Getting the Drift on Chemical Trespass

Pesticide drift hits homes, schools and other sensitive sites throughout communities

By Kagan Owens and Jay Feldman

As suburban sprawl extends further into the countryside, the numbers of people who live, play and work near agricultural land is increasing. Due to pesticides drifting, thousands of individuals are directly affected by adjacent or surrounding agricultural fields where pesticide use totals nearly a million pounds a year. Pesticides used on lawns, ornamentals and trees also drift on to neighboring property. Both scenarios result in chemical trespass causing involuntary exposure. Government and independent studies show that drifting pesticides pose serious environmental and human health risks miles away from the treated fields.[1] With 77% of all pesticides in the U.S. being used in agriculture,[2] people, especially vulnerable high risk population groups like children, the elderly and infirm, are directly exposed to pesticides drifting on to homes, schools, health care facilities and other sensitive sites throughout communities.

According to the U.S. Environmental Protection Agency (EPA), "Each year, states receive about 2,500 complaints of drift from individuals."[3] In 2002, nearly half of the reported pesticide illness cases in California were individuals who were exposed as a result of pesticide drift.[4] Researchers believe that reported occurrences are a fraction of actual incidents.[5]

While EPA has proposed changes to product labels that will instruct users to "not allow spray to drift from the application site...,"[6] the health effects associated with drift exposure are not calculated or incorporated into agency risk assessments. Could EPA allow pesticides to be used if it had to calculate the real world impacts of drifting chemicals on people suffering cancer, neurological disease, asthma, etc.? Are there requirements EPA could impose on users to prohibit drift under penalty of law? Are drift reduction or mitigation strategies effective? Should the need to stop drift require the adoption of feasible non-toxic alternatives (e.g. organic)?

Photo by LSU Ag Center

What is pesticide drift?

Pesticide drift is an inevitable problem in pest management strategies that rely on spray and dust pesticide formulations. There are essentially two types of drift: particle drift (off-target movement during application) and vapor drift (off-target movement when a pesticide evaporates from a sprayed surface). EPA does not fully regulate particle drift, and it altogether ignores vapor drift in its regulatory definition of drift.[7] Vapor drift is known to travel much further than particle drift.[8]

Although pesticides can drift when applied from a truck or hand held applicator, of greatest concern is the aerial application of pesticides, where up to 40% of the pesticide is lost to drift.[9] It is estimated that less than 0.1% of an insecticide reaches the target pests. Therefore, more than 99% of the applied pesticide is released and left to impact the surrounding environment.[10] Even the newer ultra low volume technology (ULV) under ideal weather conditions results in only approximately 25% of an herbicide reaching the target area.[11]

Pesticides drift for miles

A 2001 study by Texas A&M University researchers shows that pesticides can volatilize into the gaseous state and be transported over long distances fairly rapidly through wind and rain.[12] A U.S. Geological Survey report reached similar conclusions, finding, "After they are applied, many pesticides volatilize into the lower atmosphere, a process that can continue for days, weeks, or months after the application, depending on the compound. In addition, pesticides can become airborne attached to wind-blown dust." The report also documents that pesticides in rainfall collected in Modesto, California exceeded state guidelines for the protection of aquatic life in most samples.[13]

In *Every Breathe You Take*, Environmental Working Group reports on independent scientific monitoring that finds dangerously high concentrations of the neurotoxin chlorpyrifos in the air that many residents breathe every day. Chlorpyrifos is an organophosphate pesticide whose residential uses are being phased out, but continues to be used in agriculture, for public health mosquito control and on golf courses. The report finds that more than 22,000 children in three counties attend school near sites of heavy use of toxic pesticides.[14]

Another report, *Secondhand Pesticides*, summarizes data collected throughout California and finds that airborne pesticide levels routinely exceed acceptable health standards miles from where they are used. More than 90% of pesticides used in California are prone to drift, and 34% of the 188 million pounds of pesticides used in 2000 in the state are considered highly toxic to humans, according to the report. Concentrations of the pesticides chlorpyrifos and diazinon, another organophosphate pesticide whose residential uses are being phased out, were found near spray areas in concentrations that exceeded acceptable health levels by 184 and 39 times, respectively. The report also reveals that for 45% of pesticides applied in California, the concentrations of pesticides in air peak long after the application is complete-between eight and 24 hours after an application starts. [15]

Photo by U.S. Department of Agriculture

Studies also show that pesticides drift indoors. For example, a 1991 EPA indoor pesticide study on children's exposure shows that for newer and older homes alike, "residues of many pesticides are found in and around the home even when there has been no known use of them on the premises."[16] In a 2003 study published in *Environmental Science and Technology* on indoor toxins in homes, researchers found varying and alarming levels of some of the most commonly used pesticides in dust concentrations in sampled homes. Most concerning is that 63% of the homes tested contain the commonly used herbicide 2,4-D,[17] showing that pesticides can be tracked indoors[18] or drift in through poorly sealed or open windows and doors.

Cause for concern

Because of documented exposure patterns resulting from drift, advocates for children and other sensitive population groups are particularly concerned. Adverse health effects, such as nausea, dizziness, respiratory problems, headaches, rashes, and mental disorientation, may appear even when a pesticide is applied according to label directions. Pesticide exposure can adversely affect the neurological, respiratory, immune, and endocrine systems, even at low levels. A recent study found organophosphate pesticides cause genetic damage linked to neurological disorders such as attention deficit hyperactivity disorder and Parkinson's disease.[19] Several pesticides, such as pyrethrins and pyrethroids, organophosphates and carbamates, are also known to cause or exacerbate asthma symptoms.[20] Because most of the symptoms of pesticide exposure, from respiratory distress to difficulty in concentration, are common in children and may also have other causes, pesticide-related illnesses often go unrecognized and unreported.[21]

Studies show that children exposed to pesticides suffer elevated rates of leukemia, brain cancer, and soft tissue sarcoma.[22] According to EPA's Guidelines for Carcinogen Risk Assessment, children receive 50 percent of their lifetime cancer risks in the first two years of life.[23]

A National Cancer Institute researcher who matched pesticide data and medical records in ten California agricultural counties recently reported that pregnant women living within nine miles of farms where pesticides are sprayed have an increased risk of losing an unborn baby to birth defects.[24] A 1996 study found that living within 2600 feet of an agricultural area increased the risk of developing brain cancer by two-fold, with astrocytoma increased by 6.7-fold.[25]

State preemption grew out of drift

In 1979, Mendocino County, California was among the first local jurisdiction in the country to pass an ordinance prohibiting the aerial application of phenoxy herbicides because of drift. The measure was passed after an incident in 1977 that resulted in herbicide drift on school buses nearly three miles away from the application site. After a California State Supreme Court decision upheld the right of citizens to adopt more protective standards than the state and federal government (*The People v. County of Mendocino*, 1984), the California legislature passed legislation taking away that right. The constitutionality of the law was upheld in the Court of Appeals for the Third Appellate District (1986).

Table 1. State Buffer Zone Requirements For Agricultural Pesticide Applications[32]

STATE	APPLICATION	DIMENSIONS	SITES
Alabama	Aerial application.	400 ft.	Schools, hospitals, nursing homes, places of worship.
Arizona	Certain odoriferous pesticides.	1/4 m.	Schools, daycares, health care institutions, 25+ residences adjoining field.
	Certain highly toxic pesticides.	400 ft.	Health care institutions.
	Certain highly toxic liquid pesticides.	100 ft (aircraft) or 50 ft (ground).	25+ residences adjoining field.
	Aerial application, certain highly toxic pesticides.	300 ft.	25+ residences adjoining field.
	Certain highly toxic pesticides.	1/4 m.	Schools, daycare centers.
Connecticut	Dust pesticides.	100 ft.	Public highway.
	Aerial application.	1/2 acre.	Municipal or private owned public parks, playgrounds, swimming areas.
Louisiana	Commercial aerial application.	1,000 ft.	Inhabited structure, school grounds during school hours.
Massachusetts	Aerial application.	150 ft.	Schools.
New Jersey	Aerial application.	300 ft.	Occupied schools, hospitals, nursing homes, places of religious worship, business or social buildings.
	Gypsy moth application.	2 m. (grade school), 2 1/2 m. (high school).	Schools, during commuting hours.
North Carolina	Aerial application.	300 ft.	Occupied schools, hospitals, nursing homes, places of worship, business or social buildings and properties.
	Aerial applications.	25 ft.	Public roads.
	Aerial applications.	100 ft.	Residences.

The issue of federal preemption of local ordinances made its way to the U.S. Supreme Court and it ruled in 1991 in *Wisconsin Public Intervenor v. Ralph Mortier* that federal law (the *Federal Insecticide, Fungicide and Rodenticide Act*) does not preempt local restrictions. The pesticide lobby then went to all states without preemption clauses seeking and getting, in most cases, amendments to state laws that specifically preempt local jurisdiction. Today, only ten states allow their local jurisdictions to restrict pesticide use.

Buffer zones

Buffer zones, areas where pesticide spray applications are prohibited, can reduce unconsented exposure from spray drift on to school property, residential areas and other sensitive sites. Seven states have recognized the importance of controlling drift by restricting pesticide applications around these sites. State required buffer zones range from 100 feet to 2 1/2 miles, depending on the application method, pesticide type and site to be protected from potential drift. (See Table 2)

The U.S. District Court in Seattle issued an injunction in January 2004, as a result of *Washington Toxics Coalition, et al. v. EPA*, that put in place no-spray zones of 100 yards for aerial applications and 20 yards for ground applications of more than 30 pesticides from "salmon-supporting waters" in west coast states. The judge's ruling in the case found EPA out of compliance with the *Endangered Species Act* for failing to protect salmon from harmful pesticides.[26]

Table 2. State Notification Requirements For Agricultural Pesticide Applications[33]

STATE	APPLICATION TYPE	NOTIFICATION TYPE, APPLICATION DISTANCE	SITE
California	Aerial application, phenoxy herbicides, timber production.	Post sign, 1 m.	All property owners.
	Aerial application, phenoxy herbicides, timber production.	Mail notice, 300 ft.	Residents requesting notice.
Connecticut	Restricted use pesticide.	Post sign.	Neighboring property.
	Aerial application.	Written consent, 200 ft. (helicopter), 300 ft. (fixed wing).	Landowners and residents.
Maine	Pesticide applications.	Request to be notified, 500 ft.	Residential buildings, school buildings, playgrounds, athletic fields; commercial buildings, places of worship; recreational areas.
Massachusetts	Aerial applications.	Post sign, 500 ft.	100 feet around structures (residential, commercial, municipal, hospitals, schools, gathering places), recreation areas.
New Jersey	Aerial applications.	Written consent, 100 ft.	Private residence.
Pennsylvania	All applications.	Registry, Contiguous land.	Residence.
Texas	Airblast and mistblowing applications.	Request notification, 1/4 m.	Daycare, schools, hospitals, clinics, nursing homes; those with chemical sensitivities reside and work.
Wisconsin	Aerial application.	Request notice, 1/4 m.	Residence.
	Aerial application.	Post notice, 300 ft.	Residence, labor camp, school, playground, daycare, health care, commercial or industrial facility, public recreation area.

Mitigating pesticide drift

EPA's standard pesticide label requirement, which instructs the user to avoid drift, is viewed as inadequate and unenforceable. Community members often advocate for sustainable, organic alternatives to pesticide use to avoid altogether the harmful effects of pesticide drift.

Technical fixes have limited ability to control drift. Despite improved engineering of nozzles and droplet size, real world experience demonstrates that applicators are often not trained to use the technology correctly and frequently spray in weather conditions that exacerbate drift. The fact that acute poisonings still occur with disturbing regularity (sub-acute or chronic poisonings are even more common) suggests that more of the same "technology enhancement" approaches will not solve the problem.[27]

- **Buffer Zones**. To protect against vapor chemical drift, meaningful buffer zones require a two-mile radius around the residential and school property and other sensitive sites. Aerial applications should have a larger buffer zone, at least three-miles encircling the designated property. No-deposit buffer zones, which reduce the impact of particle drift, should encompass a minimum of 400 feet.
- **Time of Day**. Ultimately, buffer zones should be in effect at all times of the day, especially for sensitive sites such as residential areas, schools and hospitals. For schools, it is critical for spray restrictions to be in place, at a minimum, during commuting times and while students and employees are on school property to protect against airborne exposure.
- **Communication**. Farmers should meet with nearby property owners, residents, and school officials to talk about which pesticides are planned for use, establish emergency plans for accidental exposure, and share schedules when certain sensitive sites, such as parks and schools, will be in use.
- **Notification.** Ideally, pesticide applicators should provide 48-hour prior notification to all occupants and users of sensitive sites within a three-mile radius. Notification, at a minimum, should include the time and location of the application, the pesticide product name, known ingredients,

and applicator contact information. Currently, eight states provide some type of notification of agricultural pesticides to nearby property occupants and users. (See Table 2). Twenty-one states provide some type of notification of lawn and landscape pesticide applications to abutting property. (See page 16).

- **Wind Breaks**. The use of natural or artificial wind shields or breaks can help deflect and contain spray drift away from sensitive areas.[28]

- **Pesticide Choice**. Because completely eliminating drift is virtually impossible, growers and pesticide applicators should use the least toxic substances. Products with label temperature restrictions should be avoided. Avoid using chemicals that volatilize rapidly from moist soil, such as butyul ester or butoxyethanol ester, because they are more likely to result in vapor drift. Application of the most toxic pesticides, including carcinogens, endocrine disruptors, reproductive toxins, developmental toxins, neurotoxins and pesticides listed by EPA as a toxicity category I or II pesticide, should be prohibited from use.

- **Application Equipment**. Drift increases significantly as boom height on spray equipment increases. When boom height doubles, drift increases 350%. Sprayers should be set up to produce the largest droplets (at least 200 microns). Large droplets are more likely to maintain momentum, actually reach the target pest, and not get carried away with air movement. Other equipment considerations include spray pressure, nozzle size, nozzle orientation, vehicle operating speed, shields on sprayers and nozzles and application rate. Ultimately, aerial and other problematic spray technologies should be prohibited altogether.

- **Weather**. Application of a pesticide should never take place when a sensitive area is downwind, no matter the wind speed. Drift potential decreases as wind speeds decrease. Technicians identify optimal conditions as three to ten miles per hour winds blowing away from sensitive areas. Other weather considerations include: air temperature, relative humidity, topography and atmospheric stability (check for temperature inversion which can cause small-suspended droplets to move long distances).[29]

- **Enforcement of Pesticide Regulations**. State pesticide lead agency inspectors should routinely inspect planes, equipment, and application sites to ensure that regulations are being followed, and to prevent potentially damaging exposure to drift from pesticide applications.[30] Drift incidents should be reported to state enforcement agencies, which must, under federal pesticide law, conduct an investigation and a response within 30 days.

Detecting Drift

There are several ways to identify whether a pesticide has drifted on to non-target property. The obvious would be if a cloud of pesticide drift was visually evident or if there are damaged crops or vegetation. But drift is usually invisible. Therefore, drift can be documented through the use of cards, filters, panels, plastic, and air sampling equipment.

After collecting drift samples, it is best to know what chemicals are being used and collected because analytical laboratories evaluating the samples charge per pesticide. (Find a lab through the American Association of Laboratory Accreditation at www.a2La.org.) If cards are used, knowing whether the pesticide is water or oil based will guide which type of card to use. It is also important that the collecting device be placed appropriately on the property. In addition, samples need to be collected as soon as possible after the suspected drift, preferably within two hours, and placed in a sealed plastic bag and in a cold, dry place in order to preserve the pesticide before it begins to breakdown. Due to the complexities and costs associated with detecting pesticides, please contact Beyond Pesticides for advice on identifying which methods are most appropriate and a strategy for where and how to set up the detection unit.

- **Cards.** Water and oil-sensitive cards can show pesticide droplet size and distribution Simply attach cards to wherever drift may be taking place, such as along the property's fence line, trees, garden or structure. Drawbacks: These cards are sensitive to not only pesticides. Very fine droplets may not get detected. (50 cards per pack, $39.95 for water-sensitive, $34.95 for oil-sensitive, www.gemplers.com)

- **Filters**. Filter paper can be used to capture the pesticide and sent to a lab to identify the pesticide concentration. Because you will not be able to see if the filter captures pesticide drift, it should be placed next to cards. Drawbacks: Filters need to be carefully placed and handled. (Whatman Grade No.1, 100 filter papers, $4.59, www.sargentwelch.com)

- **Panels**. Drive a stake in the ground and attach a 12"X12" piece of cardboard covered with a sheet of aluminum foil to the top with a small roofing nail. Use caution and spray the upper surface with a little sticky tack. The acetone carrier will dry in a few seconds leaving a film that will trap pesticides. Once the pesticide has been collected, roll the foil up and carefully store it. Drawbacks: Same as with filters.

- **Plastic**. Black plastic garbage bags can be placed around the property as a way to detect pesticide droplets. It is easy and probably the least expensive way to detect drift. Drawbacks: Whether or not a pesticide will show depends on the droplet size.

- **Air Sampling Equipment**. Air sampling equipment to detect pesticides can be rented or purchased. (SKC, Inc., www.skcinc.com) Available to select community groups only, the Drift Catcher is being used by the Pesticide Action Network North America to collect and measure air samples. Drawbacks: Equipment is very expensive.

If drift has harmed you

If pesticide drift is suspected as causing harm to you or your property: 1) evacuate the area; 2) get medical attention; 3) find out what chemicals were used; and 4) contact the state's lead pesticide agency and file a complaint while requesting that it send an investigator to take residue samples. It is important to file a written complaint with copies to elected officials. The state is then responsible for carrying out an investigation and taking an enforcement action (or deciding not to) within 30 days. If the state fails to do this, it becomes the EPA's responsibility. Follow up on all phone conversations with a letter confirming what was discussed. Send around copies of letters, listing at the bottom of the letter, all those to whom the letter was distributed, including, U.S. EPA, the Governor and elected officials. This is critical if the lead agency is not helpful. See *What To Do In A Pesticide Emergency* on the Beyond Pesticides website, www.beyondpesticides.org[31] Contact Beyond Pesticides at 202-543-5450, info@beyondpesticides.org.

Notes

(For a fully cited version of this article, see www.beyondpesticides.org)

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