2006 Monitoring of Pesticide Drift from Applications to Control Browntail Moth (Condensed Report)

Maine Board of Pesticides Control

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The following is a summary of a pesticide drift study, conducted by the Maine Board of Pesticides Control (BPC) during May 2006, as required by 22 MRSA § 1445. The full drift study report can be obtained at the BPC office or viewed at www.thinkfirstspraylast.org.

I. Goal

These data were collected to help determine whether untreated buffer areas or other requirements are needed to prevent unreasonable pesticide drift into marine water bodies.

II. Drift Study Design and Methods

A plan for this drift study was developed April 12, 2006, by nine people representing the BPC, the University of Maine Food Chemical Safety Laboratory, and the Maine Lobstermens' Association. Also giving input to study design via email were two Department of Marine Resources employees.

A. Site Selection

Pesticide applicators from each of the four participating companies chose a property bordering the ocean to be monitored by the BPC. The four sites monitored for pesticide drift were in Falmouth, Harpswell, Freeport, and Yarmouth. Specific latitude and longitude information can be viewed in the full drift report.

B. Insecticide Application and Sample Collection

Two of the study sites were treated with cyfluthrin (Falmouth and Yarmouth) and the other two sites were treated with permethrin, all in May 2006. BPC staff was on site at the time of the applications and recorded weather conditions using a Kestrel 3000 Pocket Weather Meter.

Prior to pesticide treatment, a BPC employee mounted 185-millimeter diameter filter papers to drift card stands at each site to catch any pesticide drift. Yellow water sensitive cards were also used at three of four sites (see Figure 8). New cardboard platform bases were used at each site.

Refer to Figure 1 below for an example of the diagrams found in the full drift study report showing the layout of drift cards in relation to the pesticide spray target areas, direction of spray, and wind direction. This diagram is not to scale. Small circles represent drift cards; two circles side by side are duplicates, and three circles side by side are triplicates. The sample ID (a number in the 700s) is listed next to each drift card. Due to obstacles such as houses or trees, drift cards were only set up as far away from the target as 100' downwind at two sites. The other two sites allowed for drift cards to be set up from 50' to about 250' downwind from the target.

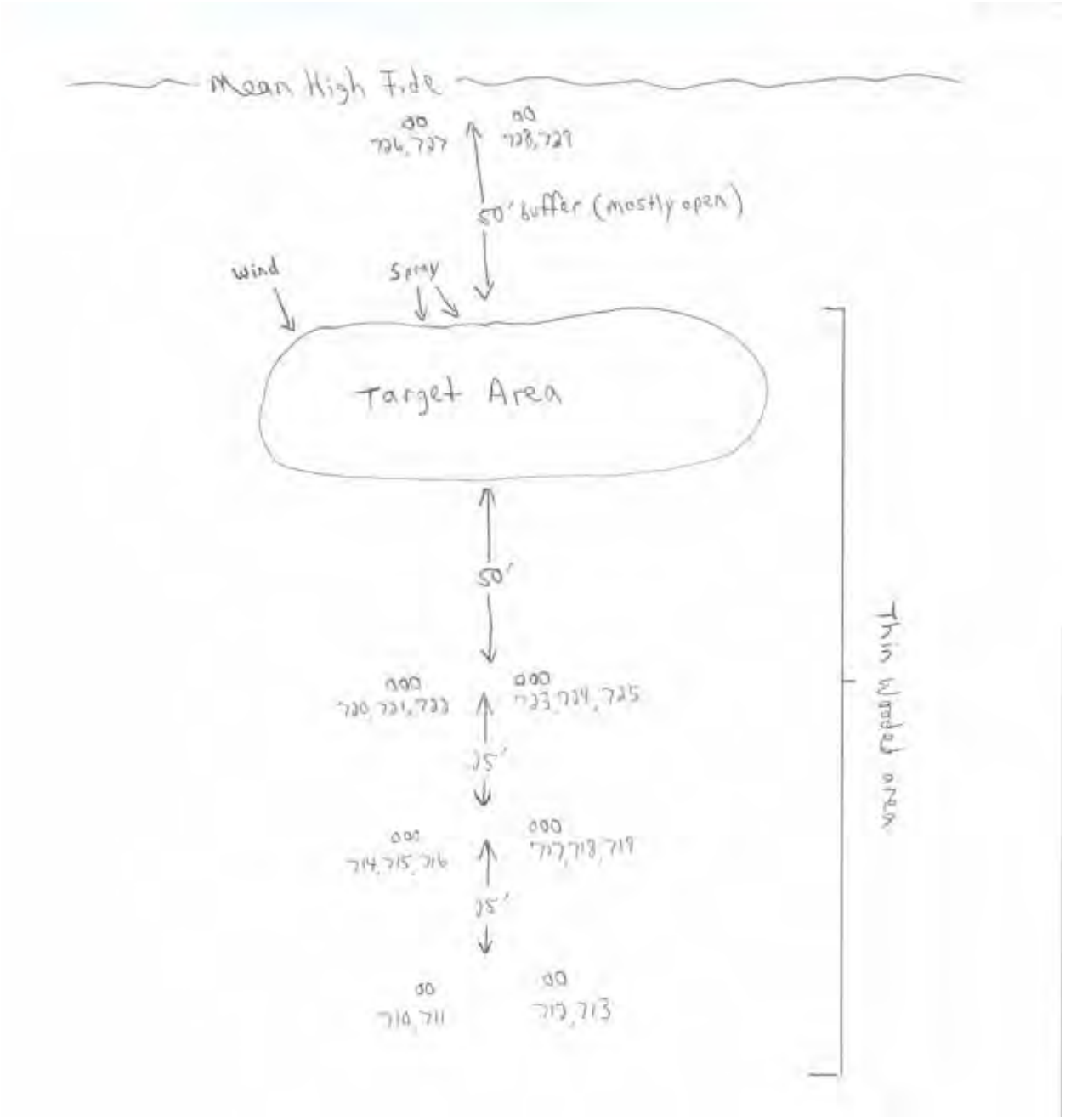

Figure 1. Falmouth Site

Photographs were taken of each pesticide application. After each spray event all of the samples were collected in 120 ml amber glass jars (one drift card per jar) and placed immediately in iced coolers. This was done to preserve the samples by preventing exposure to sunlight and maintaining cool temperatures. A new pair of latex gloves was worn for the collection of each drift card. Samples were delivered to the University of Maine at Orono, Food Chemical Safety Laboratory within 72 hours of collection, or within one week if frozen. BPC standard operating procedures for the collection of environmental samples and chain-of-custody procedures were observed throughout the sampling program.

C. Analytical Methodology

The University of Maine, Food Chemical Safety Laboratory performed the sample analyses using ethyl acetate extraction and a gas chromatograph/ mass spectrometer (GC/MS). The limit of quantification (LOQ) for cyfluthrin was 125 nanograms (0.47 nanograms per square centimeter) and the LOQ for permethrin was 15ng (0.05 ng/cm^2).

D. Quality Assurance/Quality Control (QA/QC) Procedures

The University of Maine, Food Chemical Safety Laboratory maintains a quality assurance project plan (QAPP) with QA/QC protocols for the Board of Pesticides Control and the United States Environmental Protection Agency for the analysis of samples used in the enforcement of state and federal pesticide regulations. In addition, all related BPC standard operating procedures were followed, including the collection of field blanks and sample duplicates on at least a 1 in 20 basis. In many cases triplicates were used.

III. Sample Results

The total number of drift cards analyzed by the laboratory, including QA/QC samples, was seventy. Even though wind speeds tended to be low during sampling, some pesticide drift was found on drift cards at each of the four sites. Most of the positive detections were on cards set up 50' downwind from the target area, but some drift was detected up to 250' downwind from the target.

The highest amount of permethrin detected was 230.41 ng/cm^2 (50' downwind from target). The highest amount of cyfluthrin detected was 4.27 ng/cm^2 (50' downwind from target). Note: cyfluthrin is more toxic than permethrin, so a lower rate is used in cyfluthrin applications. The highest amount of pesticide found on a drift card 250' from the target was 11.40 ng/cm^2 of permethrin (see Figure 12). The average amount of permethrin found 150' downwind was 0.30 ng/cm^2 (n=4 drift cards at the Freeport site), and the average amount of cyfluthrin detected at 150' downwind was 0.68 ng/cm^2 (n=6 drift cards at the Yarmouth site).

The full report displays all the drift card results from this study, in addition to dilution rates for individual sites, height of trees in the target area, wind speeds and directions, specific types of application equipment used, etc. Also, results for the yellow water sensitive cards matched laboratory results. Water sensitive cards showed small blue dots representing drift, in areas where drift did occur.

IV. Discussion and Conclusions

Temporary laws in effect during these applications, requiring a 50' no spray buffer next to the high tide line, and for applications within 250' of the water, requiring pesticide spray to be directed away from the water and requiring the wind to be away from the water, appear to protect marine water from drift. However, one up wind sample near the water (sample 726 in Falmouth) was found to have a level of pesticide near the limit of quantification, but this could have been a lab error since its duplicate did not detect any pesticide, or might have been a result of the calm morning.

Two duplicate drift cards in Freeport, up wind of the target, were found to have low levels of pesticide. During this spray event the hydraulic sprayer was briefly turned in the direction of the up wind samples to spray part of a tree. If the wind died down during this moment, that could explain the pesticide drifting over to the up wind cards 50' away. The target area at this site was greater than 250' from the water so the direction of spray did not have to be in a particular direction. Other up wind samples in this study did not detect pesticide.

This study found evidence that detectable levels of pesticide residues are capable of drifting down wind after an application, as expected. According to these results, low levels of pesticides can drift at least 250' from the target. Some samples did not show pesticide drifting that far, however, and that could be due to trees outside of the target intercepting the drift before it landed on the cards, lack of wind, or other variables.

In conclusion, the BPC recommends that the temporary browntail moth spray requirements be extended for upcoming spray seasons, including the requirement that wind must be away from the water. In addition, the BPC also recommends that browntail moth pesticide applications be prohibited when wind speed is less than 2 miles per hour (see the January 2, 2007 BPC memo to the legislature for other BPC recommendations not directly related to this drift study).

Appendix. Site Photos

Figure 2. Nozzle used in Falmouth.

Figure 3. Falmouth target area is three trees about 50' from water and drift cards were set up further away from the water (down wind), and at water's edge.

Figure 4. Falmouth application.

Figure 5. Harpswell application.

Figure 6. Freeport target area is trees around house, all greater than 250' from water.

Figure 7. Freeport application.

Figure 8. Freeport drift cards.

Figure 9. More Freeport application. Sprayer pointed toward drift cards.

Figure 10. Freeport drift cards set up across lawn. Pine trees may have caught some drift before it reached cards.

Figure 11. Yarmouth drift cards set up in this area. Ocean is down this hill over 250' from target area. Slight movement of air toward the water during this spray event.

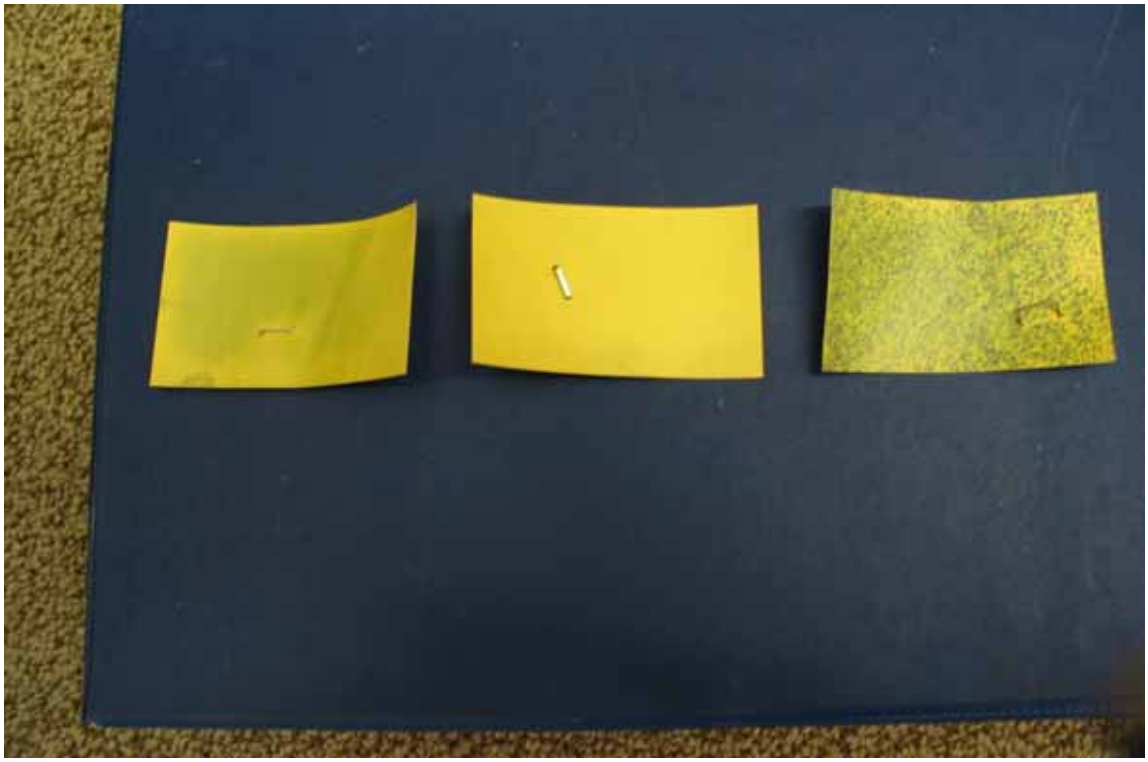

Figure 12. Water sensitive cards from the Freeport site from left to right: 250', 150', and 50' downwind from target. Very small liquid droplets are just barely visible on the yellow cards that were 250' and 150' from the target.