

## **RESEARCH REPORT TO:**

THE AGRICULTURAL RESEARCH FOUNDATION FOR 2008

TITLE: VegNet Regional Pest Monitoring Program

RESEARCH LEADER: Daniel McGrath

PHONE: 503-931-8307

EMAIL: daniel.mcgrath@oregonstate.edu

FAX: 541-967-9169

COOPERATORS: Manual Silveira and Jim Gill, NORPAC; Wayne Parker, Jason White, and Neil MacInnes, National Frozen; Jon Brown, Truitt Bros; Larry and Ron Pearmine Farm, Richard and Delbert Haener Farms, Mark and Mike Dickman Farm, Skip Gray Farm, Matt and Gary Cook Farm, Hendricks Brothers Farm, Tom and Sam Sweeney Farm. Technical support for this project was provided by Lydia Brown, OSU Department of Horticulture.

This Report is also submitted to the Oregon Processed Vegetable Commission Broccoli and Cauliflower, Corn and Bean Research Committees.

## **Introduction ~ Regional Pest Monitoring**

VegNet is a regional pest monitoring and reporting network serving the Oregon processed vegetable industry, managed by the OSU Extension Service, and funded by the Oregon Processed Vegetable Commission. In the early spring of 2008, a variety of insect traps were placed on cooperating farms in vegetable production areas around the Willamette Basin and maintained during the growing season.

At each cooperating farm, selected fields were scouted for immature insects (aphids and the larvae of cabbage looper, cabbage white butterfly, diamondback moth, Bertha armyworm, black cutworm, corn ear worm, and 12 spot beetles to confirm the correlation between trap counts and actual egg laying events.

The target audiences for VegNet Regional Pest Trends is the community of ag chemical and processor field representatives who scout vegetable plantings and make pest control recommendations and the growers they serve. During the 2008 growing season, twelve editions of the electronic VegNet newsletter (See Appendix A), was distributed to two hundred and twenty (220) growers and agricultural professionals. Insect samples from were collected during the growing season from cooperating processors to determine which insect contaminants were intercepted by quality assurance programs.

VegNet narratives emphasize that pest control decisions are made on the basis of field-specific scouting results. Regional pest trends serve as an “early warning” system which signals (high or low) when field-specific scouting efforts should be intensified.

### **The goals of the VegNet Regional Pest Monitoring and Reporting System are:**

- To save growers money by providing them with advanced notice of population outbreaks for key vegetable pests in broccoli, cauliflower, snap beans, and sweet corn
- To alert agricultural field representatives when to intensify their field-specific pest management scouting due to very high or very low pest population trends

- To strengthen the communication network among Agricultural Professionals serving the Willamette Valley processed vegetable industry regarding pest and disease trends
- To demonstrate the commitment by the Oregon Processed Vegetable industry toward the use of integrated pest management strategies to protect crops and the quality of the environment.

## Results Part One ~ Broccoli and Cauliflower Pests

Four Lepidopteron insects and one aphid species damage and contaminate broccoli and cauliflower: diamondback moth (*Plutella xylostella*), cabbage white butterfly (*Pieris rapae*), Bertha armyworm (*Mamestra campestra*), cabbage loopers (*Trichoplusia ni*), and the cabbage aphid (*Brevicorynae brassicae*). Field scouting plus regional pest monitoring generally do not lead to no-spray decisions because the probability of all five contaminating insect populations reaching low levels during the same growing season is very low. Regional pest monitoring for broccoli and cauliflower pests is focused on detecting outbreaks and signaling growers and agricultural professionals when to intensify their field scouting and to increase their aggressiveness in preventing crop losses. Cabbage Looper egg laying pressure varies a great deal from year to year (Table One).

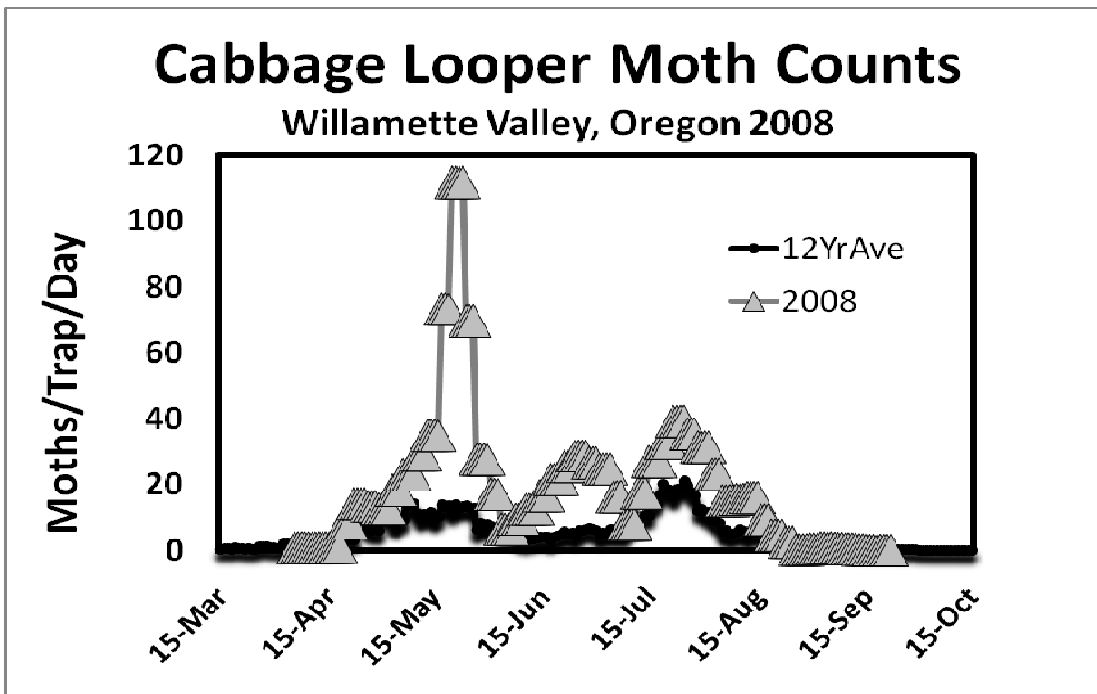
**Table One ~ Cabbage Looper Egg Laying Pressure  
Willamette Valley, Oregon 1998-2008**

	<b>Looper <sup>1)</sup> Pressure</b>	<b>WV Ave May 21<sup>st</sup></b>	<b>WV Ave July 21<sup>st</sup></b>
<b>1998</b>	<b>High</b>	<b>4.37</b>	<b>28.2</b>
<b>1999</b>	<b>Low</b>	<b>0.02</b>	<b>0.02</b>
<b>2000</b>	<b>Low</b>	<b>0.34</b>	<b>1.9</b>
<b>2001</b>	<b>High</b>	<b>34.95</b>	<b>34.7</b>
<b>2002</b>	<b>Low</b>	<b>0.60</b>	<b>1.0</b>
<b>2003</b>	<b>High</b>	<b>28.07</b>	<b>34.9</b>
<b>2004</b>	<b>Moderate</b>	<b>0.91</b>	<b>16.36</b>
<b>2005</b>	<b>High</b>	<b>19.03</b>	<b>38.7</b>
<b>2006</b>	<b>Low</b>	<b>Na</b>	<b>3.7</b>
<b>2007</b>	<b>Moderate</b>	<b>0.89</b>	<b>7.15</b>
<b>2008</b>	<b>High</b>	<b>34.98</b>	<b>27.05</b>
<b>10Yr Ave</b>		<b>12.42</b>	<b>17.61</b>

*1) Moths/trap/day averaged across all stations.*

Cabbage looper moth counts were mixed during the 2008 growing season. The first egg laying flight was very high. It appeared that we were going to experience a looper outbreak. Notices were sent to growers and agricultural field representatives to be cautious and to scout broccoli and cauliflower fields carefully due to the above average egg laying pressure. We started scouting broccoli fields carefully as they began to mature in mid June. Early field scouting showed elevated numbers of eggs and small cabbage looper counts, confirming our concerns.

Figure One

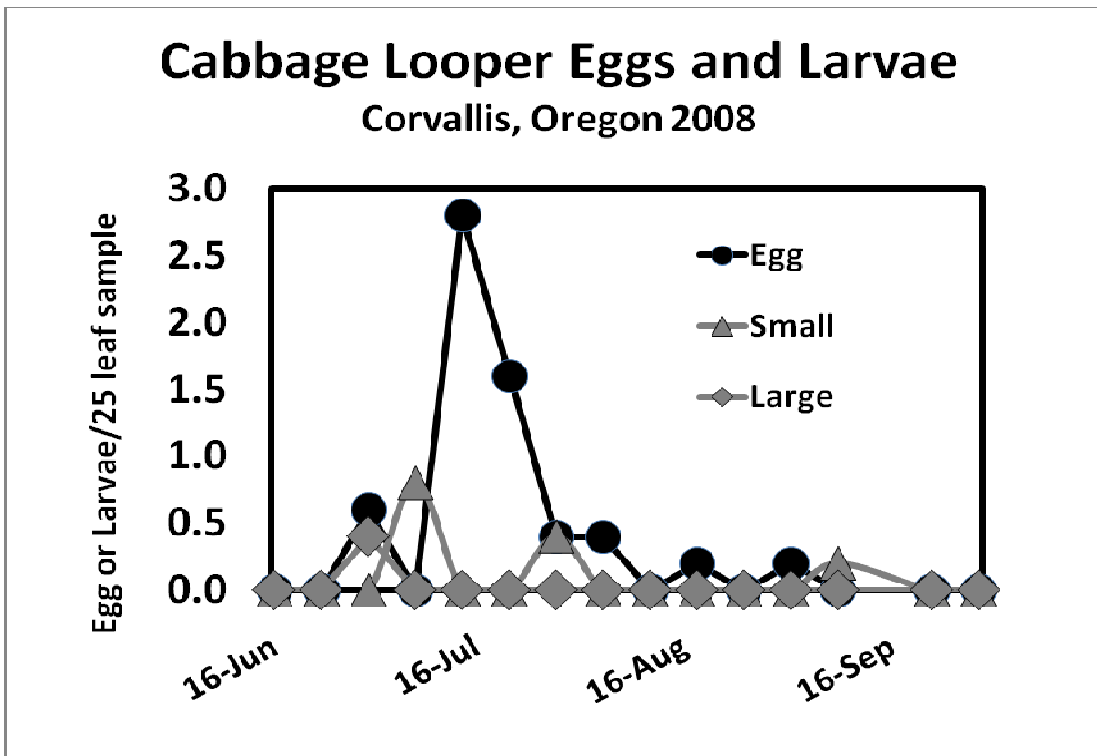


However, as the season progressed the looper population collapsed.

The moth counts dropped to normal (Figure One).

Although there were high numbers of eggs and small larvae, the population did not progress (Figure Two). Very few large larvae and zero pupae were found in the fields or detected in the quality assurance programs at cooperating processors. Something caused the looper population to collapse.

Figure Two



Populations of Cabbage White Butterfly (Figure Three) and Diamondback Moth (Figure Four) were normal or below average during the 2008 growing season.

Figure Three

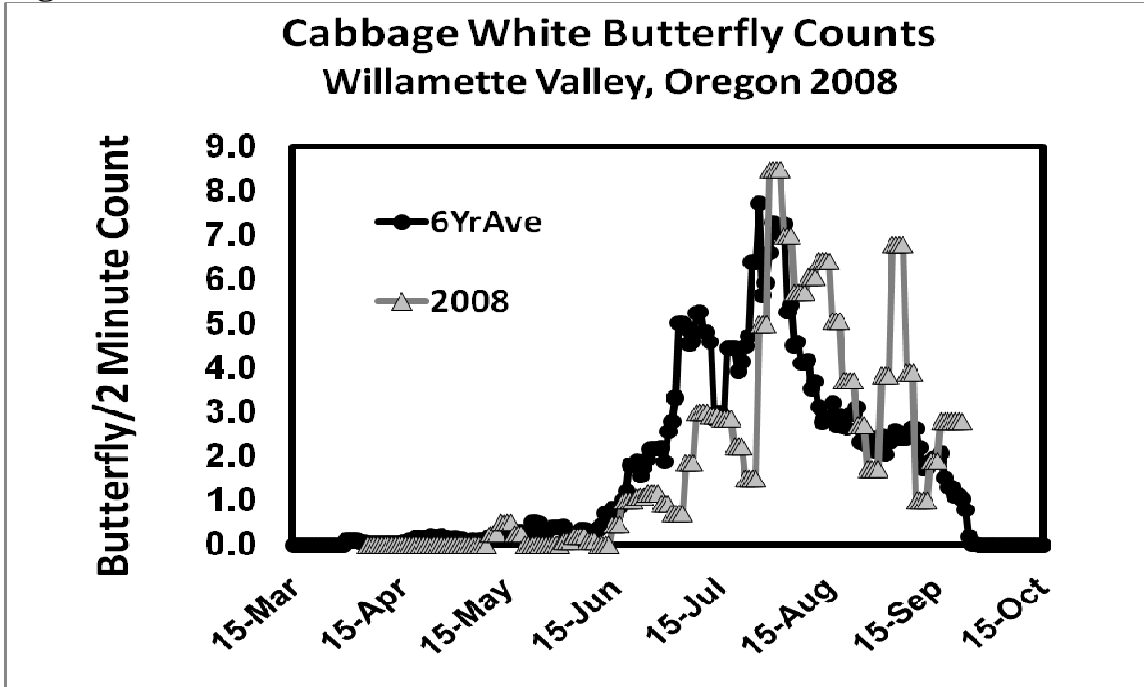
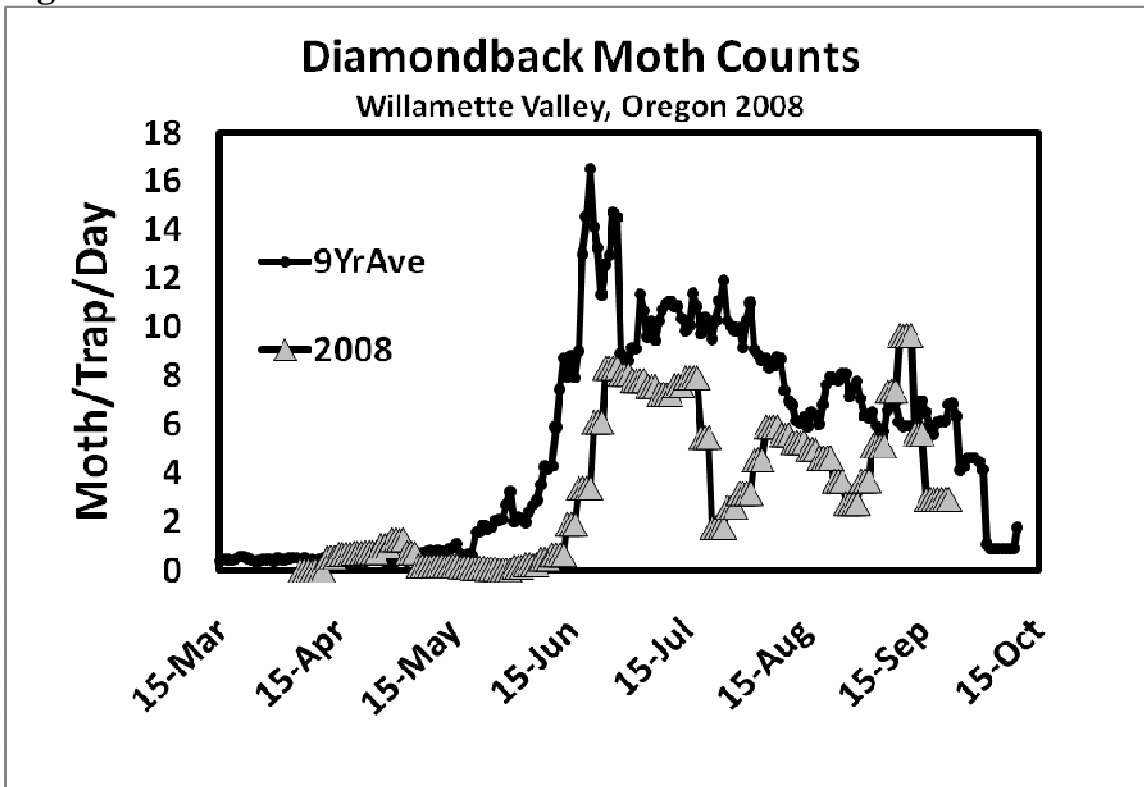


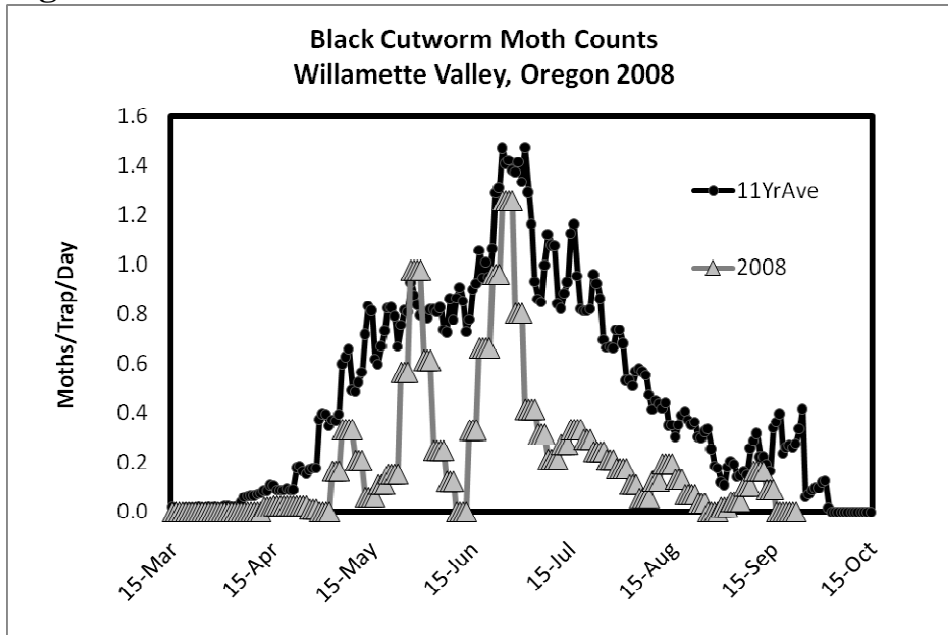
Figure Four



**Bertha Army Worm** (*Mamestra configurata*) had one major egg laying flight that was confined to the Mt. Angel area in mid August. This infestation of Bertha Armyworm contaminated a bell pepper planting in the Mt. Angel area.

## Results Part Two ~ Sweet Corn Pests

Figure Five

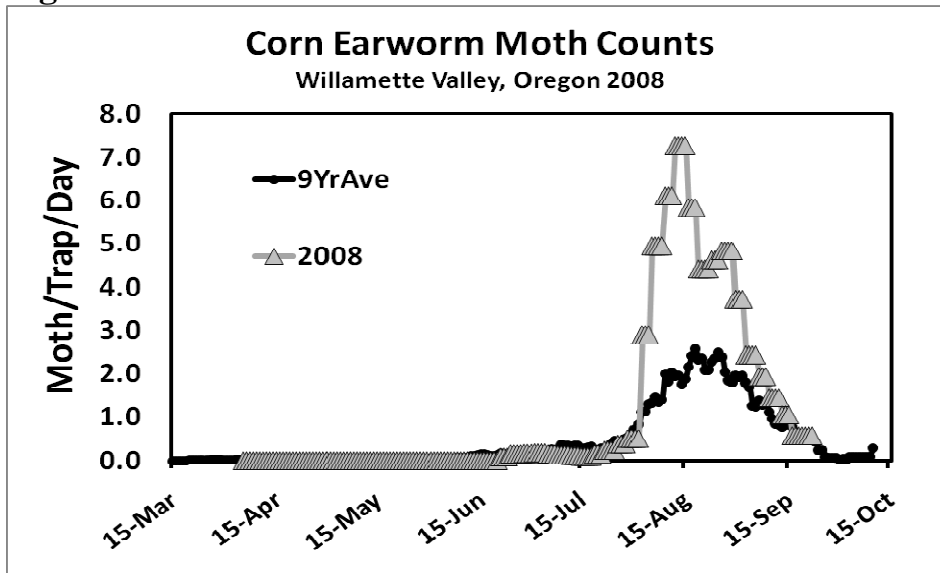


### Black Cutworm

*(Agrotis ipsilon)* outbreaks occur about once or twice per decade. Cutworm outbreaks are hard to detect in the field because early cutworm instars are small, gray-brown in color, and subterranean. Significant cutworm moth egg laying flights, on the other hand, are easy to detect. The last major Willamette Valley black cutworm outbreak occurred in 1997. Based on historical trends, we are due for another black cutworm

outbreak in the near future. During the 2008 growing season, cutworm moth counts were normal or below average (Figure Five).

Figure Six



### Corn Earworm

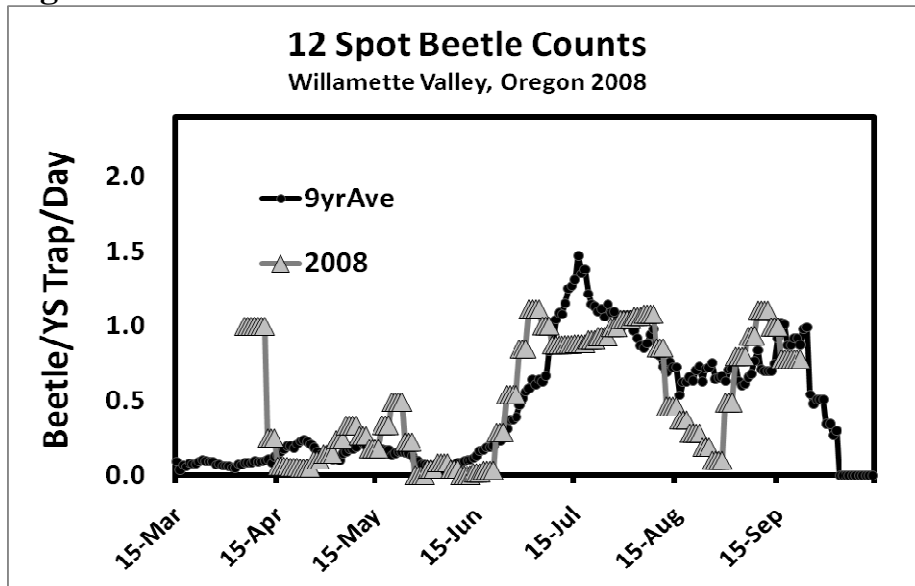
*(Helicoverpa zea)* pressure varies from year to year. Processed vegetable growers very rarely treat for earworm because the tips of the corn ears (and the earworms) are removed during the early stages of processing. The 2008 growing season was an outbreak year for corn earworm (Figure Six) with moth counts reaching historically high numbers.

A warning was sent to growers and processor representatives in August. This is the second year in a row that earworm pressure was elevated. Conversations continue with growers, agricultural professionals, and processor field representatives about whether, in retrospect, we should have treated for earworm during the 2007 or 2008 growing season. On the one hand, insecticide applications are very expensive because they generally have to be applied by air. Multiple applications are needed to completely control earworm damage. Multiple applications are not practical or economically feasible. On the other hand, a single application of insecticide will control the first wave of earworms. The next wave of earworms

following the single insecticide application would have less time to develop prior to harvest. Generally, small larvae do not cause a problem because they are small and have not penetrated deeply into the ear by the time harvest takes place. Would it make sense to have a one spray program during outbreak years?

## Results Part Three ~ 12 Spot Beetle in Snap Beans

Figure Seven



The 12 spot beetle (*Diabrotica undecimpunctata*) is the key insect pest of snap beans. The adult beetle feeds on developing “pin” beans causing deformation of the developing pod and on mature pods causing the defect “bug bite”. Field scouting and action thresholds based on sweep net sampling are well known for snap beans. Generally, if four to five sets of sweep net samples with ten arcs of the sweep net per set produce and average of two to three beetles

an insecticide application is justified. This is a conservative action. Sweep net sampling, however, is labor intensive and expensive. Monitoring beetle populations on a regional basis reduces the cost of field sampling by informing growers and agricultural professionals when to intensify their sweep net sampling.

The 2008 growing season was normal (Figure Seven). In the early spring, over wintering beetles (mostly females) came out of their refuges and laid their eggs in the soil next to preferred host plants (including sweet corn). A period of quiet followed when most of the beetle population is in the larval or pupal stages and in the soil. This pattern varies around the Willamette Basin and varies from year to year. However, this low spot is an excellent time to sweep net bean fields that are coming into bloom. If one detects few beetles in the field (based on sweep net sampling) it is pretty safe to skip the insecticide application. There are not 12 spot beetles in the landscape to invade the field until the first summer generation begins to emerge generally in mid July.

## Conclusion

The VegNet regional pest monitoring program sponsored by the Oregon Processed Vegetable Commission has been fruitful. The program has saved growers money by providing growers and agricultural professionals with early warnings of insect pest outbreaks. The combination of regional pest monitoring plus field scouting has allowed growers, in some cases, to significantly reduce insecticide applications without increasing crop damage. For better or for worse, we learn something every year.

During the 2008 growing season, it appeared that we were going to have a cabbage looper outbreak. Early warnings were sent to growers and processor representatives. It was an embarrassment for the program when the outbreak did not materialize. The moths were there huge numbers. They laid millions

of eggs. Field scouting confirmed this and detected significantly elevated numbers of small larvae in broccoli and cauliflower plantings. Then, something hammered the looper population. It never progressed past the small larval stage. This reinforces what we have said all along. Insecticide application decisions should not be made on the basis of regional pest population trends. Instead, spray decisions should be made on the basis of field-specific scouting results that are informed by regional pest population trends. The unanticipated regional collapse of the looper population in 2008 was a classic example of why this is so.

Although it was embarrassing for the program that the elevated moth counts did not result in higher levels of broccoli and cauliflower contamination, it is heartening to see that under the right circumstances, naturally occurring forces can effectively regulate insect pest populations on a regional basis. This is, after all, a central assumption of the philosophy behind integrated pest management (IPM).

The Bertha armyworm (*Mamestra configurata*) also fooled us this year. During the 2008 growing season, Bertha moth counts were fairly low on a regional basis except in one region of the valley, Mt. Angel. The data was there (See Appendix A) but it was ignored because we had never seen this pattern before. When we averaged Bertha moth counts across all of the trapping stations, the average appeared normal. We knew that Bertha has a very wide host range, but we ignored the small number of acres of bell pepper grown for processing in the Willamette Valley. What we failed to see is that the Bertha outbreak was significant and highly localized. We also failed to recognize that bell peppers were at significant risk in this localized area.

It seems that every year I find myself saying, “Hmm...we won’t make that mistake again.” Instead, we need to pay attention to localized outbreaks of Bertha armyworm and send out a warning that reminds people of the wide host range. Although the Bertha armyworm egg clusters are difficult to detect and require some rigorous field scouting, outbreak warnings can be given several weeks before the infestations cause problems. Fields can be scouted and action can be taken.

There are several questions of interest for future research and testing. In corn, would a single corn earworm spray ever be economically justified? We all agree that it is too costly and not justified to try to completely control earworm in sweet corn for processing. However, if the pressure is very high, would a single spray at first silk be justified? Would a single spray keep the size of the worms and the depth of the worm penetration into the year at acceptable levels?

The collapse of the looper population was due to weather, disease (perhaps a virus), natural enemies, or a combination of those factors. In the years to come, would it be worth the trouble to study the factors that regulate the cabbage looper population? If we could monitor the levels of disease and the dynamics of natural enemy populations as well as the insect pest populations, would we be able to better predict when surging pest populations will cause significant economic losses or crash due to natural causes without additional insecticide applications?

VegNet is a pest and disease monitoring and reporting network serving the processed vegetable industry, provided by the Oregon State University Extension Service, and funded by the Oregon Processed Vegetable Commission. VegNet is available on the net: <http://extension.oregonstate.edu/linn> Go to commercial vegetables then VegNet. If you have questions or suggestions, and if you would like to add or remove your name from this newsletter mailing list, Contact: Dan McGrath, OSU Extension, PO Box 765, Albany, OR 97321 phone (503) 931-8307; email [daniel.mcgrath@oregonstate.edu](mailto:daniel.mcgrath@oregonstate.edu)

## Corn Earworm

(*Heliothus zea*)

Corn earworm numbers are nearly as high as last year. This is significantly above the five year average.

Fresh market sweet corn growers should be applying an aggressive control program with multiple sprays. Processing sweet corn growers can expect a lot of worms.

It may be worth considering a single application of insectides at first silk. This would not eliminate worms in the ears at harvest, but it may help keep the size of the worms and the depth of ear penetration shallow.

## Cabbage White Butterfly

(*Pieris rapae*)

Cabbage white butterfly numbers are normal for this time of year. Expect an increase in the number of “green worms” in broccoli and cauliflower. Expect an overall increase in the overall worm load as we see a combination of loopers, green worm, and diamondback moth larvae.

Cabbage white butterfly eggs are yellow and football shaped. They are laid singly on the underside of the leaves.

Larvae of the cabbage white butterfly are green, fuzzy, thick necked, and have a complete set of four pairs of prolegs. Loopers have two set of prolegs missing. This is why they “loop”.

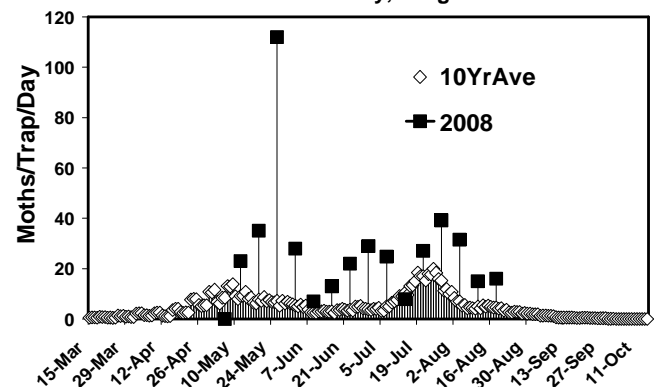
## Cabbage Looper

(*Trichoplusia ni*)

As stated earlier, we had a lot of moths, a lot of eggs, and a lot of small first and second instar larvae on broccoli and cauliflower earlier in the season. Something caused the majority of the larvae to die before maturing in to fourth and fifth instar. There have not been a lot of larvae coming into quality assurance at the processing plants. Something is killing the eggs and small larvae. It is a probably a combination of weather patterns, disease (example: virus) and/or natural enemies.

It has been a very unusual year and difficult to predict. When we saw the big flight during the early part of the season, we sent a warning to growers and agricultural professionals. Because of the above, the threat never materialized.

2008 Looper Moth Counts  
Willamette Valley, Oregon





# VegNet 2008

## Week of Aug 18, 2008 Willamette Valley, Oregon

	Aurora	Dayton	MtAngel	Gervais	Stayton	Dever	Corvallis
BCW	0.00	0.80	0.20	0.22	0.00	0.00	0.14
CEW	10.40	8.40	10.40	2.00	0.40	12.00	7.29
PHX	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12S-YST	0.80	na	0.20	0.44	0.40	na	na
12S-SN	2.25	na	0.00	0.50	na	2.50	na
CL	31.40	na	40.40	na	4.00	4.00	0.86
AL	0.00	na	0.00	na	0.00	1.20	0.29
DBM	9.40	0.60	2.40	8.56	0.40	3.60	12.00
BAW	0.20	0.00	4.60	0.00	0.00	0.00	0.00
VCW	1.40	0.00	0.60	0.00	0.00	0.60	0.00
CWB/2mi n	7.00	15.00	0.00	12.00	0.00	2.00	9.00

## Willamette Valley 7day Ave Week of Aug 18

<u>Insects</u>	<u>5-Yr</u>			<u>Note</u>
	<u>Ave.</u>	<u>2007</u>	<u>2008</u>	
BCW	0.33	0.32	0.20	Normal risk
CEW	1.46	6.15	7.27	Above Average
PHX	0.20	0.05	0.00	Normal risk
12S-YST	0.46	0.62	0.46	Normal risk
12S-SN	na	0.75	1.31	Normal risk
CL	4.27	0.54	16.13	Above Average
AL	0.08	0.21	0.30	Normal risk
DBM	5.76	8.70	5.28	Normal risk
BAW	na	1.81	0.69	Normal risk
VCW	1.33	0.46	0.37	Normal risk
CWB/2mi n	1.43	6.50	6.43	Normal risk

## VegNet Key

BCW = Black Cutworm Moths

PHX = False Corn Earworm Moths

CL = Cabbage Looper Moths

DBM = Diamondback Moths

VCW = Varigated Cutworm Moths

YST = Yellow Sticky Trap Counts

na = not available

CEW = Corn Earworm Moths

12S = 12 Spot Beetle

AL = Alfalfa Looper Moths

BAW = Bertha Armyworm Moths

CWB/2min = Cabbage Butterflies

SN = Sweep Net Counts/10 Arcs