Wenatchee Valley Pear IPM Project (WVPP)
2001 Summary Report

Ted Alway
TC Alway Consulting
P.O. Box 385
Peshastin, WA 98847
bugs@rightathome.com

The Wenatchee Valley Pear IPM Project (WVPP) seeks to demonstrate, in commercial orchards, the increased use of biological control of key pear pests to develop more effective and economical pest control programs. 2001 was the final year of the three-year project. The Washington Tree Fruit Research Commission and the Washington State Commission on Pesticide Registration provided funding for this year.

This report presents data from the 2001 season. An additional report, "The Wenatchee Valley Pear IPM Project, 1999-2001: Lessons from Soft Pest Management Programs", contains summaries and analyses of the entire three-year period.

Participants

Fifteen growers participated in Year 3 of the WVPP, providing 17 pear blocks (Table 1). Fourteen blocks were in their third year with the project. There were 3 new blocks in 2001(12D, 16C and 16E). One block (10) left the project after the grower sold the orchard. The pear blocks were located throughout the Wenatchee Valley, from the western edge of the City of Wenatchee to just outside of Leavenworth. Anjou pear was the cultivar sampled in each orchard.

The blocks varied considerably in their surroundings (native vegetation vs. orchard, narrow canyon vs. extensive farmed area). Their location and proximity to native habitat often has a large bearing on their pest situation, as the native lands serve as both a source many natural enemies as well as some pests (stink bug, box elder bug, green fruitworm).

Sampling Methods and Reporting

Every block was sampled weekly beginning in mid March, before the first sprays were applied, and continuing until the end of August, just prior to D'Anjou harvest. In addition, all blocks were sampled again in October after harvest, resulting in 25 to 27 monitoring visits per block. The sample methods varied with the stage of development of the pests and crop. The sample data from each visit was recorded on a monitoring form and sent the same day to the grower and associated fieldmen. This prompt turnaround time allowed the grower to closely monitor the development of pests and natural enemies and use the information in making pest control decisions. Ted Alway, WVPP coordinator, and Lisa Green, WVPP IPM technician, did all sampling. No pest control recommendations were provided by the WVPP. A monthly newsletter was sent to all participants, presenting information on pests, natural enemies, pest control options and WVPP developments.

PEST CONTROL PROGRAMS

The growers managed their pest control programs using the information provided by the WVPP and the advice of their consultant(s). All growers were interested in encouraging the development of more biological control in their orchards and balanced this with the risk of pest-caused fruit damage. Consequently, no two blocks followed the same spray program (Table 2).

Again, the blocks were put into two categories, based on their spray programs:

1) "Conventional" blocks (seven sites) used broad-spectrum insecticides before and after bloom for pear psylla and mealybug control. These materials included AgriMek (five growers), organophosphates (4 growers), neonicotinyls [Actara and Provado] (3 growers) and Pyramite (1).
2) "Soft" blocks (ten sites) avoided the materials above for psylla and mealybug. For psylla control sprays, these growers mostly relied upon a pre-bloom Surround (8 growers), azadirachtin [Ecozin, Aza-Direct] (5), Esteem (4), and foliar oil (9). Four of the eight growers managed their block organically, up from three in 2000 and two in 1999. Eight of these blocks were under a soft pest management program in 1999 as well.

The distinction between "conventional" and "soft" is increasingly blurred. Within the WVPP, at least, the programs have tended to merge. Among the seven conventional growers, seven applied 1% foliar oil at least twice, six used prebloom Surround, three used Esteem and two applied an azadirachtin formulation, all frequent components of soft pear pest management programs. Conversely, two soft growers applied organophosphates after bloom (one for codling moth, one for grape mealybug).

The costs of the different programs are summarized in Table 3. The soft blocks generally had less expensive programs than the hard ones (soft average material cost was $396/acre, conventional average was $500). The average cost difference between programs decreased by over $130 due to cost savings in the conventional blocks in 2001. This resulted from less insecticide use, particularly of several costly spray materials (Pyramite, Provado and Savey), and the loss of the most expensive grower (#10). The greatest cost savings from 2000 was in #12; his costs dropped $257 as he switched from a conventional to a soft program. Four of nine soft blocks

had costs increase from 2000, mostly due greater Surround use and the introduction of repeated applications of azadirachtin sprays (Ecozin and Aza-Direct). The soft blocks had an average of 8.6 spray applications, and the conventional blocks had 6.3 sprays.

Successful pest management in Wenatchee Valley pear orchards is not possible without pesticide use; biological control alone is not sufficient. The type, rate and timing of the pesticides used have a great impact on the extent of biological control. Several pesticides used in soft programs warrant further comment:

Surround- it was again used in almost all block, soft or conventional, and exclusively prebloom this year to reduce psylla adult numbers and egg laying. Use rates increased, with an average in all blocks of 145#/ac applied in 2001, compared with 98# the year before. Individual sprays were applied at rates from 50# to 100#/ac. No greater reduction in psylla numbers was seen with rates above 50#. The average reduction in counts by one spray was 50-70%, the same as in 2000. Good coverage and repeated sprays, to maintain the repellent barrier, provided the best control. Adding oil to Surround increased psylla control, generally providing an additional 10-20% drop in adult counts.

Foliar oil- the use of post bloom oil sprays has become widespread in the Wenatchee Valley. Soft and organic growers now rely more upon oil for post bloom psylla and mite control. Many conventional growers are applying oil, often at a 1% rate, with other foliar insecticides. Within the WVPP blocks, soft growers in 2001 applied an average of 6.8 gallons of oil from popcorn timing on, in 5.3 sprays; this is up from 5.5 gallons in 3 sprays in 1999. The WVPP conventional growers in 2001 applied an average of 3.1 gallons, in 3 sprays. Several oil formulations are used, that range from 80-96% oil and in cost from ca. $2.50 to $13.00/gal. No fruit or leaf marking was observed in these blocks in 2001. Concerns remain with the possible weakening of fruit spurs and reduction of tree vigor with multiple oil applications over several years.

Azadirachtin -Several formulations were used by WVPP growers in 2001, including Ecozin, Neemix and Aza-Direct. All contain azadirachtin as the active ingredient, derived from the neem tree, and are organically certified. These products were used in seven blocks, up from just two growers in 2000. Ecozin was the most common formulation, used at 10 oz/ac and four to seven applications. Three blocks compared Ecozin + oil with oil alone; no differences were found in the numbers of psylla and natural enemies between the treatments, although the number of sprays (two or three) may have been too few to have much impact.

Two concerns are raised with these products. First, do they provide enough control of pests (psylla and mealybug) to justify the expense ($30-40/ac, with four to seven sprays)? In the WVPP pear blocks, psylla nymph counts in the two weeks following an Ecozin application increased 60% of the time. Second, do they disrupt biological control? Some research indicates that azadirachtin harms key psylla natural enemies, particularly hemipterans like campylomma and deraeocoris. In the WVPP blocks, campies and derries were not consistently reduced in the weeks following an Ecozin spray. One block (16E) developed very high campy numbers, averaging 1.5/tray in July, despite six Ecozins in the May-July period. However, block 5 saw campy counts fall below 0.25/tray with seven Ecozins. This block had very high campy counts in 2000, began 2001 with counts exceeding 1/tray, and yet had high and increasing numbers of psylla nymphs throughout the summer.

Organophosphates -They have been considered "no-nos" in soft programs for their ability to disrupt biological control. However, OPs have been used post bloom in three WVPP soft blocks in the past two years. In two blocks (#4 in 2001, #6 in 2000) Guthion 50W was applied twice at 2#/ac for codling moth control. In #6, only half of the block was treated, and the two halves were sampled separately. High numbers of natural enemies had been established in these blocks the previous year. Parasitic wasps, in particular Trechnites, had been especially abundant in both blocks and were greatly reduced by the OP sprays. Deraeocoris were reduced to a lesser extent, but campylomma populations dropped little and rebounded quickly. Block 16E had a history of high mealybug populations and in 2001 adopted an Ecozin-based spray program. Two Imidans were applied in June for mealybug. Deraeocoris and Trechnites were never found in the block, but campylomma built up to high numbers, exceeding 1.0/tray for most of July. These examples suggest that it may be possible to apply OP sprays to a limited extent after natural enemies are established without severely disrupting biological control.

FRUIT DAMAGE

Pear psylla pose the greatest threat to fruit quality each year in the Wenatchee Valley. The soft blocks experienced high psylla damage in the transition year of 1999, but in 2000 and 2001 fruit marking in these blocks was acceptable and similar to the amount found in conventional blocks, with three exceptions. Blocks 4 and 6 had increased marking in 2001 (10% and 15%, respectively); both blocks developed high summer nymph counts as a result of inadequate early season control. Block 5 had high numbers of psylla nymphs develop, as natural enemies (and seven Ecozin + oil sprays) failed to provide adequate control. It is critical to keep fruit free from honeydew in the period of late June to early August (see later discussion under Pear Psylla). Fruit marking for psylla (and mealybug and pear rust mite) was counted as an accumulated area of russet on the fruit greater than the size of a nickel (20mm or 3/4" circle).

Grape mealybugs were only a concern in #5 (see above). Leafrollers were a problem in many soft blocks in 2000 but were well controlled this year with applications of Bt. Damage by boxelder bugs and stink bugs remained a concern but was limited to block edges adjacent to native vegetation. Pear rust mite became a factor in fruit damage in 2001; six of nine soft blocks had russetting by this pest, while no conventional blocks had this damage. Two soft blocks had the amount of fruit russetted by rust mite exceed 20%. Damage summaries are in Tables 4 and 5.

THE PESTS

Pear psylla

Tray counts of psylla adults began the year at 10 to 30 per tray, similar to previous seasons (Table 6). Most blocks reduced counts to below 0.5/tray before bloom; those that didn't (4 and 6) had the highest psylla nymph counts in May, and among the most marked fruit at harvest. Early season control is a key part of psylla management in any program, and even more so with the more limited options in soft blocks. Most growers used Surround with good results. Thiodan (endosulfan) was the most effective material in reducing psylla adult numbers. Used at delayed dormant timing, it has little, if any, impact on psylla natural enemies. Psylla counts dropped 90-98% with the application of 2 to 3 quarts of the 3EC formulation.

The first summer nymphs consistently appeared by mid June (Table 7). The most critical period to keep psylla nymph populations low, and honeydew off of the fruit, extends from then until early August. A number of blocks, both soft and conventional, had high populations develop in August and September after being fairly clean earlier; their fruit had low marking at harvest. This is in contrast to other blocks that had lower August counts yet more marking, due to higher psylla counts in July.

	2000		2001	
	Group A (3 blocks)	Group B (3 blocks)	Group A (5 blocks)	Group B (4 blocks)
PPn/lf - July	0.4	0.9	0.7	1.5
PPn/lf - August	3.4	3.0	2.8	2.1
Psylla marking	1.9%	12.0%	1.0%	11.0%

The most abundant psylla predators in most blocks have been deraeocoris and campylomma. Dividing the total numbers of these predators per tray by the number of psylla nymphs per leaf on top shoots provides a ratio that indicates the impact of biological control. The soft blocks had a far higher ratio (1.15) than the conventional blocks (0.05) in July, a critical period for biological control. The ratio, however, was much lower this year in seven of eight soft blocks, reflecting the generally lower predator numbers in 2001. Factors other than pesticide use and psylla abundance affect predator numbers. This year-to-year variation is a reminder that biological control of psylla is not constant each season. Natural enemies and psylla both need to be monitored to determine the need for supplemental sprays.

Grape mealybug

Mealybug remained at low numbers in most soft blocks, despite the lack of sprays applied for this pest (Table 8). The soft blocks that had substantial populations in 1999 have seen their mealybug counts drop each year, as measured by infested shoots or nymphs/tray in August. Mealybug has been detected in all soft blocks except one over the three years of monitoring, yet has not increased in the absence of controls. Neighboring growers to several of these blocks treat annually for mealybug in adjacent orchards, with one to three sprays of organophosphates and neonicotinyls.

Spider mites

Twospotted spider mites were the only spider mites found. No mite problems developed in any blocks, with counts generally below 0.5 mites/leaf throughout the summer (Table 9). Nine soft blocks applied no miticides, other than oils targeting pear psylla; one block applied Savey in early June. The seven conventional blocks applied AgriMek (once in three blocks, twice in two others), Acramite (two blocks) and Savey (one block). This lack of miticide need in the soft blocks, and on the very susceptible Anjou cultivar, may indicate biological mite control is occurring. Mite predators were rarely found in leaf samples. Western predatory mites were counted in ten blocks (nine soft), but infrequently and never above 0.1/leaf. Stethorus beetles (adults and larvae) were even less common. Bio control may occur on the trunks or in the ground cover, before mites are established in the trees.

Pear rust mite

Rust mite numbers increased greatly in many soft blocks in 2001 (Table 17). They were counted in August leaf samples in seven of the eight three-year soft blocks, up from five blocks the year before. Rust mites were not found on leaves from any of the conventional blocks. Russetted shoot leaves appeared in many soft blocks for the first time, and six blocks had detectable fruit russet, up from one the year before. One organic block had over 90% of the fruit with russet; this block had the highest rust mite counts in 2000 and at petal fall in 2001, and had dropped sulfur sprays in favor of multiple Surround applications.

Most soft blocks will need to include a miticide spray in 2002 to prevent serious fruit marking by pear rust mite. Options to consider include post harvest sulfur, prebloom Thiodan and sulfur, Carzol at popcorn or AgriMek at petal fall. Both Carzol and AgriMek have the potential to disrupt bio control, but are effective on rust mites at low rates. Thiodan at delayed dormant provides some rust mite control. In 2001, block #15 had no Thiodan applied in the delayed dormant, while the neighboring block with the same history was sprayed with it. The block without Thiodan had russet on leaves and fruit, and averaged 3.7 rust mites/lf in four August samples; its neighbor averaged 0.1/lf.

Codling moth
Codling moth populations remained low in most WVPP blocks in 2001 (Table 10). Ten of the original 14 blocks had a seasonal average catch below 5 per trap. The other four had their catch totals either decline or remain the same, except for #4 that had considerable damage by codling moth in 2000.

There was very little codling moth damage in any WVPP blocks in 2001. Only five blocks had any damage detected and in each case damage was 0.2% or less. The one block (#4) with much damage in 2000 (1.9%) cleaned up the problem this year by increasing mating disruption dispensers from 200 to 400/acre, and applying two Guthion and three Intrepid sprays. Mating disruption (MD) was used by four of seven conventional blocks, and seven of ten soft blocks, generally at rates of 200-250 dispensers/acre. MD was supplemented with insecticide sprays in one conventional and two soft blocks. Three conventional and three soft blocks did not use MD; in each case, two of the three blocks sprayed for codling moth with one or two covers.

Leafrollers
Pheromone traps were used for two leafroller species, obliquebanded (OBLR) and pandemis (PLR) leafrollers (Tables 11 and 12). OBLR is increasingly the dominant species in the WVPP blocks; OBLR catches were greater than PLR catches in 11 blocks in 2001, up from eight in 2000 and six in 1999. PLR catches have dropped in all blocks over the three years of monitoring, while OBLR catches have changed little or declined slightly. European leafroller, a single generation species, was caught in OBLR traps in four blocks in 2001.

Fruit damage by leafrollers decreased in all blocks where it was a concern the year before. In 2000 several soft blocks saw increased damage; four blocks (three organic) had at least 1.0% fruit feeding. All four blocks reduced damage in 2001 to 0.2% or less by applying one or two Bt sprays. Two growers (#3 and #11) also applied leafroller mating disruption dispensers. The conventional blocks had little damage in 2000 and none was detected in 2001. Leafroller control has been provided in some soft blocks by the use of petal fall Esteem sprays, although this material was applied primarily for psylla control. The four blocks (#4, 6, 7 and 15) that have used petal fall Esteem the past two years have had lower trap catches and lower fruit damage each year (0.25% average in 2000, 0.0% in 2001), with no other sprays applied for leafrollers.

Stink bug/Boxelder bug
Both pests tend to appear in pear blocks in the late summer, but are never found consistently on beating trays. The average damage across all WVPP blocks was similar the past two years (ca. 1.0%). Individually, six blocks had less damage this year by these bug pests and six had more damage. Fruit damage is associated with the block's proximity to native vegetation, and not with the spray program used. The extent of damage by stink bugs and boxelder bugs probably reflects the size of their populations in the nearby wild lands, determined by factors beyond the control of the orchardist.

THE NATURAL ENEMIES
Twenty different species or groups of predators and parasites were counted in the WVPP in 2001.

Deraeocoris (*Deraeocoris brevis)*
Campylomma *(Campylomma verbasci)*
Anthocorids (*Anthocoris spp.*)
Minute pirate bugs (*Orius tristicolor)*
Damsel bugs (*Nabis* spp.)
Bigeyed bugs (*Geocoris* spp.)
Stilt bugs (Berytidae)
Green lacewings (Chrysopidae)
Brown lacewings (Hemerobiidae)
Lacewing larvae
Snakeflies (Raphidiidae)
Earwigs (Forficulidae)
Lady beetles (Coccinellidae)
Black lady beetles or Stethorus (*Stethorus spp.* and others)
Parasitic wasps
Trechnites spp. (Hymenoptera: Encyrtidae)
Syrphid flies (Syrphidae)
Ants
Spiders
Anystid mites (Anystidae)

The soft blocks again contained far higher numbers of these natural enemies than the hard blocks. A diverse complex of natural enemies is needed for the most effective biological control. The diversity better allows the various natural enemies to "cover for each other"; when one species is absent or at low numbers during a particular season or time of year, the others may fill the gap. Some species are active early in the year (Deraeocoris, snakeflies), while others don't appear until after bloom (campylomma, earwigs), or build to significant numbers until later in the summer (lacewings). Some are particularly sensitive to many pesticides (Trechnites) while others show greater tolerance (campylomma).

Most counts in the WVPP were primarily of predators and parasites that attacked pear psylla. Five have been identified as being most effective and/or most abundant: Deraeocoris, campylomma, lacewings, earwigs and Trechnites.

Deraeocoris
This true bug, along with campylomma, was the most abundant predator found in Wenatchee Valley pear orchards (Table 13). Overwintering as adults, they were first found in blocks from mid March to early April, usually the earliest psylla predator to appear

in numbers. The first nymphs were found in late May. Counts of derries were down in all soft blocks in 2001, despite plenty of food (psylla) in some blocks. The July/August 2001 average was 0.2/tray (high of 0.65), while the 2000 average was 0.7/tray (high of 1.2). There were almost no derries found in the conventional blocks.

Campylomma

Campies overwinter as eggs deposited under the bark of young wood in late summer. The first nymphs appeared abruptly during or soon after bloom, and the first adults were found in early June (Table 14). The same blocks with higher numbers of campies in late summer 2000 (>0.3/tray in August) had the higher counts in May 2001 (>0.2/tray). Three generations occurred in WVPP orchards, with counts peaking in late May/early June, July and late August/early September. Campylomma were at lower levels in all soft blocks but two in 2001. The July/August 2001 average was 0.25/tray (high of 0.95), while the 2000 average was 0.5/tray (high of 2.3). There were few campies found in the conventional blocks.

Lacewings

Lacewings are predators of many insects, including psylla and mealybugs. Brown lacewings were the most common types found in WVPP pear blocks, although green lacewing adults were found in high numbers in some blocks in late summer. Some brown lacewing adults were found as early as April. Lacewing larvae were first found in late May, but only showed up consistently beginning in late July. The highest counts occurred in mid to late August, with three blocks exceeding 0.5/tray. The August counts in the soft blocks were much lower in 2001 than the year before (0.14 vs. 0.52/tray) but much higher than in the conventional blocks (0.04/tray).

Earwigs

These predators are primarily active at night and pass the day in protected locations on the tree trunk and ground. Earwigs were monitored again with earwig "condos", rolls of corrugated cardboard placed inside eight-inch long pieces of 1¼" PVC pipe. Earwigs were first found in mid to late May. Counts in the soft blocks were much higher; in July-August counts soft blocks averaged 7.4/condo vs. 1.2 in the conventional blocks (Table 16).

Trechnites

Trechnites is a parasitic wasp specific to pear psylla. They are quite sensitive to many pesticides, and in 1999 were not identified in the soft blocks until August. They have many generations each year, first appearing close to bloom when they emerge from the parasitized psylla nymphs they overwintered in. Trechnites were counted in all soft blocks in August 2000 and again this year. They were found this year in four conventional blocks, but at much lower numbers (Table 15).

Table 1. WVPP blocks, 2001

Block	Location	Ac.	Cultivar	Surroundings	% border w/ native habitat	Pest control program
1	Wenatchee	4	D'Anjou	Orchard, bitterbrush; nearby river	<25%	Conventional
2	Monitor	13	D'Anjou	Orchard,bitterbrush	>50%	Conventional
3	Cashmere	13	D'Anjou	Pine, orchard; up narrow canyon	>50%	Soft (organic)
4	Cashmere	5	D'Anjou	Orchard, pine, bitterbrush.	25-50%	Soft
5	Cashmere	7	D'Anjou	Orchard; very limited contact with bitterbrush	<25%	Soft (organic)
6	Cashmere	9	D'Anjou	Pine; up canyon	>50%	Soft
7	Dryden	11.5	D'Anjou	Orchard on all sides	0%	Conventional
8	Dryden	12	D'Anjou	Orchard, pine; up canyon	>50%	Conventional
9	Peshastin	18	D'Anjou	Pine; up narrow canyon	>50%	Soft (organic)
11	Peshastin	5	D'Anjou	Surrounded by organic orchard	0%	Soft (organic)
12	Leavenworth	12	D'Anjou	Orchard, river bank	25-50%	Soft (1st year)
13	Peshastin	9.5	D'Anjou	Pine, orchard; up canyon	>50%	Soft
14	Peshastin	5	D'Anjou	Orchard on all sides	0%	Conventional
15	Peshastin	4.5	D'Anjou	Pine, residences	>50%	Soft
16C & 16E	East Cashmere	10	D'Anjou	Orchard, highway	<10%	Conventional & Semi-soft
		139	total acres			

Table 2. WVPP Spray programs, 2001

1

Date	Material	Rate/ac	Total
3/13	Surround	100#	$65
3/27	Surround	75#	$49
	Thiodan 3EC	3 qts	$28
	Oil	3 gal.	$8
4/14	Procure	1#	$54
	Esteem	5 oz	$36
4/29	NoMate CM	200	$55
5/2	AgriMek	20 oz	$107
	SafTSide oil	1.25 gal	$13
6/20	Actara	5.5 oz	$35
	SafTSide oil	1.25 gal	$13
		2001 spray cost	$463
	#sprays(@$15)	6	$90 $553

2

Date	Material	Rate/ac	Total
3/21	Surround	100#	$65
4/18	Thiodan WP	4#	$30
	Surround	50#	$33
	Dithane	12#	$38
4/28	NoMate CM	200disp.	$55
5/6	AgriMek	20 oz	$107
	SafTSide oil	0.75 gal	$8
	Procure	8 oz	$27
7/28	SafTSide oil	1.25 gal	$13
	Actara	5.5 oz	$35
		2001 spray cost	$411
	#sprays(@$15)	5	$75 $486

3

Date	Material	Rate/ac	Total
3/21	Surround	75#	$49
	Microthiol Sulfur	15#	$13
	Omni oil	2 gal	$9
3/30	Surround	50#	$33
	Microthiol Sulfur	15#	$13
	Omni oil	4 gal	$17
4/24	Fish oil	2 gal	$15
5/1	NoMate CM	225	$63
5/12	SafTSide oil	2 gal	$21
5/24	SafTSide oil	2 gal	$21
	Deliver Bt	1#	$21
5/24	Isomate LR Plus	200	$45
6/15	Omni oil	2 gal	$9
6/28	Omni oil	2 gal	$9
		2001 spray cost	$338
	#sprays(@$15)	9	$135 $473

4

Date	Material	Rate/ac	Total
3/23	Supreme oil	3.8 gal	$10
	Microthiol sulfur	11#	$9
4/17	Esteem 35WP	5 oz	$36
	Oil	0.6 gal	$2
4/26	Isomate C+	400	$110
5/14	Esteem 35WP	5 oz	$36
	Stylet Oil	1.3 gal	$16
5/26	Guthion 50W	2#	$22
	SafTSide oil	1.5 gal	$16
6/15	Intrepid	1 pt.	$29
	SafTSide oil	1.25 gal	$13
6/30	Intrepid	1 pt.	$29
	SafTSide oil	1.25 gal	$13
7/17	Guthion 50W	2#	$22
	SafTSide oil	1.25 gal	$13
8/5	Intrepid	1 pt.	$29
	SafTSide oil	1.25 gal	$13
	2001 spray cost		$418
	#sprays(@$15)	9	$135 $553

5

Date	Material	Rate/ac	Total
3/21	Surround	75#	$49
3/30	Surround	50#	$33
	Microthiol sulfur	11#	$9
	Superior oil	2 gal	$5
4/16	Omni oil	1 gal	$4
4/26	Isomate C+	200	$55
5/7	Dipel	2#	$21
	Ecozin	10 oz	$31
	SafTSide oil	1.25 gal	$13
5/17	SafTSide oil	1.25 gal	$13
5/23	Ecozin	10 oz	$31
	SafTSide oil	1.25 gal	$13
6/21	Ecozin	10 oz	$31
	Omni oil	1 gal	$4
7/1	Ecozin	10 oz	$31
	Omni oil	1 gal	$4
7/19	Ecozin	10 oz	$31
	Omni oil	1 gal	$4
8/1	Ecozin	10 oz	$31
	Omni oil	1.25 gal	$5
	Dipel	2#	$21
	Diatom. Earth	25#	$9
8/14	Ecozin	10 oz	$31
	Omni oil	1.25 gal	$5
	Diatom. Earth	25#	$9
	2001 spray cost		$493
	#sprays(@$15)	12	$180 $673

6

Date	Material	Rate/ac	Total
4/2	Microthiol sulfur	10#	$9
	Oil	4 gals	$17
4/13	Microthiol sulfur	11#	$9
	Esteem 35WP	5 oz	$36
	Oil	0.6 gal	$2
5/7	No Mate CM	350	$96
5/10	Esteem 35WP	5 oz	$36
	Procure	8 oz	$27
	SafTSide oil	1.25 gal	$13
6/4	Ecozin	10 oz	$31
	SafTSide oil	1.25 gal	$13
	Intrepid 2F	16 oz	$29
7/24	Ecozin	10 oz	$31
	SafTSide oil	1.25 gal	$13
8/7	Ecozin	10 oz	$31
	SafTSide oil	1.25 gal	$13
	2001 spray cost		$400
	#sprays(@$15)	7	$105 $505

7

Date	Material	Rate/ac	Total
3/21	Surround	50#	$33
4/5	Surround	50#	$33
	Microthiol sulfur	17#	$14
	Omni oil	3 gal	$13
4/20	Surround	50#	$33
	Neemix	8 oz	$38
	Esteem	5 oz	$36
	Supreme oil	0.6 gal	$2
5/8	Neemix	8 oz	$38
	Esteem	5 oz	$36
	Omni oil	1.25 gal	$9
6/6	Guthion	2 lbs.	$22
7/27	SafTSide oil	1.25 gal	$13
	Neemix	8 oz	$38
8/9	SafTSide oil	1.25 gal	$13
	Neemix	8 oz	$38
	Acramite	12 oz	$56
		2001 spray cost	$461
	#sprays(@$15)	*7*	*$105*	*$566*

8

Date	Material	Rate/ac	Total
4/1	Omni oil	4 gal	$17
	Lorsban	2 qts	$23
	Thiodan 3EC	3 qts	$28
4/20	Pyramite	11 oz	$126
	Omni oil	0.5 gal	$2
5/17	AgriMek	20 oz	$107
	Omni Oil	1.25 gal	$5
	Deliver (Bt)	1#	$21
6/29	AgriMek	20 oz	$107
	Omni Oil	1 gal	$4
	Deliver (Bt)	1#	$21
		2001 spray cost	$461
	#sprays(@$15)	*4*	*$60*	*$521*

9

Date	Material	Rate/ac	Total
3/22	Surround	100#	$65
3/29	Surround	63#	$41
4/3	Surround	63#	$41
	Oil	3 gal	$8
	Sulfur	11#	$9
4/19	Surround	50#	$33
5/18	NoMate CM	200	$55
5/18	SafTSide oil	1.25 gal	$13
5/31	SafTSide oil	1.25 gal	$13
	Dipel	2#	$21
6/16	SafTSide oil	1.25 gal	$13
7/5	SafTSide oil	1.25 gal	$13
	AzaDirect	32 oz	$40
7/24	SafTSide oil	1.25 gal	$13
8/7	SafTSide oil	1.25 gal	$13
8/24	SafTSide oil	1.25 gal	$13
		2001 spray cost	$404
	#sprays(@$15)	*12*	*$180*	*$584*

11

Date	Material	Rate/ac	Total
3/20	Surround	100#	$65
3/29	Surround	75#	$49
	Oil	3.8 gal	$10
4/5	Surround	75#	$49
	Ecozin	8 oz	$25
	SafTSide oil	0.6 gal	$6
4/14	Surround	75#	$49
	SafTSide oil	0.6 gal	$6
	Ecozin	10 oz	$31
5/5	NoMate CM	200	$55
5/7	Dipel	2#	$21
	SafTSide oil	1.3 gal	$13
	Ecozin	10 oz	$31
5/23	SafTSide oil	1.6 gal	$17
5/24	Isomate LR Plus	200	$45
6/9	SafTSide oil	1.6 gal	$17
	Dipel	2#	$21
6/19	SafTSide oil	1.3 gal	$13
6/21	Ecozin	10 oz	$31
	SafTSide oil	1.5 gal	$16
	2001 spray cost		$570
	#sprays(@$15)	*11*	*$165*	*$735*

12

Date	Material	Rate/ac	Total
3/21	Surround	100#	$65
4/4	Surround	75#	$49
	Thiodan 3EC	3 qts	$28
	Superior Oil	3 gal	$8
4/18	Esteem 35WP	5 oz	$36
	Surround	75#	$49
	SafTSide oil	0.6 gal	$6
5/1	NoMate CM	250 disp.	$70
5/10	Esteem 35WP	5 oz	$36
	SafTSide oil	1.25 gal	$13
6/1	Savey	6 oz	$90
	SafTSide oil	1.25 gal	$13
6/16	Tree wash	600 gals	$0
7/24	Intrepid	16 oz	$29
	SafTSide oil	1.25 gal	$13
	2001 spray cost		$505
	#sprays(@$15)	*8*	*$120*	*$625*

12D

Date	Material	Rate/ac	Total
3/21	Surround	100#	$65
4/4	Surround	75#	$49
	Thiodan 3EC	3 qts	$28
	Superior Oil	3 gal	$8
	Dimilin	1 qt.	$32
4/18	Dimilin	1 qt.	$32
	Surround	75#	$49
	SafTSide oil	0.6 gal	$6
5/1	NoMate CM	250disp.	$70
5/9	Imidan 70WP	5#	$36
	SafTSide oil	1.25 gal	$13
	Ecozin	10 oz	$31
6/1	Savey	6 oz	$90
	SafTSide oil	1.25 gal	$13
6/14	Tree wash	600 gals	$0
6/30	Tree wash	600 gals	$0
7/24	Intrepid	16 oz	$29
	SafTSide oil	1.25 gal	$13
	2001 spray cost		$564
	#sprays(@$15)	*9*	*$135*	*$699*

13

Date	Material	Rate/ac		Total
4/7	Surround	50#		$33
4/11	Surround	50#		$33
4/16	Surround	50#		$33
	Oil	2 gal		$5
	Thiodan 3EC	3 qt		$28
4/23	Surround	50#		$33
5/23	Deliver	1#		$21
		2001 spray cost		$186
	#sprays(@$15)	5	$75	$261

14

Date	Material	Rate/ac		Total
3/22	Surround	80#		$52
4/2	Surround	75#		$49
	Oil	3 gal		$8
	Thiodan 3EC	3 qts		$28
	Lorsban	2 qts		$23
	Microthiol Sulfur	15#		$13
4/19	Surround	65#		$42
	SafTSide oil	0.6 gal		$6
5/1	NoMate CM	210 disp.	$58	$58
5/17	Agrimek	20 oz		$107
	SafTSide oil	1.25 gal		$13
	Procure	8 oz		$27
6/2	Guthion 50WP	2#		$22
7/2	Guthion 50WP	2#		$22
7/26	Guthion 50WP	2#		$22
	Acramite	12 oz		$56
	SafTSide oil	1.25 gal		$13
		2001 spray cost		$561
	#sprays(@$15)	8	$120	$681

15

Date	Material	Rate/ac		Total
3/23	Surround	66#		$43
	Microthiol Sulfur	15#		$13
4/17	Esteem 35WP	5 oz		$36
	Omni oil	1.5 gal		$6
5/3	Esteem 35WP	5 oz		$36
	Omni oil	2 gal		$9
6/1	Intrepid	16 oz		$29
	Omni oil	1.5 gal		$6
6/21	Omni oil	2 gal		$9
		2001 spray cost		$187
	#sprays(@$15)	5	$75	$262

16C

(No Ecozin)

Date	Material	Rate/ac		Total
DD	Oil	4 gal		$11
	Sulfur	15#		$13
	Thiodan 3EC	3 qts		$28
	Surround	75#		$49
CB	Esteem 35WP	5 oz		$36
	Surround	75#		$49
	Oil	0.5 gal		$2
	Diazinon WP	4#		$21
5/7	AgriMek	20 oz		$107
	Guthion	3#		$33
	Omni Supreme oil	1 gal		$4
6/18	AgriMek	20 oz		$107
	Imidan	5.5#		$40
	Omni oil	1 gal		$4
7/25	Provado	12 oz		$53
	Guthion	2#		$22
	Omni oil	0.5 gal		$2
	2001 spray cost			$581
	#sprays(@$15)	5	$75	$656

16E

(Ecozin)

Date	Material	Rate/ac		Total
DD	Oil	4 gal		$11
	Sulfur	15#		$13
	Thiodan 3EC	3 qts		$28
	Surround	75#		$49
CB	Ecozin	10 oz		$31
	SafTSide	0.6 gal		$6
5/4	Ecozin	10 oz		$31
	SafTSide oil	0.6 gal		$6
5/19	Ecozin	10 oz		$31
	SafTSide oil	0.6 gal		$6
6/8	Ecozin	10 oz		$31
	SafTSide oil	0.6 gal		$6
	Imidan	5.5#		$40
6/22	Ecozin	10 oz		$31
	SafTSide oil	1.25 gal		$13
	Imidan	5.5#		$40
7/6	Ecozin	10 oz		$31
	SafTSide oil	1.25 gal		$13
7/20	Ecozin	10 oz		$31
	SafTSide oil	1.25 gal		$13
	2001 spray cost			$461
	#sprays(@$15)	8	$120	$581

Table 3. Spray program costs, 2001 (**conventional** and soft)

Grower	2001			2000			Difference 2001-2000	
	Sprays	Application	Total	Sprays	Application	Total	Sprays	Apps
1	**$463**	**$90**	**$553**	**$657**	**$120**	**$777**	**-$194**	**-$30**
2	**$411**	**$75**	**$486**	**$544**	**$75**	**$619**	**-$133**	**$0**
3	$338	$135	$473	$306	$165	$471	$32	-$30
4	$418	$135	$553	$592	$165	$757	-$174	-$30
5	$493	$180	$673	$432	$210	$642	$61	-$30
6	$400	$105	$505	$569	$135	$704	-$169	-$30
7	**$461**	**$105**	**$566**	**$473**	**$90**	**$563**	**-$12**	**$15**
8	**$461**	**$60**	**$521**	**$631**	**$90**	**$721**	**-$170**	**-$30**
9	$404	$180	$584	$340	$180	$520	$64	$0
10	-	-	-	**$800**	**$135**	**$935**		
11	$570	$165	$735	$329	$135	$464	$241	$30
12	$505	$120	$625	**$762**	**$120**	**$882**	-$257	$0
12D	**$564**	**$135**	**$699**	-	-	-		
13	$186	$75	$261	$305	$105	$410	-$119	-$30
14	**$561**	**$120**	**$681**	**$572**	**$135**	**$707**	**-$11**	**-$15**
15	$187	$75	$262	$279	$105	$384	-$92	-$30
16C	**$581**	**$75**	**$656**	-	-	-		
16E	$461	$120	$581	-	-	-		
AVERAGE								
soft	$396	$129	$525	$394	$150	$544	$2	-$21
conv.	**$500**	**$94**	**$595**	**$634**	**$109**	**$743**	**-$134**	**-$15**

Block	Sprays '01	Block	Sprays '00
13	$186	15	$279
15	$187	13	$305
3	$338	3	$306
6	$400	11	$329
9	$404	9	$340
2	**$411**	5	$432
4	$418	7	$473
7	**$461**	**2**	**$544**
8	**$461**	6	$569
16E	$461	14	$572
1	**$463**	4	$592
5	$493	**8**	**$631**
12	$505	**1**	**$657**
14	**$561**	**12**	**$762**
12D	**$564**	**10**	**$800**
11	$570		
16C	**$581**		

Table 4. Fruit damage at harvest, 2001

Grower	# of fruit	Pear Psylla	GMB (russet)	GMB (nymphs)	San Jose Scale	Pear rust mite	Codling moth	Leaf-roller	Fruit/ Cutworm	Lygus	Stink/ Box elder bug
1	1000			0.2%			0.2%				
2	1000	0.5%	0.1%	0.2%			0.1%		0.1%		0.4%
3	1000	4.2%				0.5%		0.1%	0.8%	0.7%	3.0%
4	1000	***10.1%***				4.9%				0.4%	1.7%
5	800	***12.4%***	0.7%	4.5%				0.7%			0.2%
6	1000	***15.6%***				23.1%			0.5%	0.5%	0.9%
7	1000	***9.9%***	0.5%	0.9%			0.1%			0.4%	0.2%
8	900	0.3%							2.2%	0.7%	1.2%
9	1250					9.1%		0.2%	0.2%	0.2%	0.5%
11	550					92.7%		0.2%	0.3%	0.7%	1.8%
12D	1150	1.9%	2.4%	5.5%						0.2%	0.9%
12E	1650	0.1%		0.7%					0.1%	0.2%	1.8%
13	1000	0.9%			0.2%		0.1%		0.8%	0.4%	1.1%
14	1000	1.5%									0.5%
15	1000	2.5%	0.1%	0.4%		1.0%	0.1%		0.1%	0.3%	2.1%
16C	700	2.4%									
16E	500	*5.2%*	0.1%	2.5%					0.1%		

Damage Determination

Pear Psylla	cumulative light russet covering 3/4" circle or more
Grape Mealybug	Mealybug (coarse) russet >3/4" circle
San Jose Scale	scale or red marks found on fruit
Pear Rust Mite	russeting in calyx end, 3/4" circle or more
Codling Moth	stings or entries
Leafroller	feeding damage on fruit
Stink Bug	feeding depressions and white corky area below skin

Table 5. Fruit damage by key pests, 1999-2001

Psylla	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	conv	soft
1999	0.5%	0.3%	9.4%	-	-	**20.1%**	-	1.2%	3.4%	15.0%	**31.9%**	**13.8%**	**47.2%**	6.1%	**38.0%**	6.2%	25.0%
2000	1.6%	1.8%	**11.6%**	0.7%	8.6%	1.0%	**12.9%**	0.7%	0.0%	0.1%	0.1%	0.8%	1.8%	0.8%	0.5%	2.7%	3.0%
2001	0.0%	0.5%	4.2%	**10.1%**	**12.4%**	**15.6%**	**9.9%**	0.3%	0.0%		0.0%	0.1%	0.9%	1.5%	2.5%	2.4%	5.7%

Mealybug	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1999	0.0%	12.9%	0.0%	-	-	6.9%	-	0.4%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.2%	2.2%	1.3%
2000	0.0%	0.9%	0.0%	3.2%	14.9%	0.9%	34.4%	0.0%	0.0%	0.1%	0.0%	0.2%	1.0%	0.0%	0.9%	5.1%	2.6%
2001	0.2%	0.2%	0.0%	0.0%	4.5%	0.0%	0.9%	0.0%	0.0%		0.0%	0.7%	0.0%	0.0%	0.4%	0.3%	0.6%

Leafroller	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1999	0.0%	0.0%	0.1%	-	-	0.0%	-	0.4%	**2.2%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.4%
2000	0.0%	0.4%	**2.9%**	0.6%	0.0%	0.0%	0.2%	0.3%	**0.9%**	0.0%	**2.1%**	0.1%	**3.6%**	0.5%	0.2%	0.2%	1.3%
2001	0.0%	0.0%	0.1%	0.0%	**0.7%**	0.0%	0.0%	0.0%	0.2%		0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%

Box elder/ Stink bug	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1999	0.0%	0.0%	0.0%	-	-	0.0%	-	0.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
2000	0.3%	0.4%	0.6%	0.9%	0.4%	1.8%	0.1%	0.6%	0.9%	0.8%	0.3%	1.1%	1.6%	0.0%	4.0%	0.5%	1.3%
2001	0.0%	0.4%	3.0%	1.7%	0.2%	0.9%	0.2%	1.2%	0.5%		1.8%	1.8%	1.1%	0.5%	2.1%	0.5%	1.4%

Rust mite	1	2	3	4	5	6	7	8	9		11	12	13	14	15		
1999	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2000	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2001	0.0%	0.0%	0.5%	4.9%	0.0%	23.1%	0.0%	0.0%	9.1%		92.7%	0.0%	0.0%	0.0%	1.0%	0.0%	16.4%

Table 6. Psylla adults per tray, 2001

Week of	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15	16C	16E
5-Mar	6.8																
12-Mar	5.6	29.9	19.1	13.0	10.6		32.7			8.7		10.5	24.6	11.7	14.6		
19-Mar	5.4	30.6	5.1	22.4	12.2	14.8	11.2	22.2	15.9	13.6		7.1	21.6	13.0	9.0		
26-Mar	3.1	9.3	3.0	9.6	8.4	22.0	11.0	19.3	3.4	1.4		3.5	5.0	4.5	7.3		
2-Apr	0.1	4.7	0.7	8.4	2.8	21.2	21.8	1.3	0.6	0.4	0.4	0.4	3.9	0.0	2.0	0.5	2.0
9-Apr	0.0	3.1	0.7	5.0	1.1	16.0	0.8	0.7	0.8	0.1	0.0	0.1	1.0	0.0	2.0	0.4	1.0
16-Apr	1.0	4.7	0.6	3.0	0.7	10.7	1.5	1.6	0.8	0.1	0.2	0.5	0.8	0.1	1.0	0.1	0.7
23-Apr	0.2	0.2	0.6	4.8	0.1	6.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.6	0.1	0.5
30-Apr	0.8	0.1	1.1	2.1	0.8	4.2	0.1	0.1	0.4	0.1	0.0	0.1	0.1	0.1	0.2	0.1	0.2
7-May	0.0	0.0	0.5	0.8	0.2	2.2	0.4	0.1	0.1	0.0	0.1	0.4	0.2	0.0	0.1	0.1	0.4
14-May	0.1	0.2	0.8	0.5	0.3	0.8	0.1	0.0	0.0	0.1	0.0	0.3	0.2	-	0.1	0.7	2.4
21-May	0.1	0.0	0.1	4.0	0.1	0.3	0.1	0.5	0.1	0.1	0.1	0.0	0.0	0.3	0.0	0.4	1.4
28-May	0.0	0.3	0.1	1.5	0.7	1.5	0.5	0.9	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.2	1.5
4-Jun	0.2	1.3	0.3	2.5	1.5	2.5	0.2	1.0	0.6	0.0	0.1	0.3	0.1	0.1	0.3	0.3	3.1
11-Jun	0.1	0.5	0.7	1.6	2.3	7.3	0.4	0.8	2.2	0.9	0.3	0.3	0.7	0.4	0.6	0.3	1.5
18-Jun	0.0	0.1	1.2	1.6	1.2	4.9	0.2	0.7	1.1	0.8	0.2	0.3	0.2	0.1	0.4	0.0	1.0
25-Jun	0.0	0.7	2.5	1.9	2.0	6.5	0.1	0.4	1.5	0.1	0.3	0.1	0.1	0.1	0.4	0.2	1.3
2-Jul	0.1	0.3	1.5	2.4	2.4	4.0	0.2	0.1	2.2	0.1	0.1	0.2	0.4	0.2	0.4	0.5	1.8
9-Jul	0.0	0.8	1.5	2.0	1.4	4.3	0.3	0.1	0.5	0.1	0.4	0.3	0.1	0.4	0.0	0.1	2.7
16-Jul	0.0	0.7	4.1	14.7	2.5	5.3	0.7	0.4	0.6	0.1	0.3	0.1	1.0	0.6	0.1	0.3	3.8
23-Jul	0.3	1.7	0.5	3.5	5.6	3.1	0.5	0.3	0.3	0.5	0.3	-	0.1	3.0	2.0	0.0	3.5
30-Jul	0.1	0.5	0.4	6.8	7.8	16.8	5.8	0.3	0.3	0.2	*2.2*	0.9	0.6	5.8	1.2	0.3	4.1
6-Aug	0.9	0.7	1.0	6.4	11.5	9.3	2.0	0.4	0.2	0.1	*1.0*	0.1	2.3	4.1	6.7	0.1	0.8
13-Aug	0.3	1.3	1.4	14.0	4.8	6.6	3.5	0.3	0.2	0.1	*3.3*	0.4	4.8	6.7	2.0	0.3	0.8
20-Aug	0.6	6.0	2.2	12.0	8.6	6.8	3.9	1.3	0.5	0.3	*3.0*	0.3	14.1	7.9	9.1	0.5	1.8
27-Aug	0.1	2.8	2.8	4.5	8.0	4.3	4.4	0.5	0.4	0.0	*1.0*	0.1	13.8	5.9	1.5	0.8	2.3
3-Sep	1.5	12.1	2.5	11.0	14.5	9.0	7.5	1.8	0.2	0.0	*4.7*	0.3	6.3	6.5	3.5	0.7	1.9
1-Oct	4.1	16.7	3.8	44.0	21.3	1.8	23.5	4.5	0.9	2.0	*8.5*	0.6	27.0	29.0	12.6	0.7	4

Table 7. Psylla nymphs per leaf, top shoots, 2001

Week of	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15	16C	16E
28-May	0.10	-	-	0.05	0.00	-	0.00	-	-	-		0.00	0.00	0.00	0.00	0.10	0.05
4-Jun	0.00	0.30	0.10	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.05	0.00	0.05	0.05	0.20
11-Jun	0.05	0.00	0.25	0.50	0.10	0.05	0.10	0.05	0.00	0.00	0.05	0.05	0.00	0.05	0.00	0.30	0.20
18-Jun	0.02	0.00	0.25	0.30	0.20	0.15	0.25	0.10	0.00	0.00	0.10	0.05	0.00	0.05	0.00	0.10	0.10
25-Jun	0.02	0.25	0.30	0.80	0.30	0.20	0.15	0.30	0.01	0.01	0.10	0.05	0.02	0.03	0.05	0.30	0.30
2-Jul	0.00	0.50	0.10	0.70	1.25	0.30	0.05	0.40	0.15	0.05	0.00	0.00	0.15	0.30	0.20	0.10	0.25
9-Jul	0.00	0.45	0.35	0.65	0.65	1.45	0.50	0.20	0.40	0.25	0.12	0.05	0.10	0.80	0.10	0.05	0.10
16-Jul	0.00	0.75	1.15	1.15	1.05	1.35	0.40	0.55	0.55	0.20	0.50	0.10	0.45	0.30	0.40	0.10	0.00
23-Jul	0.00	0.40	0.50	0.45	1.40	1.60	0.40	0.25	0.10	0.15	0.05	-	0.55	0.30	0.30	0.40	0.20
30-Jul	0.10	0.20	0.45	0.40	1.40	1.10	1.55	0.25	0.15	0.05	0.60	0.02	0.25	0.85	0.25	0.10	0.07
6-Aug	0.50	0.15	0.85	1.00	1.30	1.40	0.60	0.15	0.05	0.05	0.40	0.05	0.40	1.40	0.65	0.05	0.15
13-Aug	0.05	0.65	1.10	1.30	8.20	2.30	2.50	0.40	0.05	0.10	0.35	0.05	1.10	6.10	0.65	0.25	0.27
20-Aug	0.30	2.40	0.20	5.90	7.00	1.45	3.50	0.80	0.05	0.05	1.30	0.05	4.10	10.00	2.70	0.15	0.03
27-Aug	0.70	0.40	0.70	1.90	4.35	1.10	4.80	0.75	0.10	0.05	2.20	0.05	17.30	12.90	4.10	0.20	0.15
3-Sep	0.10	2.90	1.20	3.30	6.10	0.90	4.20	0.35	0.25	0.20	2.05	0.05	7.70	11.60	1.80	0.10	0.00
June	0.02	0.14	0.23	0.43	0.15	0.13	0.13	0.11	0.00	0.00	0.06	0.06	0.02	0.03	0.03	0.19	*0.20*
July	0.02	0.46	0.51	0.67	1.15	1.16	0.58	0.33	0.27	0.14	0.25	0.03	0.30	0.51	0.25	0.15	*0.12*
August	0.39	0.90	0.71	2.53	5.21	1.56	2.85	0.53	0.06	0.06	1.06	0.05	5.73	7.60	2.03	0.16	*0.15*

Table 8. Grape mealybug, 2001(blanks are zeroes)

Week of	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15	16C	16E
% infested spurs																	
16-Apr							5%										
23-Apr					5%		10%					5%			15%		
30-Apr					55%							5%					
nymphs/tray																	
7-May																	
14-May					0.70	0.05											
21-May							0.10										
28-May					0.05		0.20										
4-Jun		0.20			0.05							0.05					
11-Jun	0.05											0.10					
18-Jun		0.05				0.30									0.05		
25-Jun		0.05			0.10												
2-Jul							0.10			0.10					0.05		
9-Jul												0.10					
16-Jul							0.05										
23-Jul																	
30-Jul							0.15		0.05			0.05					0.1
6-Aug																	0.1
13-Aug											0.7	0.05					0.2
20-Aug	0.05	0.10			0.30		0.35					0.05	0.15		0.05		0.8
27-Aug		0.05			0.30		2.30				1.4					0.7	2.5
3-Sep		0.05			1.00		0.20				0.8	0.10					0.1
1-Oct	0.05				0.05		0.05				0.1						

Week of	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15	16C	16E
GMB - % infested shoots																	
23-Jul																5%	5%
30-Jul	5%			10%	35%		95%				80%	25%				65%	70%
6-Aug		5%			60%	10%	55%				20%		5%			40%	75%
13-Aug	15%	10%		15%	50%	15%	50%				90%	40%	5%			55%	30%
20-Aug		20%		10%	85%	5%	40%	20%			30%	10%		10%		15%	45%
27-Aug		15%		5%	60%	10%	65%				20%					55%	75%

Table 9. Twospotted spider mites per leaf, 2001 (blanks are zeroes)

Week of	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15		
11-Jun											0.4				0.05		
18-Jun											0.1				0.05		
25-Jun				0.10													
2-Jul				0.05	0.05										0.05		
9-Jul							0.05		0.05		0.15			0.05	0.05		
16-Jul				0.05							0.05						
23-Jul						0.05			0.10								
30-Jul	0.30				0.30		1.60				0.40			1.15			
6-Aug	0.05		0.05		0.10		0.35				0.05				0.10		
13-Aug	0.05						0.10				0.70						
20-Aug		0.10		0.05	0.20	0.15	0.10		0.05					0.10	0.60		
27-Aug		0.15	0.05		0.50		0.25				0.05		0.05	0.05			
3-Sep	0.05	0.25		0.10	4.50	0.10						0.05		0.15	0.70	soft	conv
June	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.03	0.01	0.03
July	0.06	0.00	0.00	0.02	0.07	0.01	0.33	0.00	0.03	0.00	0.12	0.00	0.00	0.24	0.02	0.02	0.13
August	0.03	0.06	0.03	0.01	0.20	0.04	0.20	0.00	0.01	0.00	0.20	0.00	0.01	0.04	0.18	0.05	0.09

Table 10. Codling moth trap catches, 2001 (blanks are zeroes)

Week of	1	2	3	4	5	6	7	8	9	11	12	13	14	15
7-May							1							
14-May				66	2		10							1
21-May				60		2	3							
28-May			2	82		4	32						2	
4-Jun			1	4			1		1					
11-Jun				7		1								
18-Jun				33			3				1		4	
25-Jun				84		2					1	1	13	
2-Jul				53		1	6		3	1	7		12	
9-Jul				126		10	5				3		2	
16-Jul				50		1				1	5		5	1
23-Jul				10		1				1			7	1
30-Jul							2				1			1
6-Aug	4		5							1		1		
13-Aug	2	1	3				6		1				1	1
20-Aug		1	5		1		1			1				
27-Aug			4	1							1		1	
3-Sep														
total	6	2	20	576	3	22	69	0	5	5	19	2	47	5
#traps	2	4	4	3	3	3	4	4	4	2	4	3	3	2
2001 Avg./trap	3.0	0.5	5.0	192.0	1.0	7.3	17.3	0.0	1.3	2.5	4.8	0.7	15.7	2.5
2000 Avg./trap	0.5	0.7	3.0	79.0	0.0	76.0	16.0	0.3	1.0	3.0	1.0	6.0	46.0	5
1999 Avg./trap	1.5	0.0	15.3	45.0	0.0	240.7	14.3	0.8	0.0	0.5	2.8	49.7	17.0	3.5

Table 11. Pandemis leafroller trap catches, 2001

Week of	1	2	3	4	5	6	7	8	9	11	12	13	14	15
21-May														
28-May	1													
4-Jun			x							x				
11-Jun	3		x		1					x				
18-Jun	1		x	2	8		2			x	1			2
25-Jun	2	2	x	3	13	4	2		3	x			1	3
2-Jul	1		LR		9	2		9	2	LR				2
9-Jul			MD	4	41	3		1	4	MD				2
16-Jul			x	2	38					x				
23-Jul			x	2	30					x			1	
30-Jul	1	1	x		7		2	1		x				
6-Aug	1		x				1	1		x				
13-Aug	5				10			2						
20-Aug	7			1	11	2	1	1			2		1	
27-Aug	11	6		4	11	1	2	2			3		2	
3-Sep	5	6			20			3						
2001 1st gen	10	3	0	13	147	9	7	8	9	0	1	0	2	9
2000 1st gen	138	22	51	145	558	19	114	31	9	15	6	2	3	130
1999 1st gen	56	43	56	534	674	25	120	13	16	1	9	10	8	28

Table 12. Obliquebanded leafroller trap catches, 2001

Week of	1	2	3	4	5	6	7	8	9	11	12	13	14	15
21-May														
28-May	2		x			1				x				1
4-Jun			LR							LR				
11-Jun	2		MD							MD	1			
18-Jun	5	2	x	1	3	1	2	2	4	x	20	24	1	1
25-Jun	8	1		1	9	6		4	9	1	21	31	3	1
2-Jul	4	5		1	15	7		9	13	1	14	60	1	16
9-Jul	2	13	1	3	36	45	3	9	45		23	37	4	6
16-Jul	1	4		1	7	1		5	23	1	8	20	2	1
23-Jul		4			7	3	1	3	13			11		1
30-Jul		1						4	5		6	7	1	
6-Aug			x		2				2	x				3
13-Aug	7	1	LR	1	6	1	2		2	LR	16	1		
20-Aug	3	3	MD		13	1			3	MD		3		2
27-Aug	3	1	x		5	1			1	x			1	
3-Sep	1	3			1									
2001 1st gen	24	30	1	7	79	64	6	36	114	3	93	190	12	30
2000 1st gen	15	27	232	14	22	71	5	113	697	402	140	189	5	116
1999 1st gen	29	31	1	8	85	64	8	36	116	109	191	12	29	0

Table 13. Deraeocoris per tray, 2001 (blanks are zeroes)

Week of	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15	16C	16E
5-Mar																	
12-Mar				0.10													
19-Mar																	
26-Mar				0.05													
2-Apr				0.05											0.05		
9-Apr															0.05		
16-Apr						0.05											
23-Apr			0.05	0.50		0.50									0.05		
30-Apr			0.20	0.10		0.10											
7-May				0.05		0.10		0.05									
14-May				0.05		0.20				0.10							
21-May				0.05		0.10											
28-May			0.10			0.05						0.05			0.10		
4-Jun			0.05			0.20				0.10							
11-Jun			0.05			0.05				0.10		0.10			0.10		
18-Jun			0.10	0.10	0.05	0.80									0.05		
25-Jun			0.05	0.10	0.10	0.30				0.15							
2-Jul			0.05	0.10	0.15	0.35			0.05	0.05					0.05		
9-Jul			0.80	0.10	0.30	1.00			0.50	0.05	0.1	0.10			0.05		
16-Jul			3.10	0.10	0.05	0.80	0.05		0.10	0.15	0.2		0.05		0.05		
23-Jul			1.00			0.30			0.05	0.25	0.2	-			0.20		
30-Jul			0.45		0.10	0.50			0.05	0.10	0.1						
6-Aug			0.45	0.05		0.15			0.05	0.15		0.05			0.05		
13-Aug			0.25		0.10	0.05			0.05	0.10	0.2	0.05			0.10		
20-Aug			0.10	0.05	0.10	0.35				0.25		0.05			0.05		
27-Aug			0.15	0.05	0.10	0.30	0.05								0.10		
3-Sep			0.05		0.75	0.90			0.05		0.1	0.05			0.10		
1-Oct					0.50	0.20	0.05	0.05	0.05	0.05	0.1	0.05			0.05		

2001	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15	16C	16E
June	0.00	0.00	0.06	0.05	0.04	0.34	0.00	0.00	0.00	0.09	0.00	0.03	0.00	0.00	0.04	0.00	0.00
July	0.00	0.00	1.08	0.06	0.12	0.59	0.01	0.00	0.15	0.12	0.13	0.03	0.01	0.00	0.07	0.00	0.00
August	0.00	0.00	0.24	0.04	0.08	0.21	0.01	0.00	0.03	0.13	0.05	0.04	0.00	0.00	0.08	0.00	0.00

Table 14. Campylomma per tray, 2001 (blanks are zeroes)

Week of	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15	16C	16E
7-May															0.10		
14-May				0.20	1.80	1.30											
21-May				0.85	0.30	0.20			0.10	0.20			0.20		0.20		0.2
28-May	0.05			0.40	1.00	0.50	0.10		0.20	0.35			0.20		0.50		
4-Jun	0.05	0.20		0.50	1.00	1.00	0.05		0.40	0.60			0.15		0.15		
11-Jun		0.05	0.10	0.25	0.30	0.30			0.10	0.50			0.20	0.05	0.20		0.1
18-Jun					0.10	0.35							0.05		0.05		0.1
25-Jun				0.10	0.10	0.10			0.05								0.2
2-Jul		0.05	0.05	0.05	0.30	0.05			0.10	0.05							0.2
9-Jul		0.05		0.60	0.10	0.15	0.05		0.30	0.20		0.10				0.1	3.1
16-Jul		0.05	0.05	3.50	0.25	0.85			0.05	0.05	0.1		0.10			0.1	0.5
23-Jul		0.05		0.50	0.05	0.70				0.15	0.1	-			0.15		1.0
30-Jul				0.50	0.50	1.35	0.10		0.40	0.10		0.05		0.10			2.7
6-Aug		0.05		0.20	0.20	0.50			0.05				0.05		0.10		0.4
13-Aug				2.20	0.05	0.15	0.05		0.05	0.05	0.2						0.4
20-Aug				1.00	0.35	0.70			0.10		0.1			0.20	0.10	0.1	0.6
27-Aug				0.20	0.30	0.25	0.05		0.05	0.10	0.1						1.5
3-Sep	0.05			0.30	1.20	0.30	0.05							0.05			0.7
1-Oct				0.10	0.30		0.05			0.05							0.3
May	0.02	0.00	0.00	0.48	1.03	0.67	0.03	0.00	0.10	0.18	0.00	0.00	0.13	0.00	0.27		
June	0.01	0.06	0.03	0.21	0.38	0.44	0.01	0.00	0.14	0.28	0.00	0.00	0.10	0.01	0.10	0.00	0.06
July	0.00	0.04	0.02	1.03	0.24	0.62	0.03	0.00	0.17	0.11	0.04	0.04	0.02	0.02	0.03	0.02	1.49
August	0.00	0.01	0.00	0.90	0.23	0.40	0.03	0.00	0.06	0.04	0.10	0.00	0.01	0.05	0.05	0.01	0.70

Table 15. Trechnites per tray, 2001 (blanks are zeroes)

Week of	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15	16C	16E
16-Apr															0.10		
23-Apr				0.20													
30-Apr				0.40								0.10	0.60				
7-May				0.30													
14-May						0.90											
21-May			0.10	0.05			0.05										
28-May						0.10											
4-Jun				0.05													
11-Jun															0.05		
18-Jun				0.15		0.30											
25-Jun			0.05	0.10													
2-Jul				0.05													
9-Jul			0.15			0.65			0.05	0.05							
16-Jul			0.35	0.10		0.50			0.05						0.15		
23-Jul			0.05			0.20									0.05		
30-Jul			0.15	0.10		0.50											
6-Aug		0.10	0.05	0.20		0.10									0.15		
13-Aug			0.10	0.30		1.00		0.05	0.05	0.05					0.90		
20-Aug			0.05		0.10	3.30			0.15	0.05			0.10		0.60		
27-Aug	0.10				0.05	1.10			0.05	0.05	0.10			0.05	0.10		
3-Sep		0.05	0.05	0.35	0.20	2.10		0.05									
1-Oct		0.05		0.10													

Table 16. Earwigs, average number per condo (4 condos/block), 2001

Week of	1	2	3	4	5	6	7	8	9	11	12E	13	14	15	Soft	Conv
16-Jul	0.5	2.0	8.0	2.0	8.5	3.0	0.5	0.0	35.0	11.0	2.0	12.0	2.5	1.5	9.2	1.1
30-Jul	1.0	3.5	3.0	3.0	11.0	6.0	0.5	1.0	23.0	10.0	1.0	12.0	2.5	2.0	7.9	1.7
13-Aug	1.5	0.3	2.0	1.8	8.0	6.0	2.0	0.0	12.0	11.0	1.0	15.0	1.0	2.0	6.5	1.0
27-Aug	1.3	1.8	1.5	2.3	8.5	2.5	0.0	0.8	18.0	13.0	0.7	7.0	0.3	0.8	6.0	0.8
Total	4.3	7.6	14.5	9.1	36.0	17.5	3.0	1.8	88.0	45.0	4.7	46.0	6.3	6.3	29.7	4.6
Avg/check	1.1	1.9	3.6	2.3	9.0	4.4	0.8	0.5	22.0	11.3	1.2	11.5	1.6	1.6	7.4	1.2

Table 17. Pear rust mites, number per spur leaf, 2001 (blanks are zeroes)

Week of	1	2	3	4	5	6	7	8	9	11	12D	12E	13	14	15
7-May										3.5					
14-May			2.5							0.1			0.5		
21-May										1.3					
28-May										0.1					
9-Jul										16.5					
30-Jul						18.0			0.5	39.0					
6-Aug															0.5
13-Aug			0.5	2.8		1.3				0.5					
20-Aug						2.3			0.8	0.5					7.2
27-Aug			0.3	2.8	0.5	13.5			4.8	4.3		0.3			4.0