# BIOLOGICAL CONTROL
# of Pear Psylla in Areawide Organic Insect Pest Management

**Tara M. Madsen and John E. Dunley**
**Washington State University—Tree Fruit Research and Extension Center**
**Wenatchee, WA 98801**
**http://entomology.trfec.wsu.edu/pearent**

WASHINGTON STATE UNIVERSITY
*World Class. Face to Face.*

## Introduction

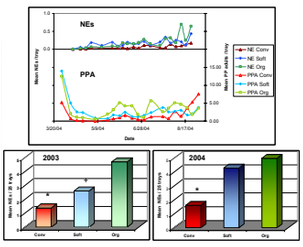
**In Organic pest management, predatory arthropods are considered important in controlling pest populations in the orchard. Because the pesticides used are less disruptive, a greater density of beneficial insects is expected. These natural enemies (NEs) in turn assist the softer (and less effective) chemicals in pest control. Yet, there is little documentation by direct measurement in the field of levels of biological control in pear orchards.**

**Pear psylla, *Cacopsylla pyricola* (Foerster), is an economically important pest in pear, with many known NEs. A better understanding of the interactions between potential biological control and the chemical control used in organic and soft programs to control pear psylla, as well as interactions with surrounding vegetation, could increase the efficacy of such pest management programs.**

**The development of areawide organic pest management offers an opportunity to study predation in a situation where biological control is most likely to be observed.**

Fig. 1. Weekly mean densities of NEs and pear psylla adults in '04, in orchards under Conventional, Soft or Organic pest management
Fig. 2. Comparison of mean numbers of NEs in orchards over entire season, in 2003 and '04.


Spring in the Peshastin Creek Valley

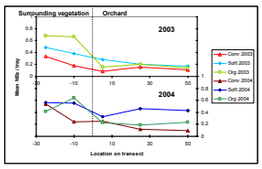



Pear psylla nymph, one of the major pests in pear


Green lacewing adult, one of many predators

Fig. 3. Mean seasonal densities of predators at five transect distances in the 2003 and 2004 field seasons, on transects under one of three different pest management types. Locations with values less than 0 are in the surrounding vegetation, values greater than 0 indicate locations inside orchard boundaries.


View from 0m into orchards on two transects





Sampling with beating trays in the orchard and surrounding vegetation

## Methods

**In spring of 2003, we established monitoring sites in the Peshastin Creek Valley. This narrow valley, on Hwy 97 in central Washington, supports approximately 300 acres of pear and is surrounded by native vegetation. Predators were monitored at a large scale beginning in '02.**

**Within our monitoring area we chose nine sites, three in each of three management types—Conventional, Soft and Organic—and established sampling transects crossing from surrounding vegetation into orchard. We used beating trays to sample these transects for natural enemies.**

**Levels of potential predation were monitored with sentinel prey placed at some transects.**

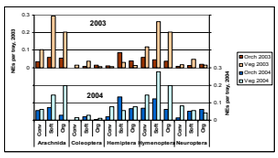
## Results and Discussion

**Large scale sampling showed that in 2003 and '04, although NE density was low, soft and organic orchards had significantly greater overall numbers than conventional. In '03, these differences did not develop until late summer. In '04, soft orchards supported more NEs than conventional from the beginning of the season; organic levels rose above conventional in June.**

**Late season increases in NE numbers corresponded to increases in late-season pear psylla populations, suggesting that the low economic threshold for control of pear psylla limits NE density nearly as much as the use of non-selective pesticides.**

**Transect sampling revealed an uneven distribution of NEs, with consistently higher average densities in surrounding vegetation than within orchards. In 2003, the management types did not harbor levels of NEs significantly different from each other overall. In the surrounding vegetation, levels were highest in Organic and lowest in Conventional; in the orchard, Soft had higher levels than Conventional, with Organic intermediate. In '04, Soft had more NEs overall than Conventional, with Organic intermediate. The vegetation showed no differences between treatments; in the orchard, levels in Soft were significantly higher than in the other treatments.**

Fig. 4. Comparison by Order of mean level of predatory arthropods in orchard and surrounding vegetation in 2003 and 2004, on transects under Conventional, Soft and Organic pest management.

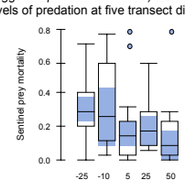



**The NEs which comprised the communities along the transects tend to vary by habitat type. Spiders were the most dominant NE in both habitats. The dominant NEs in the orchard were green lacewings, *Deraeocoris* and *Trechnites*, while the surrounding vegetation supported more ants, ladybird beetles, *Geocoris*, *Nabidae*, and snakeflies. Examination of orders showed Hymenoptera and Arachnidae to be the only orders that showed consistent differences in densities between surrounding vegetation and orchard, being higher in the surrounding vegetation in all treatments both years.**

Fig. 5. Box plot of mortality of sentinel prey (flash frozen eggs of *Ephestia kuehniella*) after 24 h, using Schneider-Orelli's correction for control mortality, showing median levels of predation at five transect distances.


Cards holding sentinel prey, exposed to predators (and exclusion controls) in orchard and surrounding vegetation


Predators eating sentinel prey in laboratory trials (CW from top: green lacewing larva, ladybird beetle, *Campyloma*)





Cards of sentinel prey being prepared in the field

**Results from the sentinel prey predation study were consistent with results from transect monitoring. 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, and did not vary consistently by distance within a habitat type. Predation levels were relatively low in general.**

**All results are preliminary, and research will continue in 2005.**

**Thanks to:** **The Peshastin Creek Growers Association, Washington Tree Fruit Research Commission**