



# Department of Pesticide Regulation



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## MEMORANDUM

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SUBJECT: PRELIMINARY MONITORING RESULTS OF CARBARYL APPLICATIONS  
FOR GLASSY-WINGED SHARPSHOOTER CONTROL IN RESIDENTIAL  
AREAS OF TULARE COUNTY (STUDY 197)

### Summary

During June and July 2000, the Tulare County Department of Agriculture's contract applicators applied carbaryl to control the glassy-winged sharpshooter (GWSS) in Porterville, California. During this time, the Department of Pesticide Regulation (DPR) took air, tank, leaf, water, fish, and produce samples at several sites in the treatment area. Air samples were taken at six locations, before, during and after carbaryl applications. The highest concentrations occurred during applications and then declined over the next 48 hours. The highest concentration of 137 parts per trillion (ppt) detected was well below the preliminary health screening level of 6,313 ppt for acute exposure to carbaryl. Tank samples showed concentrations ranging from 0.21% to 0.32% of carbaryl active ingredient versus nominal label rate concentrations of 0.11% to 0.21%. Dislodgeable foliar residue from leaf punches had concentrations ranging from 5.29 to 6.78  $\mu\text{g}/\text{cm}^2$ . Water samples from the Tule River and two residential ponds had no detectable residues of carbaryl. Three dead goldfish and pond water collected across the street from a sprayed site had no detectable residue of carbaryl. The ten fruit and vegetable samples collected at preharvest intervals, the required minimum number of days between last application and harvest as determined by the label for "7" Carbaryl Insecticide@, had residues ranging from none detected to 7.56 parts per million (ppm) which were below the established tolerance (U.S. EPA maximum allowable residues) of 10 ppm for all produce collected.



## Introduction

The Tulare County Department of Agriculture is currently using ground applications of carbaryl to control infestations of the GWSS. The GWSS (*Homalodisca coagulata*) is a serious agricultural pest in California. When feeding, it can transmit Pierce's disease, caused by the bacterium *Xylella fastidiosa*, to grapevines, and other diseases to almond trees, alfalfa, citrus, and oleander. First found in the state in 1990, GWSS has spread throughout Southern California and into areas of the San Joaquin Valley.

The Environmental Hazards Assessment Program (EHAP) of DPR has been monitoring selected treatments in residential areas to provide information on the concentrations of carbaryl in air, surface water, leaves, and representative backyard fruits and vegetables. Additionally, tank samples were taken at each location where air samples were collected. Results reported here are from applications starting June 15 through July 20, 2000, in Porterville, Tulare County. Sampling results and related GWSS monitoring reports are also available at DPR's website <[www.cdpr.ca.gov/docs/gwss](http://www.cdpr.ca.gov/docs/gwss)>.

## Materials and Methods

**Pesticide Application** - In Tulare County approximately 980 properties, residential and commercial, were sprayed over nine square miles in the city of Porterville. Tulare County survey crews determined which properties were infested with GWSS. The initial spray consisted of 330 properties that had GWSS; the second round of applications added an additional 650 infested properties. Applications of "7" Carbaryl Insecticide®, with a 41.2% active ingredient, were made by private pest control operators. Pesticides were mixed in water and delivered through an adjustable flow nozzle head (cone tip) attached to a hose from a truck mounted power rig (consisting of a tank, motor, pressure gun, and pump). Pressure at the nozzle was maintained between 30 and 60 pounds per square inch (psi) depending on hose length. Applications were not made above 15 feet or once the ambient temperature reached 90° F.

**Air Sampling** - Ambient air samples were collected at six sites in Porterville (Table 1). Carbaryl was applied on June 20, 21, 27, and July 18, 2000. In addition to the samples collected at the six monitoring sites, one ambient air sample was taken on June 15 (Site A), one week prior to the start of applications. Sites E and F were monitored during the second round of applications; they had been treated previously.

Table 1. Air monitoring sites for carbaryl, Porterville, California, 2000.

| Site | Location             | Application date |
|------|----------------------|------------------|
| A    | Morton Avenue        | none             |
| B    | Capitola Street      | 6/20/00          |
| C    | West Grand Avenue    | 6/20/00          |
| D    | Morton Avenue        | 6/21/00          |
| E    | Bel Aire Circle      | 6/27/00          |
| F    | West Mulberrv Avenue | 7/18/00          |

For each site four samples were taken before, during, and for 48 hours following application, according to the following schedule: (1) Pre-application background for a minimum of 12 hours, (2) duration of application plus one hour (total of 1.5 to 4 hours), (3) duration of 24 hours after application, and (4) another duration of 24 hours.

Air samples from sites A through E were collected using XAD-4 resin and high volume air samplers (Kurz Sntruments) calibrated at 1000 liters-per-minute. Samples from site F were collected using XAD- 2 tubes (SKC#226-30-02) and SKC air samplers (SKC# 224-PCXR8) calibrated at approximately 3 liters -per-minute. Samplers were located outdoors in open areas. Quality control samples consisted of one trip blank, one trip spike, and one fortified sample run during the 24 hours post-application period at site D. Two replicate air samples were taken at site F for each interval. Samples were stored on dry ice until delivery to the California Department of Food and Agriculture's (CDFA) Center for Analytical Chemistry for laboratory analysis. Carbaryl in XAD-4 is extracted with acetone and analyzed using high performance liquid chromatography (HPLC) with a fluorescence detector with a reporting detection limit (reliable detection level) of 1 .0 µg (micrograms) per sample. Carbaryl in XAD-2 is extracted with methanol and analyzed using HPLC with a fluorescence detector with an analytical method reporting limit of 0.2 µg per sample.

**Tank Sampling** - One tank sample was collected during the treatment at each air-sampling site. Samples were taken from the hose nozzle into a plastic 500-mL container. Samples were stored separated from other samples on wet ice until delivery to the lab for analysis. Tank samples are extracted with methanol and analyzed using HPLC with an ultra violet detector.

**Surface Water Sampling** - Carbaryl applications were made on June 19 and July 18, 2000. No applications were made near the river. Post application surface water samples were taken on June 20 and July 18, 2000 at two locations on the Tule River in Porterville. One location was upstream of applications (at Plano Rd) and the other was downstream of applications (at West Olive). River samples were collected as close to center channel as possible using a 1 O-liter stainless steel bucket and divided into one-liter amber bottles and sealed with a Teflon&lined lid.

Two additional water samples were taken on July 18 and 19, 2000 from residential ponds at the request of Tulare County. The Cobb Street residence that was sprayed had two connected ponds that were both approximately 8 by 12 feet wide and 2 feet deep. The West Mulberry Avenue residence across the street from a sprayed site had one pond that measured 2 feet wide by 20 feet long (see Fish Sampling section). Depth in the shallow end was about 18 inches deep while the deep end measured 3.5 feet deep.

Samples from the residential ponds were taken by filling a one-liter amber bottle directly from the pond and sealing with a Teflon@lined lid.

All surface water samples were stored on wet ice during transport or in a 4°C refrigerator at the storage facility until transported to the CDFA Center for Analytical Chemistry for analysis. Carbaryl in surface water was extracted with methylene chloride and analyzed using HPLC with a fluorescence detector. The reporting limit was 0.05 ppb (parts per billion).

**Fish Sampling** - A fish sample was taken on July 19, 2000, due to a reported fish kill in a goldfish pond on West Mulberry Avenue. This residence was located across the street, about 100 feet south, from a sprayed site and a pond water sample was also taken (see surface water sampling). Three fish were collected and stored frozen on dry ice until delivered to the Department of Fish and Game's Water Pollution Control Laboratory. Gill tissue from the three fish was excised and composited into a single sample for carbamate analysis. The reporting limit for the analytical method was 0.1 ppm.

**Leaf Sampling** - Leaf samples were taken at all sites monitored for air (see Table 1). Each sample consisted of 40 one-inch-diameter leaf punches collected into a 4-ounce glass jar and sealed with a Teflon@lined lid. Two samples were collected from each site: one before application (background) and the other after spray had dried (generally one hour after the application ended). Leaf punches were collected from several plants within each site with the before- and after- application samples at each site collected from the same plants. Samples were taken from a height range of one to six feet from the ground, stored on wet ice and delivered within 36 hours to the CDFA Center for Analytical Chemistry, and analyzed for dislodgeable

foliar residue. Leaf samples were washed with Surten®, extracted with methylene chloride, and analyzed using HPLC with a fluorescence detector. The reporting limit was 0.0012 µg/cm<sup>2</sup> (micrograms per centimeter square).

**Produce Sampling** - Ten produce samples were taken after the first carbaryl spray. Produce samples were obtained where any backyard fruits and vegetables were available, from properties in the sprayed area (Table 2).

Table 2. Produce sampling locations in carbaryl treatment area  
Porterville, California, 2000.

| Location          | Produce                            |
|-------------------|------------------------------------|
| Capitola Street   | Tomato, apricot                    |
| West Olive Avenue | Grape, navel and Valencia oranges  |
| Sandra Lane       | Nectarine, summer squash, zucchini |
| Gerry Street      | Grapefruit                         |
| Westfield Avenue  | Grapefruit                         |

Each sample consisted of approximately one pound of produce collected into either a quart glass mason jar with an aluminum foil lined lid or wrapped in aluminum foil and placed in a plastic Ziploc® bag. Samples were taken at the preharvest interval, the required minimum number of days between last application and harvest. According to the label for “7” Carbaryl Insecticide®, the preharvest intervals were 3 days for tomato, squash, apricot and nectarine; 5 days for citrus; and 7 days for grapes. Samples were stored on dry ice during transport or in a freezer at the storage facility until delivered to the CDFR Center for Analytical Chemistry for analysis. Samples were analyzed for total residues by grinding the produce, extracting with acetonitrile, and analyzing using HPLC with a fluorescence detector. The reporting detection limit was 0.05 ppm.

**Weather** - The applications took place on four different days for the five air monitoring sites. The weather was generally clear and sunny on all application days. On June 20, 2000 temperatures ranged from 66 to 98 degrees with the daily average wind speed of 3 miles-per-hour (mph) from the west; June 21, 2000 the temperatures ranged from 68 to 101 degrees with the daily average wind speed of 3 mph from the west; June 27, 2000 the temperatures ranged from 68 to 101 degrees with winds from the northeast at 3 mph; and on July 18 temperatures ranged from 60 to 93 degrees with winds from the southwest at 3 mph. Weather data were taken from CIMIS station #86 at Lindcove (UCD 2000).

## Results and Discussion

**Air** - A total of 32 air samples were analyzed for carbaryl, including the three quality control samples. Table 3 displays the results in ppt and  $\mu\text{g}/\text{m}^3$  for the five applications monitored and the one ambient background taken a week prior to any carbaryl applications. Air concentrations ranged from no detectable amount to  $1.12 \mu\text{g}/\text{m}^3$  (micrograms per cubic meter). Of the five applications monitored, two had detections of carbaryl in the background samples. These detects can be attributed to offsite movement from other applications being done in the general area. The highest carbaryl concentrations ( $1.12 \mu\text{g}/\text{m}^3$ ) were detected during applications with a general declining trend in the concentration over the three sampling intervals. The ambient background sample collected the week prior to any applications had no detectable residues.

Since enforceable human health standards for carbaryl ambient air concentrations do not exist, DPR has developed screening levels to place results in a health-based context. Although not regulatory standards, DPR uses these screening levels to evaluate the results and take actions as needed. These screening levels represent the first tier in a risk evaluation and provide a context in which to view measured levels of pesticides in this project. A measured air level that is below the screening level for a given pesticide would not be considered to represent a significant health concern and would not generally undergo further evaluation, but should not automatically be considered "safe." By the same token, a measured level that is above the screening level would not necessarily indicate a significant health concern. This set of monitoring data is a measurement of acute exposure to carbaryl. The screening level for 24-hour acute exposure to carbaryl is  $5.17 \mu\text{g}/\text{m}^3$  (6,313 ppt) (J. Sanborn 2000). The maximum concentration detected,  $1.12 \mu\text{g}/\text{m}^3$  (137 ppt) is well below the screening level and does not represent a significant health concern.

Table 3. Concentrations of carbaryl in air, Porterville, California, 2000.

|                |                  | ppt ( $\mu\text{g}/\text{m}^3$ ) |                                  |  |   |
|----------------|------------------|----------------------------------|----------------------------------|--|---|
| Sampling Site  | Application Date | Background                       | Interval I<br>During Application | Interval II<br>24-hours Post Application | Interval III<br>48-hours Post Application |
| A              | NONE             | ND <sup>1</sup>                  |                                  |  |   |
| B              | 6/20/00          | ND                               | 11 (0.17)                        | 21 (0.17)                                | 20 (0.16)                                 |
| C              | 6/20/00          | ND                               | 23 (0.19)                        | 24 (0.20)                                | 21 (0.17)                                 |
| D              | 6/21/00          | 0.4 (0.003)                      | 137 (1.12)                       | 57 (0.47)                                | 51 (0.42)                                 |
| F <sup>2</sup> | 7/18/00          | ND (0.06)                        | 136 (ND <sup>3</sup> )           | 46 (41 <sup>3</sup> 8)                   | 40 (0.32)                                 |
|                |                  |                                  | ND,                              | 42, (0.34, 0.33)                         | 42, 41 <sup>3</sup> (0.34, 0.33)          |

1. ND= non detected at the reporting limit (quantifiable concentration)

Reporting limit is 0.1 ppt (0.0007  $\mu\text{g}/\text{m}^3$ )

2. This site monitored using SKC personal air samplers; reporting limit 6 ppt (0.05  $\mu\text{g}/\text{m}^3$ )

3. Two numbers reported are for the corresponding replicate samples

**Tank Mix** - Table 4 displays the results for tank samples taken from each air-sampling site. The concentrations ranged from 0.21% to 0.32% active ingredient of carbaryl. Label rates for “7” Carbaryl Insecticide®, active ingredient of 41.2%, generally range from 2 to 4 teaspoons (tsp) per gallon of water for most vegetables, berries, and fruit and nut trees. For control of leafhoppers on trees and ornamentals the label reports a rate of 2 tsp per gallon of water. Theoretical calculations of percent active ingredient for 2 tsp and 4 tsp of product per gallon of water are 0.11% and 0.21% active ingredient, respectively.

Table 4. Concentrations of carbaryl in spray tank samples

| Site              | Date Collected | Carbaryl Concentration (% Active Ingredient) |
|-------------------|----------------|--|
| (B) Capitola St.  | 6/20/00        | 0.26   |
| (C) W. Grand Ave. | 6/20/00        | 0.31   |
| (D) Morton Ave.   | 6/21/00        | 0.25   |
| (E) Bel Aire Cir. | 6/27/00        | 0.32   |
| (F) Mulberry Ave. | 7/18/00        | 0.21   |

**Surface Water/Fish** - All river and pond samples had no detectable amount of carbaryl residues (Reporting limit= 0.05 ppb). No carbaryl or carbamate pesticides were detected in the fish sample. The acute LC<sub>50</sub> of carbaryl for goldfish is over 10,000 ppb (U.S. EPA 2000). LC<sub>50</sub> is the lethal concentration to caused 50% mortality to a population of a test organism, Therefore, carbaryl was not the cause of the goldfish kill.

**Leaf Samples** - Results from the leaf punch samples taken at the five air monitoring sites are exhibited in Table 5. The background samples, except for one, had no detectable amount of carbaryl. The sample with carbaryl detected in the background had residues of 0.87 µg/cm<sup>2</sup>. The five post application samples had residues ranging from 5.29 to 6.78 µg/cm<sup>2</sup>. These concentrations were comparable to safe reentry levels reported to range from 2.4 to 5.6 ug/cm<sup>2</sup> for the harvest of citrus (Iwata et al. 1979).

Table 5. Dislodgeable foliar residues of carbaryl for different plant species.

| Site              | Carbaryl concentration<br>(µg/cm <sup>2</sup> ) |                            | Plant type                                  |
|-------------------|---|----------------------------|---|
|                   | Background                                      | One hour after application |   |
| (B) Capitola St.  | ND  | 5.29                       | Apricot, citrus, and grape                  |
| (C) W. Grand Ave. | ND  | 5.44                       | Oleander, wax privet, and plum              |
| (D) Morton Ave.   | ND  | 6.78                       | Oleander, wax privet, and<br>flowering pear |
| (E) Bel Aire Cir. | ND  | 5.41                       | Wax privet and flowering pear               |
| (F) Mulberry Ave. | 0.87  | 5.70                       | Rose  |

Reporting limit= 0.0012 µg/cm<sup>2</sup>

**Produce Samples**- Tolerances are enforceable human health standards in food crops (maximum allowable residue levels) established by the U.S. Environmental Protection Agency (U.S. EPA 1999). All concentrations of carbaryl were below the established tolerance for carbaryl of 10 ppm for all commodities sampled (Table 6). Carbaryl concentrations ranged from no detectable amount on grapefruit to 7.56 ppm on nectarines.

Table 6. Carbaryl concentrations in backyard produce in treatment area, Porterville, California, 2000.

| Site              | Date sampled | Carbaryl concentration <sup>1</sup> (ppm) | Produce <sup>2</sup> |
|-------------------|--------------|---|----------------------|
| Capitola Street   | 6/23/00      | 1.53                                      | Apricot              |
| Capitola Street   | 6/23/00      | 4.27                                      | Tomato               |
| West Olive Avenue | 6/26/00      | 1.59                                      | Navel orange         |
| West Olive Avenue | 6/26/00      | 2.09                                      | Valencia orange      |
| West Olive Avenue | 6/28/00      | 0.161                                     | Grapes               |
| Sandra Lane       | 6/27/00      | 7.56                                      | Nectarine            |
| Sandra Lane       | 6/27/00      | 0.945                                     | Zucchini             |
| Sandra Lane       | 6/27/00      | 0.33                                      | Summer squash        |
| Gerry Street      | 6/28/00      | ND  | Grapefruit           |
| Westfield Avenue  | 6/29/00      | 0.649                                     | Grapefruit           |

<sup>1</sup> Reporting limit = 0.05 ppm

<sup>2</sup> U.S. EPA tolerances = 10 ppm

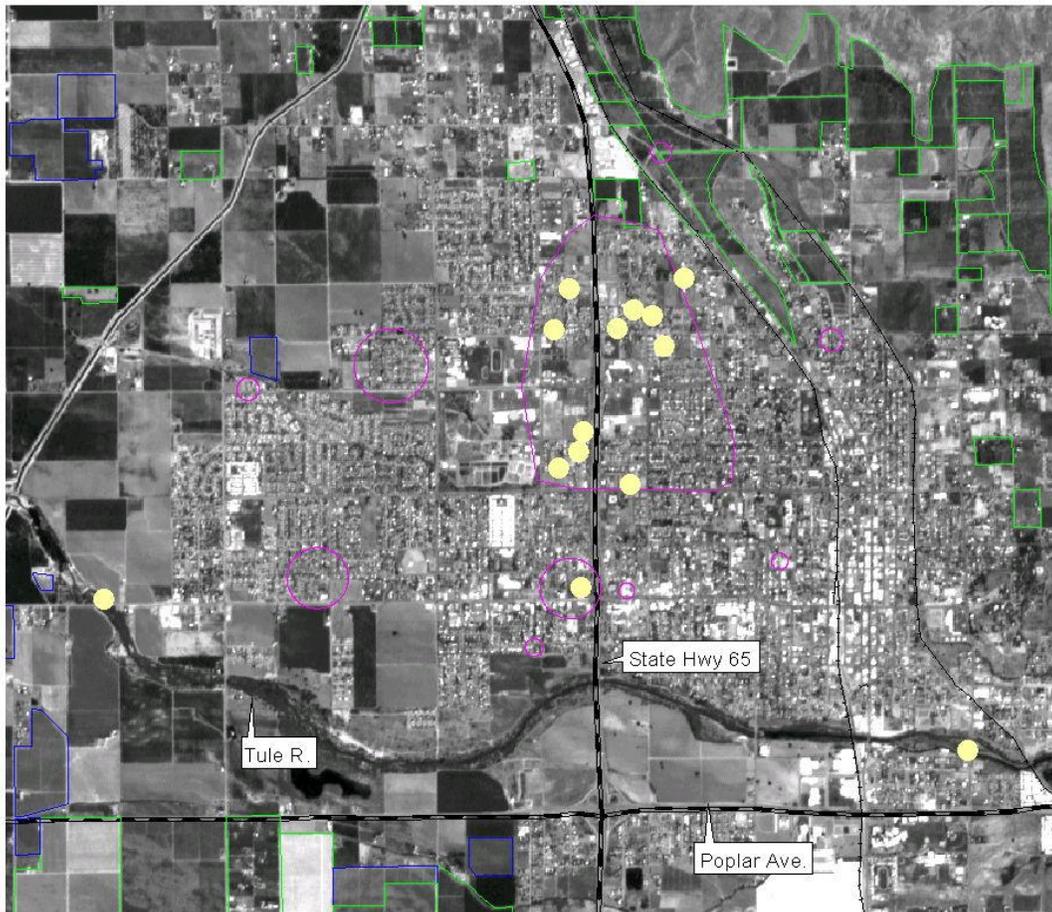
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# Carbaryl Monitoring Sites in the Glassy-winged Sharpshooter Treatment Areas, Porterville, Tulare County, Calif., 2000

- Sampling Sites
- Treatment Areas
- Citrus (DWR, 1993)
- Vineyards (DWR, 1993)
- Highways
- Railroads



0 1 2 Miles



### References

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U.S. EPA 2000. ECOTOX database at [www.epa.gov/ecotox/](http://www.epa.gov/ecotox/)

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