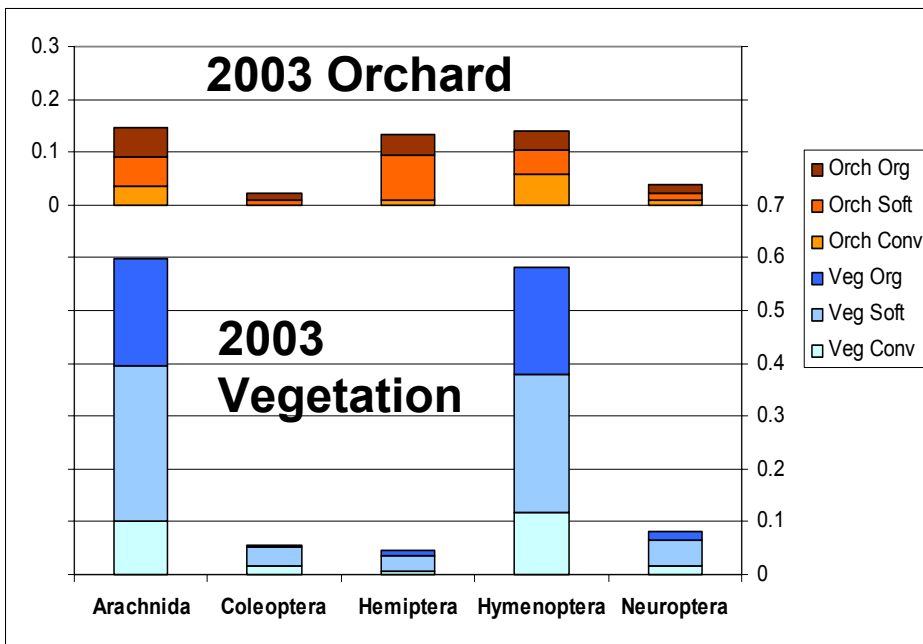
# Transect Sampling

- Two orders with consistent differences in density between surrounding vegetation and orchard
  - Arachnida
  - Hymenoptera
  - Higher in the surrounding vegetation in all treatments



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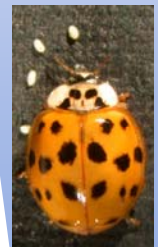
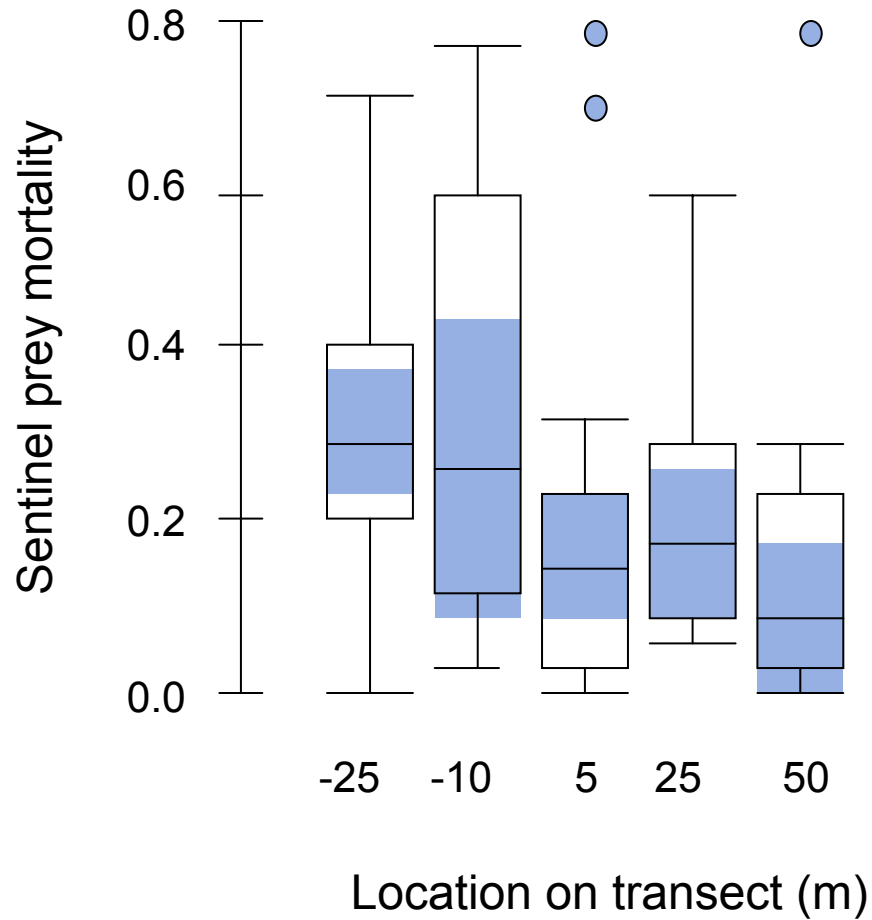
# Transect Sampling

- In 2003, the management types not significantly different overall
- In 2004, Soft treatments had more NEs overall than Conventional, with Organic intermediate
- An uneven distribution of predators
- Predators differ by habitat type
- Soft and Organic programs have more NEs
  - Increase is due to extended use of Soft/Org chemicals
  - Increase is a seasonal anomaly

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- **Results from the sentinel prey predation and exclusion cage study consistent with results from transect monitoring**
  - **Predation tended to be greater in surrounding vegetation**



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- **Results from the sentinel prey predation and exclusion cage study consistent with results from transect monitoring**
  - Predation tended to be greater in surrounding vegetation
- **Levels of potential predation, based on mortality of sentinel prey over 24 to 96h, tended to be**
  - Higher in surrounding vegetation than in orchard habitat
  - Did not vary consistently by distance within a habitat type
- **Predation levels were relatively low in general**

# Conclusions

- **Soft and Organic programs do tend to lead to increased numbers of NEs**
  - Differences vary with the season, and might be slight or negligible
- **Increased NE density might reflect  $\Rightarrow$  PP density as much as selectivity of program**
- **Upper limit of NE density is determined by PP density**
  - Economic threshold for control of PP is quite low
- **The use of even cert. Organic sprays, including oils, may limit density and diversity of NEs**

- **All results are preliminary, and research will continue in 2005.**
- **Thanks to:**
  - **The Peshastin Creek Growers Association**
  - **Washington Tree Fruit Research Commission**