

Pesticide related bee kills: How to know, how to collect samples, how to report

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The Importance of Incident Reporting

Accurate information on bee loss incidents is important to understanding the real-world experience of our pollinators. From this information, agricultural stakeholders can work together to develop best practices for pesticide use and application, as well as federal and state regulation and label language in order to protect honey bees and native pollinators.

Field experience

Within two weeks on the job as the Kentucky State Apiarist in June 2014, I got a phone call that every apiarist dreads to hear. A beekeeper had brought three sealed plastic sandwich bags of dead bees to the northeast Kentucky extension office, convinced that his neighbor had poisoned his bees. Unfortunately, as with any potential scene of criminal investigation, neither the extension agent nor I, as the Kentucky State Apiarist, can receive those three sealed plastic sandwich bags. There is no way to tell where those bees came from, when the pesticide was applied, and if the beekeeper may have lost the hive due to poor nutrition (running out of honey, *varroa* mites, etc.).

One month later, the president of the Kentucky State Beekeepers Association in Bowling Green, Kentucky, saw his neighbor applying an aerial pesticide to his tobacco crop, and immediately started videotaping his bees' erratic behavior at the entrance of the beehives. Being a pilot, the president knew that the farmer was applying the pesticide during wind that was over the recommended label instructions. He went down to the airport and recorded the day's wind speed, and contacted me. I advised him to contact the Division of Environmental Services, and two investigators went to his house the following Monday and took samples.

How to Know

The first example illustrates what **not** to do. In Kentucky, if a beekeeper suspects that his or her hives are impacted by insecticides, he or she needs to call the Division of Environmental Services immediately 1.502.573.0282 or 1.866.289.0001. *Most importantly, beekeepers need to leave the hive alone.* This is very difficult for beekeepers to understand. It seems almost second nature for beekeepers to want to scoop up some dead bees, but if a beekeeper does that, he or she

alters the scene of a potential crime (i.e., off-label pesticide use, chemicals applied in windy weather, etc.). The beekeeper also wants to call the State Apiarist, but I am one person for 120 counties. It slows down the response time of the Division of Environmental Services if the beekeeper calls the State Apiarist first; *call the Division of Environmental Services first*.

A bee kill from pesticides and a starvation case can look the same: Both have large numbers of dead bees at the entrance of the hive or on the bottom board. A quick “test” is to simply pick up the back of the hive. A healthy hive, especially in the summer, should weigh at least 90 pounds. If a beekeeper can pick up the hive with ease, that is a sign that the hive may have simply run out of honey, and not necessarily died from a pesticide. For many beginner beekeepers, their hives can run out of food but it will “look” like a bee-kill. If the hive is exceptionally light, the beekeeper may want to go into the hive and see if the frames are showing the tell-tale sign of “tails in the cells.” Doing this check may eliminate the need for an investigation team to go to a farm and fill out a report.

How to collect samples

When dealing with a possible pesticide kill, time is not on your side. You need to get a sample taken as soon as possible. If you want to take legal action against the pesticide applicator the sample must be collected by a regulatory official. If you disturb the colony, clean it up or take the sample yourself, then the sample can no longer be used in a court of law because the sample is considered to be tainted, and there is no official chain of custody. If you believe you have had a pesticide kill you need to immediately call the pesticide regulatory agency in your state, report the kill and request an investigation. The pesticide inspector will schedule a time to meet with you and collect samples.

If there is a pile of dead bees in front of the colony and there is an imminent threat of rain you should cover the dead bees to protect them from the rain (do not disturb the pile). Do not use plastic or metal to cover the pile of bees since this could contaminate the sample: use an empty deep or medium box with a cover. You need to get the sample collected within 24 hours of the kill if possible.

Remember that a pesticide can be a fungicide, rodenticide, herbicide or insecticide. Powdered formulations are generally the most toxic to the colony because bees will collect it as pollen and feed it to the entire colony. Microencapsulated formulations are also highly toxic to the colony since they can also be stored and fed as pollen. Liquid formulations are generally less toxic to the colony and more toxic to the individual field bee since the field bees don't make it back to the colony unless the application is very close to the colony.

How to Report

Pesticide bee kills can come in several forms:

- 1) The most obvious type is an acute kill of the entire colony. This happens when a highly toxic pesticide is applied inside the colony or in close proximity of the colony. Symptoms of this type of pesticide kill are a large pile of dead bees (usually several gallons or more) in front of the colony, dead bees on the bottom board, dead larvae and if recent live pupae and emerging new bees. This type of kill can also be caused

by the combination of individually non-toxic levels of pesticides that in combination are highly toxic to the bees.

I have seen this type of kill both by a farmer improperly applying a pesticide to his crops and from a beekeeper using two products inside his colonies to control pests. In one case, a farmer applied a highly toxic pesticide to a crop at the wrong time of day. In another case a farmer applied a fungicide to his crop that was not listed as toxic to honey bees, but the beekeeper was treating with an apicide to kill *varroa* mites and the combination of the two was highly toxic to the bees. In another case a beekeeper was treating for small hive beetles with one pesticide and *varroa* mites with another pesticide. The combination of the two basically produced a fumigation bug bomb inside the colonies killing 39 colonies over the next few hours.

- 2) The next type is an acute kill of the field force. This happens when you have a highly toxic pesticide applied a mile or more from the colony. Symptoms of this type of pesticide kill are sudden loss of the entire field force with an otherwise healthy looking colony. This type of kill is extremely hard to prove unless there is another beekeeper closer to the pesticide application who has an acute kill of entire colonies.

I have seen this situation where a farmer sprayed a field of sweet corn in the middle of the afternoon when bees were actively collecting pollen from the corn because Japanese beetles were eating the silks off of his crop. The farmer freely on his own accord replaced the lost colonies. This was a situation where one person was trying to protect his livelihood without thinking about or checking to see if there were honey bees actively foraging in his crop.

- 3) Chronic pesticide kills can be hard to diagnose and prove. A chronic pesticide kill is caused by a pesticide with low toxicity to the bees or a combination of pesticides that are normally not toxic to the bees but in combination become toxic to the bees. This can be a combination of pesticides the bees are bringing in from the environment, a combination of treatments that you are using on your bees to get rid of pests or diseases or a combination of pesticides the bees are bringing in from the environment and the treatments that you are using to get rid of pests and disease. Symptoms of this type of kill can be any of the following: a) bees that cannot fly, twitching and falling on the ground around the entrance, b) large numbers of bees walking away from the colony instead of flying, c) dramatic depopulation of the colony over weeks or months, d) a healthy population of adult bees with dead or dying larvae and/or pupae (in this case you will see piles of dead larvae and pupae in front of the colony).

Some pesticide kills can be misdiagnosed as pest or disease issues, and vice versa by those that have not experienced the problem in the past. If there is ever a question regarding the health of a colony always seek help from your State Apiarist, State Apiculturist or another highly experienced beekeeper.

Beekeepers may want to send in samples of their bees using an Emergency Response Kit available from the University of Maryland Lab. Kits are available at <https://beeinformed.org/programs/emergency-response-kits-2/>

Beekeepers have the option to survey for *varroa*, nosema and viral targets for \$80, and you can add pesticides for \$760. *Costs are subject to change.*

There is a how-to guide for collecting evidence of bee losses on the Pollinator Stewardship Council website http://pollinatorstewardship.org/?page_id=1342, as well as a list of labs to which you can send your evidence. Guidance for collecting evidence may also be found on the U.S. Environmental Protection Agency's website at <https://www.epa.gov/sites/production/files/2013-09/documents/bee-inspection-guide.pdf>.

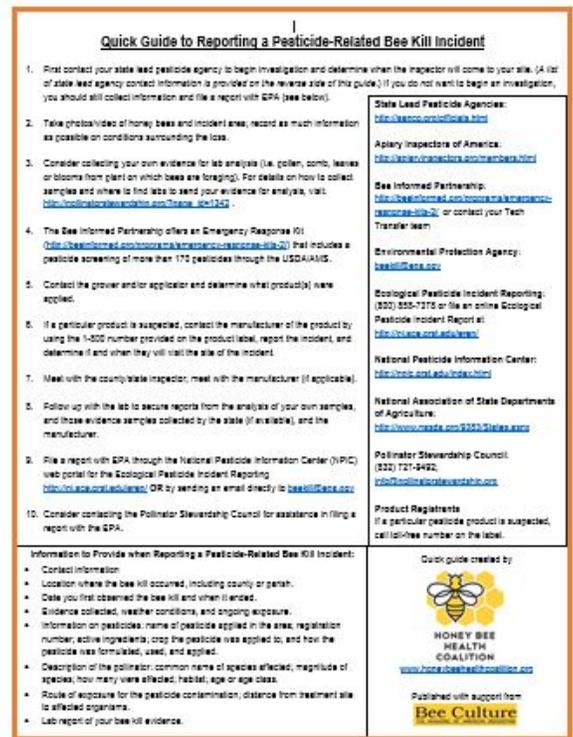
The Honey Bee Health Coalition created a *Quick Guide to Reporting a Bee Kill Incident* which can be printed at http://pollinatorstewardship.org/?page_id=3292 or you can order a laminated copy of the Quick Guide at www.pollinatorstewardship.org/QuickGuide.

Keep in mind dead bees degrade quickly, and once degraded may not serve as reliable evidence for measuring pesticide residues. Pollen samples and wax samples are the better hive products to determine levels of contaminants, as residues may be more stable (less vulnerable to degradation). The caveat in collecting your own evidence is that investigators and pesticide manufacturers may not be able to utilize the samples/pesticide residue data you collect because of their requirements regarding who handles the evidence (collects and analyzes the data), and the chain of custody through which the samples are passed.

Protecting honey bees and native pollinators

The main thing every person applying a pesticide needs to do is to read and follow the pesticide product label. Always look carefully to see if there are any contraindicated treatments for the product you are using in your colonies. Remember the treatments we use in our colonies to keep our bees healthy are similar to prescription drugs that we use in our bodies to stay healthy. Our doctors and pharmacists check for contraindications on your medications so our medications don't kill us. It is our job to check for these contraindications with the other treatments that we are using on our bees so we don't kill them.

Beekeepers can feel helpless when it comes to pesticides, but in fact, there are some simple things that beekeepers can do. Document hive health every two weeks, with pictures, etc., as well as reach out to farmers and communicate the vicinity in which one has hives. Ask to be included in any timetables in which agricultural chemicals will be sprayed. Ask the nearby farmer(s) what pesticides they will be using, and read the label together. When we work together to review the product labels of pesticides used on the pollen shedding plants on which our bees feed, we can all better protect pollinators. There are alternatives to spraying a pesticide labelled as bee toxic on a bee attractive crop: Using a short residual toxicity product, applying a pesticide



Quick Guide to Reporting a Pesticide-Related Bee Kill Incident

1. First contact your state lead pesticide agency to begin investigation and determine when the inspector will come to your site. (A list of state lead agency contact information is provided on the reverse side of this guide.) If you do not want to begin an investigation, you should still collect information and file a report with EPA (see below).
2. Take photos/videos of honey bees and incident areas, record as much information as possible on conditions surrounding the loss.
3. Consider collecting your own evidence for lab analysis (i.e. pollen, comb, leaves or blooms from plant on which bees are foraging). For details on how to collect samples and where to find labs to send your evidence for analysis, visit: http://pollinatorstewardship.org/Forms_Web/325/.
4. The Bee Informed Partnership offers an Emergency Response Kit (<http://thebeeinformedpartnership.com/emergency-response-kit/>) that includes a pesticide screening of more than 170 pesticides through the USDA/AMS.
5. Contact the grower and/or applicator and determine what product(s) were applied.
6. If a particular product is suspected, contact the manufacturer of the product by using the 1-800 number provided on the product label, report the incident, and determine if and when they will visit the site of the incident.
7. Meet with the county/state inspector, meet with the manufacturer (if applicable).
8. Follow up with the lab to secure reports from the analysis of your own samples, and those evidence samples collected by the state (if available), and the manufacturer.
9. File a report with EPA through the National Pesticide Information Center (NPIC) web portal for the Ecological Pesticide Incident Reporting (<http://www.epa.gov/epic/epic/>), OR by sending an email directly to epic@epa.gov.
10. Consider contacting the Pollinator Stewardship Council for assistance in filing a report with the EPA.

Information to Provide when Reporting a Pesticide-Related Bee Kill Incident:

- Contact information
- Location where the bee kill occurred, including county or parish.
- Date you first observed the bee kill and when it ended.
- Evidence collected, weather conditions, and ongoing exposure.
- Information on pesticides: name of pesticide applied in the area, registration number, active ingredients, crop the pesticide was applied to, and how the pesticide was formulated, used, and applied.
- Description of the pollinator: common name of species affected; magnitude of species; how many were affected; habitat, age or age class.
- Route of exposure for the pesticide contamination, distance from treatment site to affected organisms.
- Lab report of your bee kill evidence.

State Lead Pesticide Agencies:
<http://www.epa.gov/epic/epic/>

Aplary Inspectors of America:
<http://www.apiainspectors.com/members.html>

Bee Informed Partnership:
<http://thebeeinformedpartnership.com/emergency-response-kit/> or contact your Tech Transfer team

Environmental Protection Agency:
<http://www.epa.gov>

Ecological Pesticide Incident Reporting:
(800) 855-7375 or file an online Ecological Pesticide Incident Report at <http://www.epa.gov/epic/epic/>

National Pesticide Information Center:
<http://nic.epa.gov/epic/index.html>

National Association of State Departments of Agriculture:
<http://www.nasda.org/9503/States.aspx>

Pollinator Stewardship Council:
(323) 727-9492;
<http://pollinatorstewardship.org>

Product Registrants:
If a particular pesticide product is suspected, call/toll-free number on the label.

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at night, waiting until bloom (pollination) has been completed, spot treating, and similar true Integrated Pest Management practices.

It is the 21st century, and this issue becomes more volatile every year. Knowing what is going on *in* your beehive (what is the *varroa* count, how much honey, when did you last re-queen) and *within your hive's forage area* is a critical part of having an action plan if and when your hive suffers a pesticide incident.