Excerpts from the US National Pesticide Safety Education Core Manual (in press)

Chapter 7 – Pesticides in the Environment, Section PREVENTING PESTICIDE DRIFT

Drift can be defined simply as the airborne movement of pesticides to non-target areas. Off-target movement can be in the form of spray droplet drift, vapor driftor particle (dust) drift. Studies have shown that a significant percentage of pesticides may never reach the intended target site because of drift. It is impossible to eliminate drift totally, but it is possible to reduce it to a tolerable level.

Where significant drift does occur, it can damage or contaminate sensitive crops, poison bees, pose health risks to humans and animals, and contaminate soil and water in adjacent areas. Applicators are legally responsible for damages resulting from off-target pesticide movement. All persons and animals should be removed from the area where pesticides are being applied.

Spray Drift

Spray drift refers to the off-target movement of a pesticide during a liquid application. This is the result of small spray droplets being carried off-site by air movement. Spray drift occurs more frequently than the other two types of drift because almost all spray applications result in some off-target movement.

Most problems associated with spray drift can be avoided by paying close attention to ***spray droplet size*** and the ***wind direction and speed***. Larger spray droplets are less likely to drift than smaller ones. Typically, larger nozzle orifices and lower pressures produce larger droplets. There are, however, some new nozzles such as the venturi or air-induction nozzles that produce larger droplets when used at higher pressures (above 40 psi).

Droplet size can be affected by the viscosity (thickness) of the liquid. The **viscosity** of a liquid is a measure of its resistance to flow. For example, mayonnaise is more viscous than water. As the viscosity of the liquid increases, so does the droplet size, thus reducing the potential for off-target movement. Formulations such as invert emulsions have a thick consistency that aids in reducing drift. With other formulations, some spray drift results as water droplets begin to evaporate before reaching the intended target. As a result, these droplets become very small and light and may move from the target site. Thus, invert emulsions shrink less with more of the pesticide reaching the target. Several drift-reducing additives are available that can help reduce the potential for drift. The number of large droplets can be increased by using certain additives and thickeners**.** Remember, always follow the label directions about using any spray additive that is intended for minimizing drift.

Air movement is the most important environmental factor influencing the drift of pesticides from target areas. The movement of air is influenced by the temperature at ground level and the temperature of the air above it. When the air near the soil surface is warmer than the air above it, the warm air rises and the cool air settles, resulting in a gentle mixing of the air. Often this condition occurs early in the morning and in the early evening. Under most circumstances, except in the case of temperature inversions, these may be the best times to apply pesticides because the spray droplets will move slowly upward. Windy conditions occur when the temperature near the ground increases, causing hot air to rise faster and mix rapidly with the cooler air above it. These conditions that favor drift may occur during midday when the wind speed often increases. Do not spray under windy conditions.

Low relative humidity and/or high temperatures can also increase the potential for spray drift. Under these conditions, the evaporation rate of water increases, resulting in smaller spray droplets that drift more easily. Avoid spraying at these times as well.

Outdoor drift problems can be reduced by spraying when the wind speed is low, by leaving an untreated border or buffer area around the target area, and by spraying downwind from sensitive areas

such as residential properties, schools, crops, waterways, or beehives. For reducing drift indoors, pest control operators must consider the air circulation patterns inside of buildings and must turn off fans and air-conditioners, and close vents where necessary to prevent pesticide from drifting to other areas of the structure. Indoor pesticide drift problems can also be reduced by using low-volatile or non-volatile pesticides and by using only low-pressure treatments.

Temperature Inversions

Applications made under low-wind conditions can sometimes result in more extensive drift than those made under high winds. Drift that occurs over long distances (over a mile) is most often the result of applications that were made under stable atmospheric conditions or **temperature inversions**.

A temperature inversion exists when the air at ground level is cooler than the temperature of the air above it. Under these conditions, the air is considered stable because there is little or no vertical air movement. Almost all air movement associated with inversions is sideways (lateral). This results in a high concentration of small spray droplets that are suspended in this layer of cool air near the ground. These droplets can then be carried long distances, especially if wind speeds increase. When the spray droplets settle out, they are still concentrated enough to cause potential damage or harm. Inversions can occur at any time of the day and at any height above the ground, but they most often develop during the early evening hours as the ground temperature begins to cool and the warm air has already risen. They intensify during the night and may persist until midmorning when the ground has warmed sufficiently to start air mixing vertically, causing a dilution and separation of suspended spray droplets. Consequently, applications made during early evening, night or morning hours under what appear to be ideal conditions can result in highly damaging drift that can move long distances. This is especially true if the humidity is high.

These stable air conditions (inversions) can be recognized by observing the movement of dust or smoke. If the dust or smoke rises little from its source and tends to hang in the air, an inversion is probably present or in the process of developing. Another method of detecting inversions is to place a thermometer at ground level and a second thermometer high above the ground and compare the difference in temperature. If the temperature at ground level is below that found at the elevated thermometer, a temperature inversion exists. An applicator should not apply pesticides under such conditions.

Vapor Drift

Vapor driftrefers to the movement of pesticides as vapors from the target area. Some pesticides are volatile and can change readily from a solid or liquid form into a gas under the right conditions. This most often occurs with high air temperatures. Pesticides that have volatilized into a vapor or gas may drift farther and for a longer time than as spray droplets. Only those pesticides that are able to volatilize are susceptible to vapor drift. As air temperatures increase, the likelihood that these pesticides will volatilize and cause vapor drift also increases.

Whenever possible, choose a pesticide that is formulated as a low-volatility product. Avoid applying volatile pesticides on very hot days. Some products can even volatilize several hours after application, so the applicator should know if high temperatures are predicted for later in the day. Many products carry precautions against applying these products when temperatures are above 85 degrees F or expected to reach 85 degrees. Remember to check label precautions for product-specific concerns about vapor drift.

Particle Drift (Dust Drift)

Particle drift refers to the movement of solid particles from the target area by air during or just after an application. These solid particles may include pesticides formulated as dust or soil particles to which pesticides are attached. Some pesticides can remain active on soil particles for long periods

after they are applied. If particles are blown off the target area, contamination or damage to sensitive areas can occur.

Particle drift is not limited to the outdoor environment, however. To prevent particle drift indoors, turn off fans, forced air heat systems and other air-circulating equipment. Check pesticide labels for statements related to these concerns.

Applicator Responsibility

The applicator is ultimately responsible for drift management. Applicators must assess the vulnerability of neighboring properties and those areas downwind of the application site. Weather conditions must also be evaluated for temperature inversions, wind direction, and wind speed before making the all-important decision about whether to spray. The applicator may have to make adjustments to the application equipment to reduce spray drift. The applicator should also consider using low-volatile formulations or adding a drift-reducing additive or thickener to help minimize drift. (For further discussion on equipment designed to minimize drift, see Chapter 11.) A good drift management program will include a combination of as many drift-reducing techniques as are available for a particular application.

Applicators who apply pesticides indoors are also responsible for preventing drift. They must ensure that pesticides do not move beyond the target site and that all people and animals are kept out of the treatment area according to label instructions.

Chapter 11 – Pesticide Application, Section: TECHNIQUES FOR MINIMIZING DRIFT

Spray drift removes the chemical from the target making it less effective and depositing the chemical where it is not intended. Application techniques, including the equipment selected, greatly influence the amount of spray drift that occurs. Applicators need to evaluate how their equipment is set up because off-target movement is affected by the type of nozzle, nozzle orifice size, sprayer pressure, and the height or distance of the nozzles from the target. It is important to review the product label for specific information on drift reduction techniques or requirements. The applicator must also check weather conditions such as air stability, wind direction, and speed at the time and place of the application and follow all weather-related restrictions on the label.

Of the many nozzle types available for applying pesticides, several are specifically designed for reducing drift. Whenever practical, use large capacity (larger orifice) nozzles to minimize drift**.** The applicator should refer to the nozzle manufacturer's product guide to determine which nozzle and pressure combinations produce the desired range of spray droplet sizes for the material and target being sprayed. Select nozzles that give the largest droplet size that will provide adequate coverage at the intended application rate and pressure.

In addition to the size of the nozzle orifice, newer features in nozzle design aid in drift reduction. Some new nozzle designs incorporate air into the spray to form an air-fluid mix. These air-induction nozzles, known as venturi nozzles, form a larger spray droplet, produce fewer fine particles, and provide energy to help transport the droplets to the target. These nozzles do, however, require higher spray pressures (40 to100 psi) to be effective. Even at these higher pressures, venturi nozzles will still dramatically reduce the potential for drift.

Operating pressure also affects the droplet size and output volume of the sprayer**.** Doubling the pressure will not double the flow rate. To double the flow rate, you must increase the pressure four times. Pressure cannot be used to make major changes in application rate, but it can be used to correct minor changes because of nozzle wear. To obtain a uniform spray pattern and minimize drift, keep the operating pressure within the recommended range for each nozzle tip. Exceeding the recommended pressure range will often result in more drift potential.

Spray height or distance from the target is an important factor in reducing drift. The closer the boom or spray nozzle is kept to the ground or target. To maintain a proper spray pattern, nozzles must be set according to the manufacturer's recommendations based on nozzle spacing and spray angle.

Another tool available for minimizing drift is the use of *drift control additives***.** Tests indicate that the use of some drift control additives reduce downwind drift deposits from 50 to 80 percent. Drift control additives make up a specific class of chemical adjuvants not to be confused with surfactants, wetting agents, spreaders, or stickers**.** A number of products are commercially available. They must be mixed and applied according to label directions to be effective. Research has shown that some products intended to reduce drift will in fact result in more drift potential. Spray applicators should be advised to thoroughly evaluate drift control additives under their application conditions before adopting full use.

Using approved application techniques and adopting new technologies designed to reduce spray driftwill improve the performance of spray materials, benefit the environment, be more cost-effective. Any one practice used alone may not suffice. Therefore, incorporate as many drift reduction techniques as practical into your spray program (see Table 11.1).

Table 11.1. Recommended techniques for reducing drift.

Recommended technique:	**Explanation:**
Follow label directions for reducing drift.	Read the label and reference the nozzle manufacturer's guide to determine which nozzle and pressure combinations are needed.
Select a nozzle to increase droplet size.	Large droplets are less prone to drift. Use the largest droplets that will provide necessary coverage.
Increase nozzle size resulting in higher application volumes.	Larger capacity nozzles can reduce the amount of spray depositing off-target.
Consider using new technologies.	Drift-reduction nozzles (e.g., air-induction nozzles).
Lower boom height.	Wind speed increases with height. Lowering the boom height a few inches-can reduce off-target drift.
Maintain appropriate travel speed.	High travel speeds may result in an unstable boom, high boom positions and increased drift potential.
Keep nozzle close to the target.	When using hand-held equipment, keeping the nozzle close reduces the potential for drift.
Avoid high application ground speeds or major speed changes across the field.	Rate controllers adjusting to speed changes may result in pressure adjustments causing droplet size variability. Rapid speed increases may create high pressure that results in more drift potential.
Avoid applications during times of high wind speeds.	More of the spray volume will move off-target as wind increases. Wind currents can drastically affect spray droplet deposition.
Do not spray in the presence of a temperature inversion.	Temperature inversions prevent the dissipation of spray particles.
Consider using buffer zones/no-spray zones near sensitive areas	Leave a buffer zone/no-spray zone if sensitive areas are downwind.
Use a drift-control additive when needed.	Drift-control additives increase the average droplet size produced by the nozzles. These additives, however, should not become your only drift reducing technique. They will not make up for poor spraying practices.

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Draft: Best Management Practices (BMP's) for Boom Spraying

PM-23 ad hoc committee
E. Ozkan, A.Womac, D. Parish, A. Hewitt, Y. Jeon

Too little pesticide results in poor pest control and reduced yields, while too much injures the crop, wastes chemicals and money, and increases the risk of polluting the environment. Achieving satisfactory results from pesticides depends heavily on five major factors:

1. Positive identification of the pest.
2. Using the right pesticide. Choose the least persistent and lowest toxicity pesticide that will work.
3. Selecting the right equipment, and particularly the right type and size of nozzle for the job.
4. Applying pesticides accurately at the right time.
5. Maintaining equipment in good condition. Individual components of the equipment should be checked periodically to make sure that you are applying the amount recommended on the chemical label.

BMPs for Effective Spraying

Following is a list of recommendations that should help pesticide applicators achieve greater accuracy and efficiency in liquid pesticide application using boom-type ground sprayers.

1. Read Product Label

1.a. Label-Specified Equipment Selection and Setup

Identify any specification of nozzle spacing, nozzle pattern angle, travel speed, release height, or other sprayer equipment factors listed on the label.

1.b. Label-Specified Spray Rates

The product label may also specify spray application rate in gallons per acre. This information helps determine nozzle flow rates to a large extent and thereby influence nozzle type, size, number, and operating pressure.

1.c. Label-Specified Spray Classification / Droplet Sizes

Newer labels will indicate the minimum required droplet size as a spray classification category (i.e. very fine, fine, medium coarse, very coarse, extremely coarse). The applicator selects a nozzle from the nozzle manufacturer's specification to match the label classification requirement for droplet size. Some labels may indicate the minimum required droplet size classification corresponding with buffer zones or distance to sensitive.

1.d. Label-Specified Product Agitation Requirements

Insufficient agitation may be a big problem with large size tanks. This problem is most serious when applying wettable powder-type pesticides. If there are "dead spots" or sharp corners in the tank, and if the agitation is not sufficient for a given size of tank, wettable powders may settle to the bottom. In other cases, dry pesticides may float on the surface a long time before a uniform concentration of pesticide in the tank is achieved. As a result, the mixture sprayed may have varying amounts of active ingredient at different times during the spray operation.

Many formulations have very specific mixing requirements in terms of the particular constituents required in the solution, the order of their addition into the solution, and especially the agitation required to dissolve or maintain a uniform pesticide concentration in the spray solution. Though it may be only a general term such as "moderate" or "heavy" agitation, it is critical to thoroughly mix the solution. This will increase pump flow requirements if hydraulic agitation is used. Mixing the chemical in a small container first, then pouring in the sprayer tank helps achieving a uniform mixing of active ingredients in the tank.

1.e. Label-Specified Required Adjuvants

Many product labels specify the use of specific adjuvants in order to provide good product efficacy, influence droplet size or solution evaporation rate, to reduce drift improve deposit retention.

1.f. Label-Specified Application type required

Some pesticides are highly volatile which may require incorporation into soil after application. Follow label recommendations to avoid drift with highly volatile pesticides.

2. Identify Sprayer Operating Capabilities (Observation and Operator's Manuals) to Identify Acceptable Application Factors:

2.a. General inspection of sprayer

Carefully examine the components of the sprayer (nozzles, hoses, pump, etc.) to make sure they are the right type, size, and can function effectively under various operating conditions (for example, output of some pumps decline with increased pressure).

2.b. Nozzle Spacing

The application equipment generally arrive set up with a particular nozzle spacing that is typical for the type of spraying to be performed (i.e. row crop sprayer, floater, etc.). Choose the equipment setup recommended to achieve best results (banding, broadcast, directed spraying, etc.). Selected nozzles may be deactivated or nozzle spacing may be modified for certain applications based on the crop, the spray application rate, the release height, and the nozzle flow rate, and pattern angle. Nozzle spacing may vary from 10 to 60 inches in many applications. The limits on nozzle spacing must be considered in selecting nozzles and their arrangement.

2.c. Number of Active Nozzles

Nozzles have limitations on flow rate and pattern. The spray application rate determines the flow rate per unit of boom width, which is determined by the number of nozzles per unit of boom width and the flow rate delivered by each nozzle. More nozzles at a closer spacing, multiple nozzle spray heads, drop nozzles, or increased flow rates may provide an increased overall application rate. If nozzle flow rate is limited, then selecting an appropriate number of active nozzles per unit of boom width must be exercised to affect the change in application rate.

2.d. Pump Flow Rate Range

The pump must have enough pumping capacity and pressure to provide for all of the nozzle flow plus any required agitation. Characteristic pump curves, "i.e. gpm vs. psi," for different types of pumps are available from the manufacturers. Most pump manufacturers also recommend not exceeding 70-80% of the pump's capacity continuously in order to reduce wear on the pump. Do not run the pump without liquid in the tank.

2.e. Spray Pressure Range

Spray pressure affects the performance of a sprayer in several ways. It changes the application rate as well as the size of droplets. The operating pressure for a typical boom-sprayer ranges from 15 to 80 psi. Most nozzles tend to produce a greater volume of spray in finer droplets at higher operating pressures. The lowest practical pressure that will provide adequate coverage and efficacy should be chosen to reduce drift. A good-quality (glycerine-filled) and accurate pressure gauge should be used.

The actual pressure used to deliver the spray is delivered by the pump and set by means of pressure regulator control.

2.f. Sprayer Speed Range

Sprayer speed influences the application rate. All sprayers or tractors have an upper limit on the travel speed and many have multiple discrete speed ranges that may limit travel to several different speed ranges. The range of possible sprayer speeds will partially determine the flow rate required of the nozzles for the selected application rate. A higher travel speed will require a higher nozzle flow rate to achieve a given application rate and, conversely, a higher nozzle flow rate may permit higher travel speeds to achieve a specified application rate, under otherwise similar conditions. Higher travel speed increases aerodynamic turbulence and boom instability though, which may provide greater opportunity for smaller droplets to be carried aloft by wind or thermal updrafts, and thus increase the potential for drift.

2.g. Boom Height Range

Boom height, in combination with nozzle spray pattern angle and spacing influence overlap and uniformity of spray application. Boom height affects the spray pattern overlap and the fall distance the droplets are exposed to wind and evaporation, which directly influences drift. Boom dynamics and instability also influence the effective release height of the spray so, the length of the boom, the travel speed, and the terrain roughness also influence drift potential. Spray release height and boom instability should be kept to a minimum in order to reduce drift. Nozzles placed lower into the canopy (i.e. drop nozzles) may improve targeting and reduce drift. The proper height should be kept at all sections of the boom.

2.h. Hydraulic Agitation Flow Rates (as required)

As mentioned under the pump flow rate range, hydraulic agitation requirements must also be considered in selecting a pump. If a particular pesticide formulation requires more agitation in order to keep the product thoroughly mixed and all particles uniformly suspended, then a higher flow-capacity pump will be required. A pump should be selected that will provide adequate flow for the highest anticipated flow requirement expected, allowing for the pump to be operated at 70-75% of its maximum flow rate in order to reduce wear. Mechanical forms of agitation are also available.

2.i. Calculate Maximum Nozzle Flow Rate

Evaluation of sprayer operating capabilities helps establish the potential flow rate required for each nozzle. The maximum flow rate of the selected nozzles will be limited by the flow rate and pressure-delivering capacity of the pump (and controlled by a pressure regulator) minus any agitation flow requirements. When the application rate is determined according to label instructions, then a nozzle flow rate can be determined using travel speed and nozzle spacing.

3. Read Nozzle Manufacturer's Guide and Identify:

3.a. Nozzle Types Available

There is a wide variety of nozzles available for different applications. Application rate, spray pattern, and droplet size requirements may all influence nozzle type selection. The type of nozzle must include a specific nozzle that is able to provide the flow rate needed to achieve the desired application rate with the selected equipment settings. Mount nozzles tightly to their positions. Be sure to use identical nozzles in all positions.

3.b. Nozzle Flow Rate Sizes

If the application rate, nozzle spacing, and travel speed have been selected, then the specific nozzle flow rate that is required may be calculated. Several nozzle sizes may provide the required flow rate because many nozzles have a relatively wide range in flow rate, usually by a factor of two or three. Selecting a nozzle size and operating pressure to produce a droplet classification that will minimize drift is usually possible.

3.c. Spray Pressure Range

A particular nozzle size may provide different flow rates based on the operating pressure. Selecting a nozzle size that will provide the specified flow rate at a lower operating pressure will often tend to reduce drift for a given equipment setup and operating environment.

3.d. Nominal Spray Angle

Nozzles are available that provide a variety of spray pattern angles. Wider spray pattern angles permit lower release heights to provide adequate spray pattern overlap and better coverage for a given nozzle spacing. Increased nozzle spacing requires a broader spray pattern angle to achieve complete overlap. If spray pattern overlap is specified in the product label, then it will also influence the required nominal spray angle of the nozzle. If nozzle spacing is limited, this may dictate the spray pattern angle required for a given range of acceptable boom heights.

3.e. Spray Classification / Droplet Sizes

If a nozzle has been found that provides the required flow rate and pattern at a specified operating pressure, it should be confirmed that the nozzle produces the desired spectrum of droplets, both for purposes of improved efficacy, as may be required for specific target pest control, and to reduce drift. Label requirements may specify nozzles that produce a certain droplet size spectrum, such as fine, medium, coarse, very coarse, etc. Carefully check the label to determine the optimum droplet size and proper nozzle size for a spray application.
Ensuring that a minimal volume of smaller droplets (those less than 150-200 microns) is produced by the nozzle at the specified operating pressure will reduce drift.

4. Determine Sprayer Setup for Acceptable Application Rate:

4.a. Pick Nozzle Spacing

Once a general nozzle type has been found that will produce the proper flow rate with an acceptable droplet size, the nozzle spacing may be selected. The spray pattern angle and some relatively close idea of the boom height are needed in order to determine the precise nozzle spacing required to achieve proper overlap and adequate coverage. If drop nozzles are used, then crop row spacing will have a direct impact on nozzle spacing.

4.b. Pick Spray Rate

The application rate, in gallons per unit area, is to be selected based on label requirements, which are frequently specified as some minimum. The actual spray application rate may be something greater than the specified minimum however and, once an application rate has been selected, the nozzle flow rate, nozzle spacing, and sprayer travel speed determine the actual spray application rate.

4.c. Pick Sprayer Speed

With the spray application rate and nozzle spacing determined, identify the sprayer travel speed based on the label requirements, sprayer capability, terrain, aerodynamic effects, and boom stability requirements to reduce drift.

4.d. Calculate Required Nozzle Flow Rate using 5940 Equation:
Calculate the required nozzle flow rate using the nozzle spacing, spray application rate, and sprayer speed using the following equation:

$$NFR(gpm) = \frac{AR(gpa) * TS(mph) * NS(in)}{5940}$$

Where: NFR = Nozzle Flow Rate
AR = Application Rate
NS = Nozzle spacing (for broadcast application)
TS = Travel speed

The travel speed should be measured in the field where the spraying will be done. At the same gear setting, a tractor may have different ground speeds if the ground conditions (soil type, moisture). Also, do not rely on the tachometer or speedometer on the tractor. They often do not display the actual ground speed as a result of several factors such as tire slippage and improper tire pressure. Many sprayers today are equipped with more accurate speed measurement devices such as radar guns.

4.e. Pick the Specific Nozzle Type and Size Considering Spray Classification and Nozzle Flow Rate Requirements
Once the individual nozzle flow rate has been determined, then the specific nozzle tip size may be selected. Presumably, a preliminary review of the nozzle tip flow ranges has already been performed and a nozzle of the desired type is available in an appropriate size. Selection of the type and size of tip is based on their capacity to provide the required flow rate for the equipment setup and to produce the proper pattern and droplet spectrum classification according to label requirements.

4.f. Identify Nozzle Tip Operating Pressure
If the nozzle tip has been selected and it is known that the hydraulic pump has adequate flow and pressure capacity, then the precise operating pressure required to deliver the desired flow rate may be selected from the nozzle tip operating pressure/flow rate specifications table usually provided with the tip.

4.g. Identify Exact Nozzle Tip Spray Classification at the Selected Operating Pressure
Use manufacturer's specifications or other data from a reputable droplet measurement instrument to determine the spectrum of droplets produced by the nozzle at the selected operating pressure does, in fact, provide the appropriate spectrum of droplets.

4.h. Ensure Nozzle Classification Matches Label Classification
When the actual droplet spectrum produced by the nozzle has been confirmed, this should be compared against labeling or other requirements for droplet size. If the nozzle produces an excess volume of spray in fine droplets, it will be necessary to repeat the nozzle type, size, and tip selection process until an acceptable droplet spectrum can be obtained.

4.i. Select Boom Height Based on Nozzle Angle and Spray Overlap (Minimize Boom Height to Reduce Drift)
Confirm nozzle angle, the desired overlap, and boom height necessary to achieve the desired overlap with the actual nozzle spray pattern angle of the selected nozzle and tip.

5. Calibrate the Sprayer

The only way to determine whether or not a sprayer is actually applying a chemical at the recommended rate is to calibrate the sprayer. For safety reasons, the sprayer should be calibrated using water as the spray solution. There are several procedures that can be used to calibrate a sprayer.

Nozzle catalogs are good sources of calibration information. Also, help can be provided by Cooperative Extension Service Educators and representatives of spray equipment manufacturers. The flow rate of nozzles, especially those made from brass, increase as they become worn. Therefore, calibrate your sprayer as often as possible. A study conducted at the University of Nebraska indicates that there is a direct correlation between the number of calibrations performed by the applicator and spraying accuracy.

5.a. Verify Flow Rate

Nozzles should have their output flow rate measured over a specified time period to confirm that they are delivering the precise flow rate required. All nozzles should produce the flow rate that does not vary by more than +/- 10% of the original output of the nozzle at that given pressure. If it is not, then any nozzle falling outside the appropriate range should be replaced.

5.b. Check pressure

Maintaining the desired pressure at the nozzle is essential to achieve the desired flow rate. The pressure reading seen on a spray rate controller or on the gauge near the pressure relief valve indicate the pressure at the pump not at the nozzle. Therefore, a second pressure gauge should be used to check the pressure at the nozzle to determine the pressure drop between the pump and the nozzles. There will always be some pressure drop between the pump and the nozzles. However, this can be reduced to minimum by having hoses of the proper size on the sprayer, using a manifold to distribute the spray mixture evenly to several boom sections, and by reducing the number of fittings, valves etc. along the spray line between the pump and the nozzles.

5.c. Check uniformity

Maintain uniform deposition of spray material on the target across the boom. How uniformly the chemical is deposited on the target is as important as the amount deposited. Non uniform coverage can result from simple reasons such as using misaligned or clogged nozzles, nozzles with different fan angles, or from uneven nozzle height across the boom. These common problems result in streaks, untreated areas, or over-application of chemicals. A portable patternator can be used to check spray uniformity.

6. Mixing chemicals

6.a. Determine the amount of chemical to mix

Pesticides must be mixed in sufficient liquid carrier to get uniform recommended coverage over the sprayed area. The applicator should be able to calculate the exact amount of actual chemical required to add to the spray solution in order to satisfy the label requirement. The dilution rate should be in compliance with the label.

6.b. Determine tank capacity

For accuracy, the exact amount of carrier solution in the tank must be determined before calculating the exact amount of chemical to add to the tank. The accuracy of liquid volume markings on exterior of tanks should be verified. They are not always accurate. Inaccurate tank markings can cause under or over application of the active ingredient. Measuring how much the tank holds can be done either by using a flow meter or by weighing the sprayer on a scale when the tank is empty and full, and then converting the difference in weight to gallons of water (One gallon of water weighs 8.34 pounds.) Once the accuracy of markings on the tank is verified, then the right amount of carrier should be put in the tank. For example, a tank rated at 300 gallons may actually hold 315 gallons when accidentally overfilled. This mistake can result in a 5% error (under application) in active ingredient amount per acre.

6.c. Cleanliness and pH of water

Water that looks clean enough to drink should be used to fill a tank. Most troubles with sprayers can be traced to foreign materials in the water. They clog screens and wear out nozzles and pumps. Any water pumped from ditches, ponds, or lakes should be filtered before filling the tank.

Water pH may change efficacy level of some chemicals. Check the chemical label and take precautions to change the pH level of water to that recommended by the chemical.

7. Spray Additives

7.a. Consider Use of Additives

A wide variety of spray adjuvants serve to accomplish different purposes, including the reduction of droplet evaporation and drift. Many product formulation labels require the use of specific adjuvants and include detailed mixing and agitation instructions for these adjuvants, which may require consideration of solution properties that affect droplet evaporation and drift. Some formulations and adjuvants may have different specific gravity or fluid characteristics than the water used for calibration, for example, and may require special adjustment. Drift reduction may or may not be realized because of increase in relative droplet size span. Some adjuvants may increase the larger droplet sizes and simultaneously decrease the size of smaller droplets. Some formulations and adjuvants may produce long-chain polymers that may be subject to shearing by pump, lowering their effectiveness in reducing the volume of spray contained in smaller, drift-prone droplets. Drift retardant chemicals should be used as a second line of defense against drift only after exercising other drift mitigation factors such as switching to low-drift nozzles, using nozzles with larger orifices, lowering the spray pressure etc.

8. Spray Timing

8.a. Lateral Wind Speed and Direction

Wind speed is one of the most influential factors affecting drift. Also, spraying should not be performed when wind speeds are less than 1-2 mph, since that may indicate less than ideal atmospheric conditions regarding vertical updraft. Upper wind speed limitations may be from 8-10 mph, or up to 15 mph depending on product being applied, nozzles used, sprayer setup, and proximity to downwind sensitive areas. Usually less drift occurs in early morning and late evening because of less wind. Although the distance droplets will drift is a function of many other factors such as droplet size, relative humidity, temperature and boom height, it is best not to spray when wind speeds are greater than 10 miles per hour.

8.b. Apparent Sensitive Areas Downwind

Another important consideration for determination of acceptable spraying conditions is the presence of sensitive areas or concerns, such as sensitive crops, wildlife, or aquatic bodies, downwind of the spraying target area. Select the time when drift is likely to be low for spraying the parts of the field near sensitive areas. Spraying near sensitive areas located downwind should be avoided if the wind direction is towards the sensitive area. Leave a buffer strip 50 to 100 feet wide and spray this strip later when the wind shifts. New label requirements may use a drift model to determine the required buffer width. Exercising various drift-reduction techniques this buffer zone may be reduced to minimum. Spraying on extremely hot, dry days should be avoided, especially if sensitive vegetation is nearby.

8.c. Ensure Adequate Vertical Mixing with Respect to Vertical Updraft, Stability, Inversions

Spray timing must be considered with respect to meteorological conditions according to label instructions to minimize drift. Make spray applications in slightly unstable atmospheric conditions. Avoid spraying during times that are conducive to atmospheric thermal inversions.

8.d. Keep records

Pesticide applicators are now required to record environmental conditions such as wind speed and direction. Recording additional information such as type and size of nozzles used, spray pressure, temperature, and relative humidity may play key roles in the outcome of a drift-related litigation.

9. Follow safety guidelines
Read the sprayer operator's manual and chemical labels to review recommended procedures for safe use of chemicals and the equipment. Wear protective clothing when calibrating, spraying, and cleaning equipment. Goggles, rubber gloves, and respirators or masks should be standard equipment when handling pesticides.

10. A final check before spraying
Make sure all vital parts of the sprayer are functioning properly before starting any spraying job. Check for leaks, and make sure the framework of the sprayer is securely fastened together and to its carrier.

11. Periodic checks during spraying
Observe the output pattern of nozzles periodically. Streaks in the pattern indicate that foreign materials are inside the nozzles. Remove and clean nozzles; use a soft brush for the tip and screen. Cleaning with a pin, a knife, or any other metallic object can completely change the spray pattern, flow rate, and droplet size characteristics of a nozzle. Maintain the sprayer in peak condition by periodic inspections and repairs. Carry extra nozzles, washers, other spare parts, and tools for quick repairs in the field.

12. Applicator Continuing Education
Personnel involved in pesticide application should be continually educated with regard to the safe and proper handling and application of the pesticides that they use.

13. Summary
In order to accomplish practical spray applications in the field according to mandatory label instruction, including performing the application in such a manner as to minimize spray drift, development of Best Management Practices (BMP's) for Boom Spraying provides a detailed methodical procedure needed to accomplish these objectives. With observation of the label instructions, equipment capabilities, instructions, and calibration, the spray solution and adjuvant characteristics, and the field conditions present for the desired application, the operator has an additional tool in these Best Management Practices that will organize and solidify the technical concepts and procedures necessary to achieve effective applications with minimal drift. Remaining up to date on current labeling, regulations, technology, methods, and BMP's through continuing education is a professional responsibility for all spray applicators.

Revised, August 2, 1999 by Richard C. Derksen, USDA-ARS, ATRU, Wooster, Ohio; Original draft provided by Skee Jones, EPA

DRAFT: Best Management Practices for Airblast/Air-assist Treatment of Tree/Vine/Bush Crops

General Recommendation

It is the operator's responsibility to ensure that the best management practices available are being implemented during each application to avoid drift problems. Consult the manufacturer's information, research publications, and other guidance for recommendations concerning pesticide application methods that will improve application efficiency and reduce spray drift potential. Your local extension service may be a good source of this information. (we need some IPM verbage)

Spray Direction

Drift potential is much greater from applications made to the outside rows of a treatment area. Spray the last row of smaller trees, vines, or bushes using nozzles on one side only, with spray directed into the treatment area. Larger crops that must be treated from both sides should be treated with the air and spray delivery system orientated to try toeliminate spray movement over the top of the crop and through (or under the crop. Shut off nozzles on the side away from the orchard when spraying outside rows. Shut off spray delivery before exiting the orchard when turning at ends of rows and when passing gaps within rows. Vertical towers or masts on sprayers can aid in directing spray into the crop canopy while minimizing spray losses over the top and under the crop. Use of tree (canopy senosors for nozzle shut-off should be considered for sprase plantings in particular.

Air Delivery

The most effective drift mitigation tool with orchard sprays is to not direct air over the canopy or spray between gaps in plantings. The use of tower, cross-flow or wrap around sprayers have all shown drift reduction potential and possible efficacy improvements. Use the lowest necessary air speed to minimize movement through and over a canopy. Enough air should be supplied to just keep the spray material within the canopy. Reducing travel speed decreases the air speed necessary to delivery the spray into the canopy. Use air guides and directional control of nozzles to direct the spray into the canopy.

Droplet Size

A major way to reduce drift potential is to properly manage droplet size. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (See Wind, Temperature and Humidity, and Temperature Inversions). Drift potential is much greater from applications made to the outside rows of a treatment area. It is important to manage operating parameters such as droplet size when treating the outside rows of canopies

Wind

Avoid application when winds are calm and when greater than 15 mph. However, many factors, including droplet size and equipment type determine drift potential at any given wind speed. Applications should be avoided when winds are calm because the direction of spray movement may be variable and a temperature inversion may exist. Operators should be aware of how local terrain

can influence wind patterns. Cold air drainage on slopes can cause airborne spray particles to move down a slope, away from a treatment area. Wind direction directly down drive rows (parallel with the sprayer should be avoided or early spray cut off prior the last row must be used. Wind speed and direction should be continuously monitored at the site at the time of application.

Sensitive Areas

The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g. residential areas, bodies of water, known habitat for threatened or endangered species, etc.) is minimal (e.g. when wind is blowing away from the sensitive areas). Do not make applications when the wind is blowing toward a nearby sensitive area unless adequate buffer distances are used. Check labels for recommended minimum buffers. Land owners and applicators are responsible for knowing and taking into account the location of all sensitive areas including endangered species, organic farms, and public use areas including school bus stops, etc.

Temperature And Humidity

Low humidity and high temperature increase the evaporation rate of droplets and therefore increase spray drift potential. Avoid spraying during conditions of low humidity and/or high temperature. When making applications in low relative humidity, set equipment to produce larger droplets to compensate for evaporation. If applications are necessary when conditions that promote high rates of evaporation exist, spray equipment should be modified to produce larger, less drift-prone, droplets. Spray applications made in foggy conditions should be avoided as they can result in more off-target spray movement.

Temperature Inversions

Avoid applications that allow small droplets to reach a temperature inversion layer above the treatment area. Temperature inversions restrict vertical air mixing, which causes small, suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on clear nights or with very limited cloud cover and light to no wind. They may begin to form as the sun sets and often continue well into the morning. Their presence can be indicated by ground fog; however, if fog is not present, Inversions can also be identified by the movement of smoke or dust from a ground source or smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing. Local sources of weather information may help identify the presence of temperature inversions. Do not spray the outside two rows if inversion or fog potential is significant.

DRAFT 10.05.04
Best Management Practices (BMPs) for Aerial Application of Pesticides

Introduction

The term, Best Management Practices or BMPs, originated from rules and regulations in Section 208 of the Clean Water Act and was defined as a method for preventing or reducing pollution resulting from an activity. The term has been broadened in recent years to mean a set of practices or common-sense approaches that one uses each and every time that an activity (i.e. spraying) is done in an effort to minimize or eliminate any adverse consequences of the activity. The BMPs discussed in this document are designed to help the aerial applicator make the most efficacious application while maintaining safety and reducing risks of off-target movement of their spray materials. BMPS are guidance measures only and not a regulatory tool.

Three basic factors are key to minimizing off-target spray movement: applicator professionalism, weather conditions, and spray equipment configuration. The applicator's professionalism is primary because the applicator controls the decision-making regarding how the application equipment is set up and whether the weather conditions are conducive for a quality, effective application within safe parameters. Spray application equipment must be set up to ensure treatment efficacy and to prevent off-target movement. Ultimately, it is the applicator who reads the label, assesses the weather and site conditions, and makes the decision to turn on or off the spray apparatus.

General Recommendation

It is the operator's responsibility to ensure that the best available management practices are being implemented during each and every application to avoid spray drift problems. Consult the product label, nozzle and equipment manufacturer's information, research publications, and other guidance for recommendations concerning pesticide application methods that improve application efficiency and reduce spray drift potential.

It is strongly suggested that aerial application pilots participate each year in the National Aerial Application's Research & Education Foundation's (NAAREF) Professional Aerial Application Support System (PAASS). The PAASS program develops a new educational curriculum each year specifically designed to keep the applicator informed of the latest technologies and methods used in aerial application to mitigate drift. In addition, it is strongly suggested that aerial applicators participate in NAAREF's Operation S.A.F.E (Self-regulating Application & Flight Efficiency) clinic before each season. S.A.F.E. clinics allow aerial applicators to properly calibrate their plane's equipment and the output of each nozzle to ensure the aircraft spraying system is properly set up. It is also important that aerial applicators continuously update themselves with the latest aerial application technology equipment. Most importantly, remember that THE LABEL IS THE LAW.

Recordkeeping

Keeping thorough, detailed records of both the pre-planning decisions and the conditions of an application is the first step for making an effective and professional spray application. By having an established record system that is used for each and every application, the applicator has documentation showing that all aspects of a job were thoroughly considered and appropriate actions were made; even if the decision was made to not spray at that time. Some of the basic recordkeeping categories include: site of application, product used, spray rate, start and stop times of the application, equipment configuration and operational settings, weather conditions (i.e., wind direction and speed, temperature) at the site of application, and notations of the sensitive areas downwind of the application site. At a minimum, record all state or federally-mandated recordkeeping categories. Applicators can develop their own recordkeeping system or use a commercially-available software package.

One of the best sources of spray record data available to aerial applicators is the data log that is created by a GPS aircraft guidance system, if installed. GPS systems are used to accurately guide the pilot to each swath during an application. The data recorded by these systems include: time and date of application, location of the application, altitude and speed of application, and in most cases, times when the aircraft was spraying. This information can be quickly downloaded and incorporated into the spray record.

Best Management Practices

a. Prior to an application, start a record of the spray job and record all significant pre-planning information related to the application job.
b. Record all information related to drift management measures, such as boom length, nozzle type and size, spray pressure, air speed, application height, as well as weather conditions; note any droplet size requirements found on the label.
c. Work with ground-crew to properly complete records for every spray job.
d. If the aircraft is equipped with a GPS guidance system, establish a methodology for downloading and incorporating GPS data into the spray job record.

Weather Conditions

Wind: Know what is downwind from your application area at all times and document your findings. Monitor wind direction throughout the application.

Many factors, including droplet size and equipment type, determine drift potential at any given wind speed. Wind currents can drastically affect spray droplet deposition. Low winds can result in unpredictable, variable air movements and a temperature inversion may exist which can reduce mixing of air. Be aware of how local terrain can influence airflow and wind patterns. In hilly or mountainous areas, cold air drainage on slopes can cause airborne spray particles to move down a slope and away from a treatment area. Measure the wind speed at the application site. Continuously monitor wind speed and direction through out the application. Avoid application when winds are calm (less than 3 mph) or when greater than 15 mph.

Temperature Inversions: When warm air has already risen during the day (warm air is light, cool air is dense and sinks), and the cool air settles below the warm air, a temperature inversion exists. Temperature inversions result in no vertical mixing and very stable air. Typically, inversions develop as the sun sets, last all night, and do not break until later the next morning when the sun has risen and warmed the ground. Inversions are common on clear nights or when there is limited cloud cover and light or no wind (there is still air-flow and drainage). However, inversions can occur under cloudy conditions. With a temperature inversion and no vertical mixing, small-suspended spray droplets remain in concentrated clouds and do not dissipate. The concentrated cloud of small droplets floats with whatever air movement or light winds are present during the inversion. Temperature inversions can be very localized or widespread. Under temperature inversion conditions, long distance drift of small droplets can occur over hundreds of feet or even miles.

Measuring temperatures at different altitudes can tell you whether there is a temperature inversion. Inversion layers can be found at different altitudes. Ground fog, smoke layers and hanging dust on a dirt road are prime indicators of temperature inversion conditions. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion. Smoke that moves upward and rapidly dissipates indicates good vertical air mixing and a good time for applications. Local sources of weather information may help identify the presence of temperature inversions.

Temperature and Humidity: Low humidity and high temperature increase the evaporation rate of droplets and may increase spray drift potential. Use caution when spraying in low humidity and/or high temperature conditions. If applications are necessary under conditions that promote high rates of

evaporation, configure spray equipment to produce larger droplets to reduce drift potential. Avoid spray applications during foggy conditions since they can result in more off-target spray movement.

Best Management Practices

a. During pre-planning, know what your shut-off parameters are, such as, wind direction or speed and the location of sensitive areas. Establish personal minimums for changes in weather conditions and make an operational plan for those occurrences.
b. Establish a firm chain-of-command for making weather-related decisions in regards to applications. Have pilots and ground crews act as a cooperative team in communicating meteorological observations, especially during conditions that approach shut-off parameters.
c. Determine wind direction and velocity at the job site by using aircraft smokers or an anemometer.
d. Determine if a temperature inversion exists at the job site prior to making applications under low wind conditions.
e. Arrange application schedules to take advantage of the most favorable weather conditions. For example, when wind is not ideal, only treat the upwind portion of the job; then wait for a wind change before completing the job.

Droplet Size and Equipment Selection

Drift potential from an aerial application can be significantly reduced by properly managing droplet size. Apply the largest droplets that provide sufficient coverage and control. However, applying larger droplets does not prevent drift when applications are made improperly or under unfavorable environmental conditions. Be aware that larger droplets are broken up more easily by wind shear when applied at speeds over 130 MPH. Since each applicator must develop a unique equipment configuration that fits individual customer needs, label restrictions, local conditions, and state and local regulations and ordinances, it is not possible to recommend a "best" configuration for application equipment.

In order to properly set up the spray boom to be appropriate for the job at hand, become familiar with boom length and location, nozzle performance (type and size) and operating conditions (pressure, airspeed, and nozzle orientation). Know how changes in any of these items affect droplet size or spray deposition. Several resources are available, such as the basic information found in nozzle manufacturer literature and Extension publications, and in even greater detail through the use of nozzle models developed by USDA-ARS. The models are available on the Internet at: apmru.usda.gov/downloads/downloads.html

Properly aligned and configured spray delivery systems optimize atomization and increase efficacy. Make adjustments to boom length and nozzles to provide for droplet control and to meet state regulations. Position booms and nozzles to allow release of spray materials in non-turbulent air (laminar flow). To prevent reverse airflow, don't release spray directly behind the boom in the low-pressure area. Extending nozzles slightly behind the boom with fittings usually remedies reverse airflow. To minimize pattern distortion, drop nozzles to either side of or below any air flow obstruction, such as landing gear, oil coolers, boom hangers, pumps, and swath markers. Make adjustments until there is no indication of dribbling along the boom or distortion of the spray pattern. For each job, select nozzles and position them in the air stream to produce the largest drop size consistent with boom pressure to give acceptable job performance and to minimize drift. Check swath pattern for uniformity.

Many pesticide labels require applications be made using specific droplet sizes or classifications. Use models, like the USDA-ARS model, to make sure your set-up complies with label directions and local regulations. Examine all spray equipment daily for any leaks or loose connections.

Best Management Practices

a. Prior to use on a job, inspect, adjust, and calibrate all aircraft spray systems used in the application for each type of job to be performed**.**
b. Depending on application needs and state regulations, adjust boom length and location on aircraft.
c. Review the product label to determine if a droplet size or classification is required; then adjust spray equipment or operating conditions to comply with the label.
d. Set up equipment for larger droplets if downwind movement is a concern.
e. Review and record the operating conditions (nozzle type, spray pressure, nozzle orientation, pattern uniformity, flow rate, and airspeed) used during an application to document professionalism and compliance.

Flight Height and Direction

The height or point of release of spray droplets has a dramatic effect on where droplets are deposited. Selecting the optimum flight height is a balance between preventing streaking (flying too low), reducing off-target movement of spray materials (flying too high), and safety (the most important concern). Flying heights between 8 and 15 feet often result in optimal spray characteristics, if the terrain and field obstacles allow this to be a safe height. Make height adjustments to fly safe and to mitigate drift. Swath offsets or moving upwind from a field edge can be an effective way to minimize drift past the field edge. Effective wing-loading of the aircraft when making an application next to a field edge may also mitigate off-target drift.

Best Management Practices

a. Fly at a height that minimizes streaking and off-target movement of products, and provides for safe operating conditions.
b. When entering or leaving an application site, turn on and off nozzles at the appropriate time and altitude to minimize off-target movement.
c. Be aware of any adverse wind currents generated by the aircraft due to aerodynamics. Use flight techniques and equipment configurations to minimize these effects.
d. Fly at the speed and select the boom pressure that has been verified in the equipment selection process to produce the best performance while minimizing drift.
e. Be constantly alert for leaks in the spray system and take appropriate corrective measures to avoid contamination of non-target areas.
f. Fly the headlands and edges of fields next to susceptible areas when there is a measurable wind away from susceptible area and the aircraft is in a low wing-loaded condition.

Drift Control Additives

Drift control additives are another tool available for minimizing drift. These are a specific class of chemical adjuvants not to be confused with surfactants, wetting agents, spreaders, or stickers**.** Quality drift-control additives increase the average droplet size produced by the nozzles. Research has shown that some commercially available products intended to reduce drift work well, while others result in more drift potential. Be advised: thoroughly evaluate drift control additives under their application conditions before adopting full use. Efficacy data for drift-control additives can be found on the Internet at: apmru.usda.gov/Aerial/2003ASAE/2003%20Techical%20Session.htm.

These additives should not be the only drift-reducing technique considered for use. They will not make up for poor spraying practices. You should first consider changing nozzles and their configuration to increase droplet size before using drift-control additives. If drift control additives are used, mix and apply them according to label directions to ensure efficacy.

Best Management Practices

a. When appropriate, use drift-control additives to enhance the deposition of spray onto the application site and to minimize off-target movement. However, first make sure your equipment is set up to minimize drift.

Sensitive Areas

Know your surroundings. Pay attention to sensitive areas adjacent to the application site and even those further downwind. Sensitive areas include any location occupied with people, most notably, schools, hospitals, residential areas, bus stops, and public gathering places. Additionally, sensitive areas could be croplands, aquatic sites, or locations known as habitat for threatened or endangered species. Create a log of these sensitive areas and review the log each time when you plan a new application. Only apply the pesticide when the potential for drift to adjacent sensitive areas is minimal (e.g. when wind is blowing away from the sensitive areas). Do not make applications when the wind is blowing toward a nearby sensitive area unless adequate no-spray buffers are used. Some labels specify minimum buffers. Land owners and applicators are responsible for knowing and taking into account the location of all sensitive areas. Communicate with the key person who oversees the sensitive area. Educate them on what you do and how you take precautions.

Best Management Practices

a. Maintain a sensitive areas log.
b. Review the log before each spray job to remind yourself of any sensitive areas that may be downwind of an application site.
c. Avoid spraying directly upwind of any sensitive area unless adequate buffer zones are used.
d. Treat fields near sensitive areas when the wind is blowing away from it; or, if wind is blowing toward the area, use an adequate buffer.

Endangered Species

Under the Endangered Species Act, EPA "must ensure that use of pesticides it registers will not result in harm to the species listed as endangered and threatened by the U.S. Fish and Wildlife Service, or to habitat critical to those species' survival." Therefore, applicators must be aware of any endangered species habit in or near their working areas. Document the locations of all endangered species that are in your application areas. The presence of endangered species plays a significant role in product selection, timing, and application precautions. If EPA finds a pesticide to possibly or probably have an effect on an endangered or threatened species, they may require buffers to be used. Some product labels may have buffers listed, but other requirements may only be found on the EPA endangered species web site for pesticide use. For more information concerning endangered species and associated buffer zones, applicators are referred to EPA's website (www.epa.gov/espp/) and the U.S. Fish and Wildlife Service's website (endangered.fws.gov/).

Conclusion

The applicator is ultimately responsible for spray drift management. Applicators must assess the vulnerability of neighboring properties and those areas downwind of the application site. Weather conditions must also be evaluated for temperature inversions, wind direction, wind speed, temperature and humidity before making the all-important decision about whether to spray. The applicator may have to make adjustments to the application equipment to reduce spray drift (increase droplet size). The applicator can also consider using low-volatile formulations or adding a drift-reducing additive or thickener to help minimize drift. Equipping aircraft with the latest drift mitigation application technologies and participating in continuing education programs related to drift, such as NAAREF's PAASS Program, and in application calibration clinics, such as NAAREF's Operation S.A.F.E. program, are also important in augmenting drift mitigation. A good drift management program

includes a combination of as many drift-reducing techniques as are available and appropriate for a particular application.

Again, these BMPs are designed to help the aerial applicator make the most efficacious application while maintaining personal and aircraft safety. These BMPs focus on application practices that should be considered to reduce risks of off-target movement of pesticides that are applied as sprays. BMPs are intended as guidance measures only, and are not stated here as regulatory language.

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Draft Pesticide Registration (Pr) Notice 2004 -Xx
Notice To Manufacturers, Producers, Formulators and Registrants of Pesticide Products

Attention: Persons Responsible for Federal Registration and Reregistration of Pesticide Products

Subject: Labeling Statements on Products Used for Adult Mosquito Control

This Notice presents the Agency's guidance on appropriate label language for pesticide products intended for wide-area application to control adult mosquitoes. EPA occasionally undertakes initiatives such as this in order to improve and clarify pesticide product labeling. The specific label statements and label organization principles recommended in this Notice are intended to improve existing labels by clarifying language conveying environmental hazards posed by these products, as well as specific use directions and instructions to the applicators. The Agency believes that adoption of these recommendations will help both pesticide users and pesticide enforcement officials to improve effective mosquito control and protection of public health, while ensuring that use of these products will not pose unreasonable risks to the environment. The Agency believes the incremental cost of label modifications is outweighed by the benefits to public health protection by having appropriate label statements that help ensure the proper and effective use of these products for mosquito control.

I. Background

In recent years state pesticide regulators and vector control agencies have raised a variety of concerns about the labeling of pesticides used for adult mosquito control. For example, in 1999 the State FIFRA Issues Research and Evaluation Group (SFIREG) submitted an issue paper to the Agency raising two specific concerns about such labeling. (SFIREG is a committee of the Association of American Pesticide Control Officials, and its public meetings serve as a forum for state regulators to discuss issues concerning the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) with Agency officials and other interested parties). The SFIREG paper noted that the statement "do not apply directly to water" which appears on many outdoor use pesticide products, if broadly interpreted, would severely restrict the application of mosquito adulticides, especially in floodwater situations, such as those encountered in the aftermath of hurricane Floyd in September 1999. SFIREG also noted that the standard label language intended to protect bees, which prohibits pesticide applications "...if bees are visiting the treatment area", could be seen as making virtually any daylight application of mosquito adulticides a violation of the label, even during an urgent threat to public health. Since state agencies enforce pesticide use regulations under cooperative agreements with EPA, and since FIFRA section 12(a)(2)(G) makes it an unlawful act "to use any registered pesticide in a manner inconsistent with its labeling", the interpretation of label requirements is a critical issue for EPA headquarters and regional offices, state pesticide regulatory agencies, and users.

In February 2001, the increasing impact of West Nile Virus on vector control and regulatory agencies led EPA's Region II office to sponsor an Inter-Regional Mosquito Control Conference for EPA and state agency representatives. Although labeling was one of many subjects discussed at the conference, participants felt this was an area that should be addressed. It was agreed that a group representing EPA's Office of Pesticide Programs (OPP), Office of Enforcement and Compliance Assurance (OECA), EPA Regional offices and state lead agency volunteers would develop initial, informal proposals for improving mosquito control product labels, with the focus on adulticides only. The EPA-State workgroup developed a paper which included seven recommendations. It also raised

the question of overriding bee protection use directions in a public health emergency, but did not make a recommendation on that issue.

In April 2003, the initial recommendations were discussed at a public meeting of the Pesticide Program Dialogue Committee (PPDC). The PPDC is chartered under the Federal Advisory Committee Act to advise EPA on pesticide issues. Its members represent a broad spectrum of interests, including the pesticide industry, grower groups, public health agencies, academic researchers, public interest and advocacy organizations. In general, PPDC agreed that improved labeling for this class of products should be pursued, and that the initial set of recommendations were generally appropriate, but needed further development. PPDC recommended that EPA develop the initial recommendations into more formal Agency positions.

After considering the comments and suggestions of SFIREG, the PPDC and other interested parties, the Agency has decided to make the specific recommendations in this Notice as a means to promote improvements in the labeling of adult mosquito control products. In October 2003, both the PPDC and SFIREG were briefed at public meetings on the approaches being presented in this notice, although the exact language of the recommendations was not shared outside of EPA at that time, since they were still subject to additional modifications. EPA's Office of Water reviewed the recommendations as part of the Agency's internal process, as the use of adult mosquito control products has the potential to raise issues related to the National Pollutant Discharge Elimination System. The recommendations consist of some specific statements that should generally appear on labels for this class of products, some model statements that registrants may adapt to the specific characteristics of their products, and some principles on organizing elements of the label.

II. Products Covered By This Notice

Since current labels for adult mosquito control products show a great deal of variation, the relevance of the recommendations in this Notice will vary from product to product. Registrants are encouraged to review and, as appropriate, petition to amend their product labels for insecticides registered for wide-area adult mosquito control to include the additional or revised use directions and other statements, and take related actions as described in this Notice. These recommendations apply to products labeled for wide-area application by ground or aerial equipment, typically as Ultra Low Volume (ULV) sprays or fogs, and not to home and garden use products which may list mosquitoes on the label. Control of mosquito larvae is a wholly different use pattern from adult mosquito control, and thus, products registered as mosquito larvicides are not included in the scope of this Notice.

III. Discussion Of Issues and Recommendations

This section presents seven labeling issues the Agency wishes to address, followed by a statement of a specific improvement that the Agency believes appropriate to deal with each issue. The label improvements recommended in this Notice are not identical to the seven initial recommendations presented to the PPDC in April, 2003. In some cases, the initial recommendation was stated as a general principle, which has now been developed into specific language. The Agency's own assessment has also led to merging some of the initial recommendations and adding new ones.

The general purpose of these recommendations is to improve consistency in the labeling of this group of products. Differences in use directions and hazard statements are appropriate for different active ingredients, formulations or application methods. However, since products were registered and labels approved individually over many years, variations have occurred in the level of detail for use directions and approaches to precautionary language, especially those related to hazards to aquatic organisms. The Agency has identified seven aspects of labeling discussed below for which consistency rather than differences among labels for this class of product would better serve the needs of users, regulators and the public.

Most publicly supported mosquito or vector control programs use an Integrated Pest Management (IPM) approach to mosquito control which includes public education, control of mosquito larvae through habitat modification and the use of registered larvicides, as well as wide-area spraying or fogging to control adult populations. EPA supports IPM approaches and believes that the use of mosquito adulticides should be consistent with IPM principles. Wide-area adult mosquito control employs different techniques from those used to control most other insect pests. Mosquito adulticides are typically applied as Ultra-Low Volume (ULV) sprays or fogs in which small amounts of pesticide, typically a few ounces per acre, are dispersed over a relatively wide area in the form of extremely fine droplets. The primary target of the ULV spray is any significant concentration of flying (host-seeking) mosquitoes, or mosquitoes resting on vegetation or other surfaces. Optimum control is achieved by the dispersion of the ULV spray over a wide area in order to make direct contact with mosquitoes in flight. In other words, the primary area being treated by a ULV spray is the air where flying mosquitoes are present, rather than a specific, defined area of infestation on the ground. Since mosquitoes are often found in close proximity to bodies of water, effective targeting of ULV sprays may require application of the pesticide over or near a body of water in order to disperse the pesticide to a downwind area where mosquitoes are present. Given the tendency of a ULV spray to stay airborne and be carried by wind, deposition of pesticide droplets to a body of water may occur on some occasions, even though this is incidental to the intended application.

All currently registered pesticides for adult mosquito control pose some degree of risk to aquatic organisms, and the synthetic pyrethroids, such as permethrin, sumithrin and resmethrin, are considered very toxic to aquatic organisms. All of the commonly used adulticides carry label precautions to warn of potential adverse effects to aquatic life. To avoid such adverse effects, an applicator treating areas near water must calculate many factors in order to avoid depositing spray material into a body of water. Weather conditions including wind speed and direction are important, but others factors that determine how far a spray will carry include the size of the spray droplets, the height above ground at which spray is applied, nozzle orientation, the flow rate, and the speed of the delivery vehicle. Some of these factors are addressed by label directions, but as noted above, with varying degrees of specificity among different products. The recommendations given below are intended to improve the clarity of certain use directions and precautions, and bring about more consistency among labels for this group of products. The Agency believes that adopting these recommendations will assist users in making effective mosquito control applications with minimal risks to the environment. Clear and consistent labels also assist regulators and the public in recognizing appropriate application practices.

Issue 1. <u>Adult mosquito control applications should be limited to trained personnel.</u>

Adult mosquito control often includes treatment of residential areas and publically controlled lands, and typically involves special ground or aerial equipment for applying Ultra Low Volume (ULV) sprays or fogs. Correct use of the equipment and application techniques require adequate training. The state and local agencies responsible for vector control programs are also accountable to the public for ensuring safe and effective applications. Given the complex application methods and the potential of the adulticide chemicals to cause adverse effects to the aquatic environment if misapplied, there is broad agreement among interested parties that proper training and supervision of applicators are essential to avoid adverse effects and ensure a safe and effective mosquito abatement program. However, there is not complete agreement on how best to accomplish this goal. For example, state laws can limit the use of pesticides for wide-area mosquito control to persons trained in a specified manner, and some states do have such requirements. However, not all states limit use in this manner. Since pesticide use regulation is geared to enforcing label provisions, there is a strong interest among regulators in using the label to help ensure use by appropriately trained and supervised applicators.

One way to ensure use or supervision by trained applicators is to classify a product for restricted use. Products classified by EPA for restricted use under section 3(d) of FIFRA are labeled as such, and may only be applied by or under the direct supervision of a certified applicator. Each state has an EPA-approved certification and training (C & T) program for the purpose of allowing trained applicators to use restricted pesticides. Resmethrin, sumithrin, permethrin, malathion and naled are among the pesticides most often used for adult mosquito control programs. Products using the active ingredient resmethrin are classified by EPA as restricted use products (RUPs), and some states restrict other mosquito control products through state regulations. However, at this time, most of the pesticides used in adult mosquito control are not classified for restricted use. As noted above, some states do require health or vector control agency personnel or their contractors to be certified even though RUP products are not used. However, other states require a lower level of training or none at all for mosquito control applicators, unless RUPs are being applied.

Independent of EPA's authority to classify a product for restricted use pursuant to FIFRA section 3(d), it is also possible to limit use to appropriate personnel through enforceable use instructions, provided that the label language identifies a clearly defined group of potential applicators. It would not be effective, however, to use a phrase that is ambiguous or subject to broad interpretation, such as "pest control professionals". Since there is considerable variation among state programs for both the regulation of vector control applicators and the certification categories that cover training for mosquito control, EPA has not been able to identify a universally appropriate training requirement to include on product labels. However, the Agency believes that limiting the use of mosquito adulticides to appropriately trained and supervised persons should be part of the label of any such product which is not already classified for restricted use. Therefore, it is the Agency's position that the following statement should appear on the label of non-restricted use products labeled for wide-area adult mosquito control:

> Recommendation 1. "For use only by federal, state, tribal, or local government officials responsible for public health or vector control, or by persons certified in the appropriate category or otherwise authorized by the state or tribal lead pesticide regulatory agency to perform adult mosquito control applications, or by persons under their direct supervision."

Issue 2. Some products combine adult mosquito control and other uses on the same label, generating uncertainty about which directions and precautions are applicable to which uses.

The Agency believes that adult mosquito control products should be labeled solely for adult mosquito control, or for mosquitoes and other pests such as blackflies or midges which are treated in essentially the same manner. Different uses involve different use directions and precautionary statements, which can be confusing when they appear on a single label. For example, among products currently labeled for agricultural uses in addition to mosquito control, the "Environmental Hazards" section of the label usually includes this statement: "For terrestrial uses, do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark." In this context, EPA employs "terrestrial uses" as a collective term for conventional agricultural and non-agricultural outdoor uses, but the term is not meant to include certain other general use patterns including adult mosquito control, direct aquatic applications (e.g., mosquito larvicides, aquatic weed control, etc.), greenhouse applications, indoor uses, or aerial forestry applications. The statement has become virtually standard on outdoor use pesticides. Thus, on some labels, the qualifying phrase "For terrestrial uses" introduces an environmental hazard section of the label that is intended to distinguish these other uses from mosquito adulticide treatments. However, the overall effect is that when the language quoted above appears on a label of a product intended for multiple uses, it may not be clear to users that it does not apply to adult mosquito control. To avoid confusion over what language is meant to apply to adult mosquito control, products should be labeled solely for that use. If a label does include non-mosquito control use directions, it is essential to distinguish portions of the label applicable to different uses.

Recommendation 2. Products labeled for wide-area adult mosquito control should not include container labeling for uses unrelated to mosquitoes. The standard terrestrial use water hazard statement should not appear on product containers labeled solely for mosquito control. If a container label includes non-mosquito control use directions, those directions and associated precautions should be clearly distinguished from those applicable to mosquito control. The terrestrial use statements on a mixed-use label should be followed by the statement "See separate directions and precautions for mosquito control applications."

Issue 3. Label statements intended to protect bodies of water and aquatic life should be harmonized, as well as improved to assist effective mosquito control applications.

The precautionary label language intended to manage risks to aquatic life varies considerably from product to product. For example, some permethrin based mosquito control products direct the user not to apply the product within 100 feet of lakes or streams. This restriction or "buffer zone" was put on many permethrin labels out of concern for aquatic toxicity that might result due to runoff from agricultural sites, not as a result of an assessment of risks associated with the significantly lower concentrations of the active ingredient involved in ULV mosquito control applications. Resmethrin product labels state "Avoid direct application **over** lakes, ponds and streams" (emphasis added), but the same labels state that vegetation "around stagnant pools, marshy areas, ponds and shorelines may be treated" and there is no buffer zone requirement. Products based on other active ingredients, including malathion and sumithrin, have label warnings about hazards to aquatic organisms, but neither buffer zones nor the prohibition of "over water" applications appear on these labels. Naled labels explicitly do allow application over water in order to treat adult mosquitoes, blackflies or houseflies.

For different active ingredients, differing environmental hazard statements may be warranted, based on whether risks posed otherwise would be unreasonable. Generally, however, EPA believes that a consistent approach to the environmental hazard label statements for this class of products is a practical benefit to both users and enforcement agencies and should be achieved where permissible under FIFRA. The language recommended below would help to resolve inconsistencies in label language where possible, although departures from this language may prove necessary on a case-by-case basis.

The recommended language would also help to achieve the objective of effective mosquito control. From a vector control point of view, applications sometimes do need to be made over or near bodies of water in order to reach areas where mosquitoes are present, and limitations such as buffer zones or "over water" prohibitions can impede effective control. For example, a 100-foot buffer zone may require leaving potentially infested areas untreated if they happen to be within 100 feet of a water body, yet not be necessary to avoid unreasonable risk. Similarly, an "over water" prohibition may sometimes interfere unnecessarily with the timely treatment of infested areas adjacent to water if, for example, an area happens to be downwind of a water body.

The Agency believes that the purpose of environmental hazard statements for these pesticides, in general terms, is to enable the user to recognize and minimize risks in the context of carrying out an effective public health pest control program, consistent with the assessment of risks identified in the registration process. Protecting public health from mosquito-borne diseases with the pesticides now available often involves some degree of ecological risk. The Agency concludes, however, that the public interest would generally be better served in terms of health protection if ULV mosquito control pesticides can be applied in a manner consistent with commonly accepted vector control practices, rather than under widely varying limits on some products. It also follows that environmental hazard statements need to be as clear as possible in order to identify the potential risks that applicators are expected to avoid. For example, it is preferable to state that a product is "toxic to fish, crustaceans,

and oysters", if data show that, rather than only stating the generalization "toxic to aquatic organisms" used on some current labels. Based on all of these considerations, the Agency recommends the model environmental hazard statement embodied in recommendation #3 for mosquito adulticides. (Note that the parts of this statement concerning bee protection and consultation with state agencies are the subject of additional recommendations in this Notice, and are represented here with a placeholder in brackets).

> Recommendation 3. "This pesticide is [toxic/extremely toxic] to aquatic organisms, including [insert types of organisms]. Runoff from treated areas or deposition of spray droplets into a body of water may be hazardous to [insert types of organisms]. [If appropriate, insert any additional wildlife hazard statements]. [Bee precaution can be inserted here or as a third paragraph of this section of the label]. [Insert consultation with state/tribal agency statement].
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> "Do not apply over bodies of water (lakes, rivers, permanent streams, natural ponds, commercial fish ponds, swamps, marshes or estuaries), except to target areas where adult mosquitoes are present. Do not contaminate bodies of water when disposing of equipment washwaters ."

Issue 4. Users should consult with the State or Tribal lead agency for pesticide regulation to determine if permits or other regulatory requirements exist.

State and Tribal agencies often have specific information about sensitive areas in terms of species habitats, drinking water sources and other factors, and may require specific protective measures through permits or other regulations. Obligations imposed on applicators by a State or Tribal permit or other regulation do not depend on whether there is any notice of them on a pesticide label. The Agency does not believe it is appropriate for the label to create an obligation for applicators to consult state/tribal pesticide agencies, but it is reasonable that applicators be advised of the possibility of additional requirements, since this promotes compliance with measures to protect the environment.

Current labels are inconsistent in referring the user to state authorities. Some labels are silent on the matter, others mention "applicable state and federal regulations", and others instruct the user to consult the State's Fish and Wildlife Agency. Some labels do instruct users to consult the State or Tribal agency responsible for pesticide regulation, which the Agency believes is the better approach. States differ widely in terms of agency roles in protecting environmental and wildlife resources, so no single term like "Fish and Wildlife Agency" is universally appropriate. Based on comments from a variety of interested parties, the Agency concludes that the most reliable source of information on whether there are additional requirements for mosquito control is the lead agency for pesticide regulation. Although the pesticide agency is often not the permitting authority, they will generally know if such regulations exist in their state or tribe, and who administers them. The Agency concludes that the following statement is appropriate for all wide-area mosquito control product labels.

> Recommendation 4. "Before making the first application in a season, it is advisable to consult with the state or tribal agency with primary responsibility for pesticide regulation to determine if permits or other regulatory requirements exist."

Issue 5. Labels need to specify the appropriate spectrum of ULV spray/fog droplet sizes, and indicate that droplet size should be determined according to the equipment manufacturer's directions.

Effective use of mosquito adulticides depends on proper application rates delivered in the appropriate droplet size. Current labels vary greatly in the level of detail instructing the user on what

droplet size spectrum to use and how to achieve a particular droplet size spectrum. While some labels simply specify a droplet size spectrum, others appear to make the user responsible for selecting the appropriate droplet size. Because droplet size is a critical parameter in defining efficacy and risk to non-target organisms, the Agency believes that droplet size affording good efficacy and low risk should be specified on product labels. The appropriate range of droplet sizes may vary somewhat from one formulation to another, so registrants should propose the acceptable droplet size range for their individual products.

The Agency believes the most reliable approach for calibrating application equipment to produce specified size spectra is for the applicator to follow equipment manufacturer directions for droplet size. The Agency acknowledges that many applicators prefer to have flexibility in choosing droplet size spectra appropriate for their specific treatment areas. The recommended language below provides an upper bound requirement for droplet size, allowing applicators to use finer sprays when necessary. Specifying the droplet spectrum also allows the Agency to estimate downwind airborne concentrations and deposition levels of adulticide sprays for risk assessment purposes. The following language is recommended as a model for droplet size calibration instructions on adulticide labels.

> Recommendation 5. "Equipment should be calibrated so that no more than *[percentage to be provided by registrant]* % of the spray volume is contained in droplets larger than 50 microns (□m) in diameter and no more than *[percentage to be provided by registrant]* % is contained in droplets larger than 100 microns in diameter. For aerial applications, calibration must account for the effects of flight speed and nozzle angle on droplet size under application conditions. For aerial application equipment, directions from the equipment manufacturer provide the best guidance and should be used for droplet size calibration. Droplet size measurements made by applicators using slides, paper, or other surfaces should not be used in lieu of the manufacturer's instructions for calibrating equipment to the required droplet size, but should be used regularly to ensure that equipment is performing consistently from application to application."

Issue 6. Precautionary language to protect bees should have a provision to allow mosquito control applications that might otherwise be prohibited in order to respond to immediate threats to public health.

Applications for adult mosquito control are generally made in the evenings, at night, or in the early hours of the morning – the periods when most mosquito species are active. These are the periods of the day when bees are not active, so mosquito control applications usually do not pose a serious threat to bees, nor do they conflict with bee precautionary language which prohibits applications "...to blooming crops or weeds if bees are visiting the treatment area." In some circumstances, however, public health protection may require daylight treatments which could include areas being visited by bees. For example, the widespread flooding caused by Hurricane Floyd in 1999 caused a mosquito and fly population explosion that threatened public health and required extremely large area applications by military aircraft. These applications were made in daylight for safety reasons. There are also some mosquito species that do feed during the day and can be vectors for West Nile Virus and other diseases. If those species are numerous at a time when human or animal disease cases have occurred in the region, daylight applications may be appropriate in spite of increased risk to bees.

The Agency believes that provision should be made to allow public health considerations to override a strict interpretation of bee precaution label language. Public notification of very wide-area applications can help to reduce risks to bees by providing opportunity for beekeepers to confine or move hives prior to pesticide applications. This type of application is not expected to be a common occurrence, but the determination should be made by an appropriate authority. The following

language should be added to the last sentence of the bee precaution statement on the labels of mosquito adulticide products.

> Recommendation 6. "... [when bees are visiting the treatment area], except when applications are made to prevent or control an imminent threat to public and/or animal health declared by state, tribal or local health or vector control agency, or if specifically approved by the state or tribe during a natural disaster recovery effort."

Issue 7. Mosquito adulticide labels should include specific statements on timing and frequency of applications.

The Agency's labeling regulations at 40 CFR 156.10 (i)(2)(vii) state that directions for use shall include "[T]he frequency and timing of applications necessary to obtain effective results without causing unreasonable adverse effects on the environment." With very few exceptions, however, mosquito adulticide labels direct the user to "repeat as necessary" and do not specify an interval between treatments, or any limitation on the number of treatments to the same site, and this poses several problems. "Repeat as needed" clearly does not meet the intent of the regulation by indicating to users or enforcement agencies what is an acceptable, efficacious, and safe application frequency, and it may lead to overuse and increased risks. It also impedes the Agency's ability to conduct risk assessments for the pesticides involved, since there is no clear starting point for estimating use and exposure. For risk assessment purposes the Agency would ideally like to know the maximum number of applications in a year, since some endpoints of concern may have cumulative or chronic effects. A specific limit on applications provides a baseline for assessment, rather than relying on assumptions about what may be "typical" and "worst case" use scenarios.

The Agency recognizes that vector control agencies generally utilize Integrated Pest Management (IPM) principles in determining treatment schedules. The Agency also recognizes that there may be limited data available to support specific interval and frequency limitations, since comprehensive reassessments of some of the mosquito control pesticides, as required by FIFRA and the Federal Food, Drug and Cosmetic Act (FFDCA), have yet to be completed. Nevertheless, registrants have data on the toxicity, environmental fate and efficacy of their products, and should be able to propose reasonable interval and frequency limits appropriate to their individual products.

Although interval and frequency limits are appropriate for the adulticide labels, mosquito control is primarily a public health concern, and the Agency does not believe that the label should prevent applications needed for effective control unless there is specific evidence that finite limitations are appropriate for a particular product or active ingredient. For that reason, the Agency is recommending a model for timing and frequency statements that includes provision for additional treatments to address threats to public health.

> Recommendation 7. "Do not retreat a site more than once in [X hours/days]; no more than [Y] applications should be made to a site in any [Z weeks/months] or [one year]. More frequent treatments may be made to prevent or control an imminent threat to public and/or animal health declared by state, tribal or local health or vector control agency, or if specifically approved by the state or tribe during a natural disaster recovery effort."

IV. Implementation

A. Application for New Registration

EPA expects that each applicant for registration of new products labeled for adult mosquito control will adopt the recommended labeling statements and principles in this Notice, to the extent appropriate for the product.

B. Application for Amendment

EPA requests that registrants of existing products covered by this Notice submit an application for amended registration. This application must include the following items: a completed EPA application form 8570-1, three copies of the draft label (highlighting the changes made on one label), and a description on the application, such as, "Amended consistent with the guidance set out in PR Notice 2004-XX." All such submissions must pertain only to this PR Notice. Additional unrelated amendments and/or changes to the product must be submitted as a separate action or the submission will be considered unacceptable and will not be reviewed. The Agency will attempt to process correctly submitted applications which require no additional scientific review within 180 days.

Registrants should send applications for amendment to the following addresses:

U.S. Postal Service Deliveries:
The following official mailing address should be used for all correspondence or data submissions sent to OPP by mail:

Document Processing Desk (AMEND)
Office of Pesticide Programs (7504C)
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Hand-Carried/Courier Deliveries:
The following address should be used for all correspondence or data submissions that are hand-carried or sent by courier service Monday through Friday, from 8:00 AM to 4:30 PM, excluding Federal holidays:

Document Processing Desk (AMEND)
Office of Pesticide Programs (7504C)
U.S. Environmental Protection Agency
Room 266A, Crystal Mall 2
1921 Jefferson Davis Highway
Arlington, Virginia 22202

V. Scope Of Policy

This Notice describes certain requirements set forth by FIFRA and its regulations and provides general guidance to EPA and affected parties. While the requirements in FIFRA and its regulations are binding on EPA and other affected parties, this Notice is intended to provide guidance to EPA, applicants, registrants and the public. As guidance, this policy is not binding on either EPA or any outside parties, and EPA may depart from the guidance where circumstances warrant and without prior notice. Registrants and applicants may propose alternatives to the recommendations in this Notice, and the EPA will assess them on a case-by-case basis. If a product does not meet the requirements of FIFRA section 2(q) or the regulations at 40 C.F.R. Part 156, the Agency may find the product to be misbranded and may take appropriate enforcement and/or regulatory action.

VI. Effective Dates

For all products covered by this PR Notice:

- As of the effective date of this notice, EPA will review all applications for new pesticide product registrations, amendments to registered products and reregistration of registered products consistent with the guidance contained herein.

- As of October 1, 2004, EPA will begin to evaluate products released for shipment by registrants and distributors to ensure consistency with the guidance contained herein. Registrants are reminded that they are responsible for informing their distributors when they change their labeling, and for monitoring the labeling of their distributors to assure that they make the necessary changes.

Various states' requirements should be taken into consideration when deciding on the timing of your amendment submission to EPA. Some states may require a review of the modified label by EPA prior to submission to the state for state approval purposes.

VII. For Further Information

For information on this Notice contact Jim Roelofs (Telephone 703-308-2964; e-mail roelofs.jim@epa.gov.

Jim Jones, Director
Office of Pesticide Programs

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