Pesticides and You

News from Beyond Pesticides: Protecting Health and the Environment with Science, Policy & Action

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Cultivating an Ecological Conscience

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Safer Mosquito Repellents

Embracing Natural Systems and Rejecting the Cancer Causing Weed Killer Glyphosate (Roundup)

This issue of PAY features a talk from last year's National Forum, *Sustainable Communities*, from Fred Kirschenmann –farmer, author, philosopher, who urged us to find solutions to pests in natural systems. As we face the challenges of growing food crops or managing green spaces, we must seek to identify the conditions that are conducive to the unwanted insect or plant/weed which we have defined as a pest. As this suggests, we need a new way of looking at problems and productivity. This is not a new concept to the pages of this newsletter, but it is something that we must find ways of bringing to our community discussions as we seek to eliminate toxic pesticide use. As Fred asks, so how do we come to the point where we understand how natural systems function and then manage those natural systems in ways that prevent pests from emerging. He quotes Joe Lewis in *A Total Systems Approach to Sustainable Pest Management* (National Academy of Sciences, 1997), who said what we ought to do, instead of asking, how do I get rid of the pest, ask why is the pest a pest?

Shifting the focus to nature

As educators, organizers, scientists, and practitioners in the community, it is clear that we must teach our decision makers that we have lost touch with natural systems and to recover from the dramatic pollinator decline and ensure that children are not exposed to neurotoxic chemicals linked to behavioral effects and autism, respiratory illness and cancer, we must adopt ecological-based methods. In developing organic programs, it is not about finding organic pesticides, but about adopting organic soil building nutrient recycling systems that may, if necessary, incorporate benign materials. We have to educate on the benefits that nature brings to a landscape or farm field and help to make the cultural shift to nurturing biological life in the soil.

This has come in sharp focus as we debate a piece of legislation to ban the cosmetic uses of pesticides in Montgomery County, Maryland. We have listened to managers of the parks department tell the city council that parks cannot be managed organically because they require neonicotinoid insecticides and the herbicide glyphosate (Roundup). As they say this, it sounds like they may have forgotten that they are talking about putting poisons on fields and areas where children play. Then there is the ecological impact of using highly toxic, systemic, and persistent neonicotinoids that indiscriminately kill insects, including the ones that make up a balanced and beneficial ecological system.

In communities that have embraced an organic ethic, having passed an ordinance like Montgomery County is considering, people are sitting in day-long training sessions to learn to reconnect with natural systems and understand the benefits of soil biology. As Fred told us, the toxic approach is not sustainable because you never get rid of all of the target pests. You cause pest resistance. Because in trying to kill the target, you kill off other biological organisms, many of which previously served as predators in the system. "So, you're actually creating a problem that you're trying to solve," Fred said. The industry with a business plan to apply synthetic fertilizers and spray poisons is buying in because they are set up to kill things –insects and weeds, rather than support nature's capacity to grow healthy grass and naturally reduce problems.

Roundup is cancer causing

The urgency of the need to move to natural systems took on a new urgency when the International Agency for Research on Cancer (IARC) of the World Health Organization announced in March that glyphosate (Roundup) had just been ranked as a Class 2A carcinogen, the highest order carcinogen possible based on animal studies. This is the most widely used weed killer in residential areas, in parks, playing fields, and school yards, and in food production resulting in allowable residues in our food –and it causes cancer. Since we don't test toxic chemicals on humans, this is the standard that tells us when we should ban a chemical from use. With the cancer classification on top of the documented weed resistance to glyphosate and water contamination resulting from its use, continued reliance on glyphosate is irresponsible from a public health and environmental perspective.

This is one of those times in modern history when people will rally to protect their family and children's health from widespread use of a hazardous chemical throughout our community, especially given that it is not needed for a green lawn, beautiful landscape, and a productive farm.

Precaution in the face of doubt

But, of course, the manufacturer of the chemical, Monsanto, is pushing back with its industry science. And as the debate heats up in communities and school districts across the country, Monsanto takes a page from the industry playbook and raises issues of scientific doubt, especially with local decision makers. We can reject the doubt-mongering of industry, which, in the face of a ruling like IARC's, argues that we do not know enough to act now. In fact, we know that Roundup can be replaced by cost-effective, non-toxic alternatives, which should move our community debates to embrace precaution and a precautionary policy. We know that industry scientists said for decades that we didn't have enough evidence to link smoking and cancer. The same arguments were made for DDT and other pesticides. We do not have to accept the harm, the probability of harm, or the controversy about harm. Our communities can embrace precaution and put policies and practices in place that adopt organic practices. *Down East* magazine gave the Town of Ogunquit, Maine its 2015 Environmental Award for adopting an ordinance that bans toxic lawn pesticides on all land. The local hardware store jumped in, clearing out its toxic products to make shelf space for organic-compatible products. That's a community working together for our future.

Jay Feldman is executive director of Beyond Pesticides.

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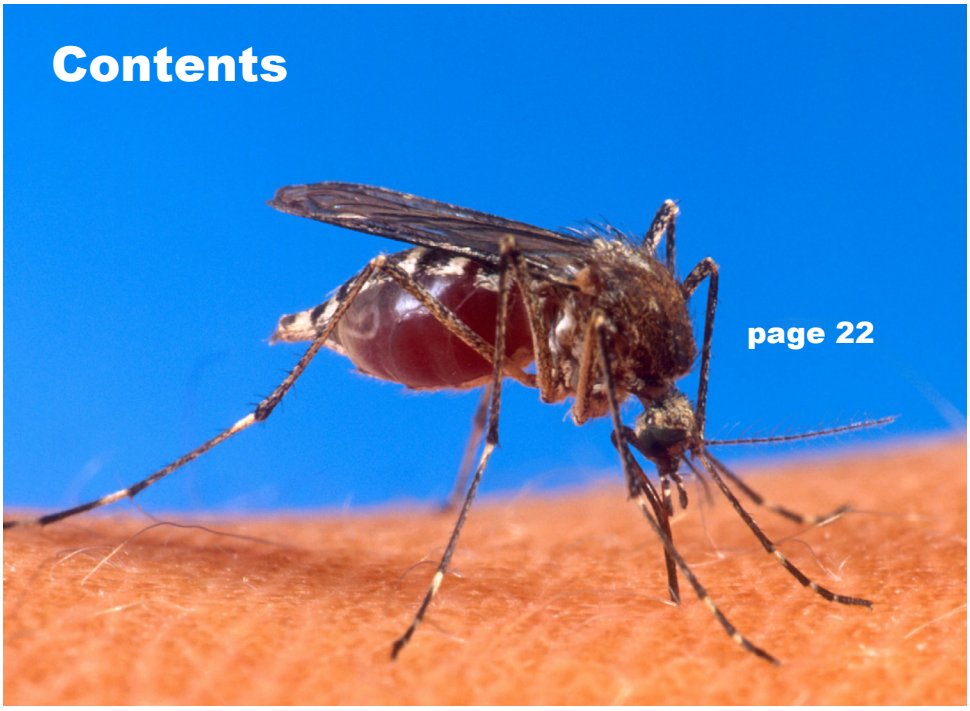

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IPM –Varying Definitions

I know that some commercial pest control companies promote IPM (Integrated Pest Management) as their official practice, but I'm a bit confused. Some of the companies I hear from indicate they support IPM, but say they'll spray if they find a bug. What's going on?
Chuck H.

Hi Chuck,
Unfortunately, in many cases we've seen the term Integrated Pest Management co-opted by chemical industry interests. When this has occurred, the definition of IPM effectively allows any pesticide on the market as a first line of attack after monitoring for pest populations. Weak definitions of IPM generally define the program as a "system that uses multiple techniques including, cultural, biological, mechanical, and chemical controls." This is in stark contrast to the definition of IPM that Beyond Pesticides has long supported; (in very general terms) a program that focuses on cultural, mechanical, biological controls before the consideration of even least-toxic pesticide products. Many pest control companies will say they practice IPM, but just go ahead and spray, and even spray on a regular schedule – the antithesis of IPM! To further clarify the difference between these approaches, Beyond Pesticides now tends to use terms like "organic pest prevention," "least-toxic controls " or "defined IPM" to indicate that the definition of IPM matters, and a focus should be on the most minimally intrusive practices and materials possible. The good thing is that more and more companies are not only adopting these terms, but backing them up with practices that forgo the use of even least-toxic pesticides, unless cultural, mechanical, and biological controls have proven ineffective. So when a landscaper or pest control provider indicates they use IPM, be sure to ask how the term is defined and what practices are utilized to prevent and manage pest problems. For more information on Beyond Pesticides' take on IPM, see our fact sheet here: http://bit.ly/WhatisIPM.

Meeting with Elected Officials

I'm meeting with an elected official in my town's local government this weekend. I know they're interested in restricting lawn care pesticide use, but I want to come prepared and make a good case for a change. Do you have any good news stories on successful town/county implementation of new methods of landscaping or avoiding pesticides? Or, resources for training for town staff? I suspect his biggest concern will be the challenge of getting staff to do things differently.
-Dean H.

Hi Dean,
Thank you so much for coming to Beyond Pesticides with this question! It is great that you've arranged a meeting with your local elected official, and there is interest in this issue. Beyond Pesticides is more than willing to help supply fact sheets and resources on the dangers associated with pesticides and alternatives to their use. When you email Beyond Pesticides, we can provide you with this information. If you're in a locality that is not subject to pesticide preemption policies, you can work toward enacting pesticide restrictions that are similar to those recently passed in Takoma Park, Maryland or Ogunquit, Maine. These localities are able to restrict pesticide use on both public and private property. If you're in a state that does preempt local authority, you can still work to stop the use of pesticides on public land (e.g., parks, playing fields, rights-of-way), similar to Cuyahoga County, Ohio, Durango, Colorado, and Marblehead, Massachusetts. Further, when towns are interested in this type of legislative action, Beyond Pesticides is happy to support these efforts by helping localities organize education and training sessions and outreach. We have training videos posted on our website that national organic turf care expert Chip Osborne of Osborne Organics created specifically for municipal officials and transitioning landscapers. You can also go to the City of

After meeting with elected officials to get a bill introduced in Montgomery County to ban cosmetic lawn pesticides for public and private use, a public hearing was held. Photo by Kevin Tan.

Share With Us!

Beyond Pesticides welcomes your questions, comments or concerns. Have something you'd like to share or ask us? We'd like to know! If we think something might be particularly useful for others, we will print your comments in this section. Mail will be edited for length and clarity, and we will not publish your contact information. There are many ways you can contact us: Send us an email at info@beyondpesticides.org, give us a call at 202-543-5450, or simply send questions and comments to: 701 E Street SE, Washington, DC 20003.

Takoma Park's website to see an abbreviated training session and other web materials used to implement the transition to organic land care practices in their town (http://www.takomaparkmd.gov/safegrow). Beyond Pesticides also has a model ordinance and implementation plan produced to help localities make a smooth transition to organic land care. So do let local leaders know that if they're serious about working toward safer, pesticide-free landscapes in their town, we're serious about helping out. We look forward to working with you and city leaders toward these important goals.

Mosquito Spray on an Organic Garden?

I'm interested in the impact you think my neighborhood mosquito spraying will have on my organic garden. Kudos to you guys for all your hard work and dedication, and thank you in advance for any information you can give me.
Leah J.

Dear Leah,
Thanks for reaching out to Beyond Pesticides with your question! The mosquito spraying in your neighborhood can certainly have an effect on your organic garden. Pesticides applied from trucks or aerially are likely to result in direct hits or drifting pesticides, which create the likelihood that these chemicals will make their way into your garden. Not only could drift cause harm to the important pollinators and beneficial insects that visit your garden, but there is the potential for their residue to remain in your garden and on vegetables, posing a health risk. Please let us know if you're able to find out which mosquito pesticide is being used so that you can research the exact effects of that pesticide.

It is incredibly important for concerned citizens like you to speak up and voice your concerns about the effect of mosquito spraying on your garden. Beyond Pesticides provides many resources for community organizing. Armed with the right facts, you can be a great advocate for your neighborhood and community. It is important to note that mosquito spraying has very limited efficacy. Spraying is not an effective way to prevent deaths or illnesses that are associated with insect-borne West Nile virus. Elimination of mosquito breeding areas, such as standing water and damp leaves, attacks the problem at the source. There are many resources on alternative management strategies for mosquitoes, found on our website, which we urge your neighbors and local leaders to use. Visit Beyond Pesticides' mosquito management homepage for more information: http://bit.ly/mosquitomgmt.

From the Web

Beyond Pesticides' Daily News Blog features a post each weekday on the health and environmental hazards of pesticides, pesticide regulation and policy, pesticide alternatives and cutting-edge science, www.beyondpesticides.org/dailynewsblog. Want to get in on the conversation? "Like" us on Facebook, www.facebook.com/beyondpesticides, or send us a "tweet" on Twitter, @bpncamp!

USDA Reports Pesticide Residues on Over Half of Food Tested

Excerpt from Beyond Pesticides' original blog post (12/23/2014): The U.S. Department of Agriculture's (USDA) Agricultural Marketing Service (AMS) has posted a report on its data from the 2013 Pesticide Data Program (PDP) Annual Summary.

D. Boutot comments:

"Thank you for sharing this valuable information on pesticide residue testing. I think this is a subject that is getting evaluated more thoroughly now that so much attention has been brought to it (or at least we would hope it is!). I can't believe the amount of food products tested that they found with residue! 59.5 percent is such a high number! I hope they can fix this problem to put consumers at better ease while grocery shopping, or perhaps bio foods or organic foods are a good way to go. Thank you very much for your information!"

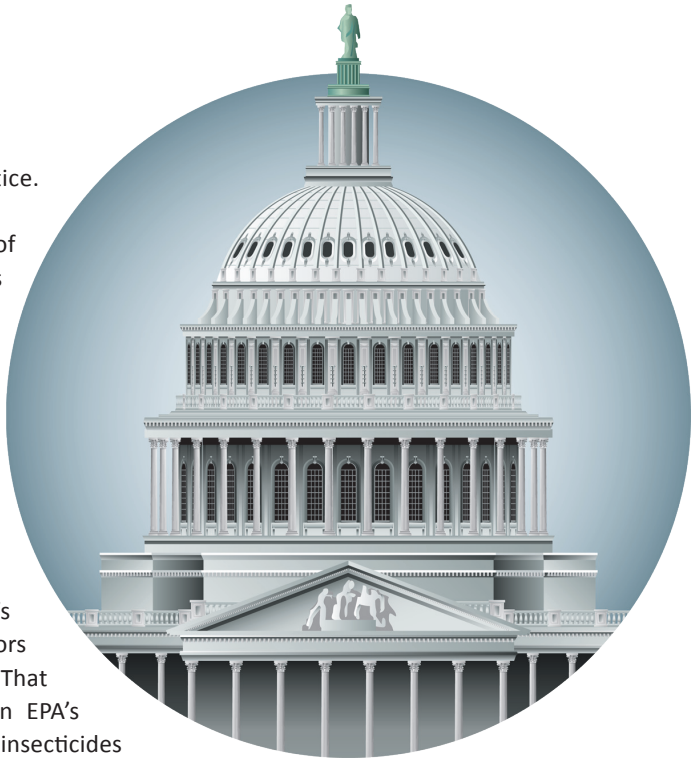
Glyphosate Classified Carcinogenic by International Cancer Agency, Group Calls for Ending Herbicide's Use

Excerpt from Beyond Pesticides' original blog post (3/20/2015): A national public health and environmental group, Beyond Pesticides, is calling on the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA) to stop the use of the country's most popular herbicide, glyphosate, in the wake of an international ruling that it causes cancer in humans.

L. Brockmeier comments via Facebook:

"Let some of the wild plants mingle with the grass in your lawns. We let the native clover grow; when the weather is dry and the grass turns brown, the native clover stays nice and green. We use no chemicals and our yard is fine. It doesn't need to look like a putting green. Think about priorities."

Appeals Court to Hear Case on EPA's Registration of Bee-Toxic Chemical



The 9th U.S. Circuit Court of Appeals has agreed to hear the case brought by beekeepers challenging the U.S. Environmental Protection Agency's (EPA) approval of a pesticide known to be toxic to bees. In 2013, the beekeepers filed suit against the agency, citing that the new chemical, sulfoxaflor, is further endangering bees and beekeeping and noting that their concerns were not properly addressed by EPA before registration was granted. Sulfoxaflor is a sub-class of the neonicotinoid pesticides that have been linked to global bee declines.

The Court agreed to hear the case on April 14, 2015. The case, *Pollinator Stewardship Council v. EPA*, which requests changes to EPA's product label for sulfoxaflor, was first filed in July 2013. The petitioners include the Pollinator Stewardship Council, the American Honey Producers Association, the National Honey Bee Advisory Board, the American Beekeeping Federation, and beekeepers Bret Adee, Jeff Anderson and Thomas Smith. The beekeeper groups are represented by Earthjustice.

The case is one of a number of pending legal cases on EPA's pesticide decisions under the *Federal Insecticide, Fungicide and Rodenticide Act* (FIFRA), including one filed in March 2013 by Beyond Pesticides, the Center for Food Safety, beekeepers, and other environmental and consumer groups that challenges the agency's failure to protect pollinators from dangerous pesticides. That lawsuit notes deficiencies in EPA's oversight of neonicotinoid insecticides –clothianidin and thiamethoxam, which have been repeatedly identified as highly toxic to honey bees and are being used under a faulty registration process and product labels.

In the case of sulfoxaflor, the beekeepers' suit is requesting changes in the sulfoxaflor product label, the Biological Economic Assessment Division (BEAD) assessment of the value of pollinators and their established habits, and EPA's risk assessment process. According to Greg Loarie, one of the Earthjustice attorneys arguing the case, "There's very little case law in general challenging directly EPA's decisions regarding pesticide labels."

USDA Approves GE Apple that Won't Brown

In mid-February, regulators at the U.S. Department of Agriculture (USDA) approved a genetically engineered (GE) apple that does not brown after slicing or bruising. The "Arctic" apple, produced by Okanagan Specialty Fruits, is engineered using a novel technique called RNA interference (RNAi). In the case of this GE apple, RNAi technology has been used to silence the genes that produce polyphenol oxidase (PPO), the enzymes responsible for the browning that results after an apple has been bruised.

Government approval of this method of genetic engineering raises serious concerns because of considerable uncertainty regarding the unintended effects of this technology. These concerns are compounded by the agrichemical industry's future interests in using RNAi technology to control crop pests.

So far, USDA has approved commercial use of Granny Smith and Golden Delicious "Arctic" apples, and the company plans to produce Gala and Fuji cultivars in the future. Beyond the questionable utility of an apple that does not brown, are the health and economic risks associated with the apple's commercial production and use.

Some opposing the GE apple have dubbed it the "botox apple." It can give apples the appearance of being fresh long after it is sliced, when it is not; raising concerns about the development and spread of bacteria. The turning off of these genes raises uncertainties about the affect on other genes or the rest of the apple tree, as compounds that produce PPO are present throughout the tree, not just in the fruit.

Over 4 Million People Press Obama to Protect Bees

A coalition of beekeepers, farmers, business leaders, environmental and food safety advocates rallied in front of the White House and delivered more than 4 million petition signatures in early March, calling on the Obama administration to put forth strong protections for bees and other pollinators. This action anticipates the Pollinator Health Task Force recommendations. The task force, announced by the White House in June, is charged with improving pollinator health through new agency regulations and partnerships. The assembled groups are demanding that the recommendations include decisive action on rampant use of neonicotinoids, a class of systemic insecticides scientists say are a driving factor in bee decline.

The rally coincided with a D.C. metro ad campaign and the reintroduction of the *Saving America's Pollinators Act*, sponsored by U.S. Representatives Earl Blumenauer (D-OR) and John Conyers (D-MI), which will suspend the use of four of the most toxic neonicotinoids until the Environmental Protection Agency (EPA) conducts a full review of their safety.

Representative Blumenauer said, "Pollinators are not only vital to a sustainable environment, but key to a stable food supply. In fact, one out of every three bites of food we eat is from a crop pollinated by bees. It is imperative that we take a step back to make sure we understand all the factors involved in bee population decline and move swiftly to protect our pollinators."

"The EPA plans to wait until 2018 before reviewing the registration of neonicotinoids. But America's bees cannot wait three more years. Neither can the thousands of farmers that rely on pollinators," said Representative Conyers. "Our honeybees are critical to ecological sustainability and to our economy. I am urging all of my colleagues to please protect our pollinators and support the *Saving America's Pollinators Act*."

Suit Asks for Endangered Species Review of 2,4-D/Roundup

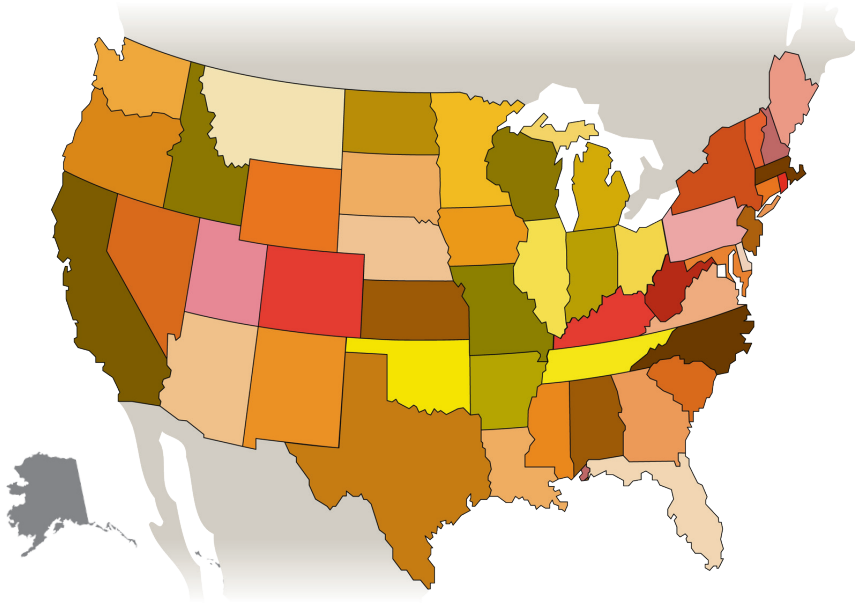
With the U.S. Environmental Protection Agency's (EPA) nod to the pesticide industry on expanded uses of the herbicides 2,4-D and glyphosate, environmental groups are charging that the agency violated the *Endangered Species Act* (ESA). Repeating a pattern of putting the environment in harm's way through violations of federal endangered species law, a lawsuit filed in February documents EPA's failure to consult with the U.S. Fish and Wildlife Service (FWS) regarding the impact of the herbicide on two endangered species –the whooping crane and the Indiana bat. Dow AgroSciences' herbicide, Enlist Duo, was initially approved for use on genetically engineered (GE) crops in six Midwestern states, and then ten other states.

Enlist Duo is an herbicide that incorporates a mix of glyphosate and a new formulation of 2,4-D, intended for use on GE Enlist Duo-tolerant corn and soybean crops. Approved for use on GE corn and soybeans that are engineered to withstand repeated applications of the herbicide, the creation of 2,4-D-tolerant crops and EPA's approval of Enlist Duo is the industry's response to weed resistance to glyphosate, the active ingredient in Monsanto's Roundup.

"EPA admits that its approval of a toxic pesticide cocktail including 2,4-D for widespread use may affect endangered species, including the whooping crane, one of the most endangered animals on Earth," said Paul Achitoff, Earthjustice's managing attorney. "We ask only that the court decide whether EPA has violated the law, as we believe it has, before putting these imperiled birds at further risk."

By EPA's own admission, whooping cranes "will stop to eat and may consume arthropod prey" that may have been exposed to 2,4-D in fields sprayed with Enlist Duo, and that in sufficient amounts, this exposure can be toxic to the cranes. According to the motion, "The whooping crane is one of the most endangered animals on earth. It was pushed to the brink of extinction by unregulated hunting and loss of habitat to just sixteen wild and two captive whooping cranes by 1941. Conservation efforts over the past seventy years have led to only a limited recovery; as of 2006, there were only an estimated 338 whooping cranes in the wild."

Similarly, EPA's own analysis found that the Indiana bat would likely suffer reproductive harm resulting from the consumption of 2,4-D-contaminated prey, as a direct result of the agency's approval of Enlist Duo. In addition to habitat loss and cave disturbance, scientists have identified pesticide contamination of the Indiana bats' food supply as a reason for their continued decline.



Partial Victory as Hershey's Announces Move Away from GMO Ingredients

Amid growing consumer backlash, Hershey's has announced its first steps toward moving to non-genetically engineered (GE) ingredients in its chocolate. The news comes in response to tens of thousands of Facebook posts, emails, and telephone calls from consumers who took part in a campaign calling on Hershey's to move to non-GE ingredients, led by GMO Inside. In a statement released February 18, Hershey's said that it will "transition some of its most popular chocolate brands, including Hershey's Kisses Milk Chocolates and Hershey's Milk Chocolate Bars, to simpler ingredients." Last week, Hershey's confirmed with GMO Inside that as part of its commitment to simpler ingredients, its two iconic products will be non-GE by the end of the year. However, the company did not respond to the request to source its sugar organically.

Because the main ingredient in the two Hershey's chocolate products is sugar, and most conventional sugar in the U.S. is sourced from GE sugar beets, this action could have a potentially huge impact on the market. This is unlike a similar effort to appeal to consumers, when General Mills announced last year that it would remove all GE ingredients from Cheerios. However, the main ingredient in Cheerios is oats, and oats are not currently genetically engineered, so many in the environmental community called the action a ploy by the company to revive its image after spending millions of dollars to defeat state-level GE labeling initiatives. Furthermore, General Mills rejected a company-wide ban of GE ingredients last fall.

"Hershey's needs to take the next step and go non-GMO with all of its chocolates, and get third-party verification for non-GMO ingredients. This includes sourcing milk from cows not fed GMOs and agreeing to prohibit any synthetic biology ingredients, starting with vanilla," stated John Roulac, co-chair of GMO Inside. "Consumers are increasingly looking for non-GMO products and verification, and Hershey's and its competitors would be wise to offer third-party verified non-GMO products to consumers."

Lower Pesticide Levels in People Who Eat Organic

People who eat an organic diet have lower levels of pesticides in their bodies than those who eat conventional fruits and vegetables grown with pesticides, according to a new study. The study, *Estimating Pesticide Exposure from Dietary Intake and Organic Food Choices: The Multi-Ethnic Study of Atherosclerosis (MESA)*, published in the journal *Environmental Health Perspectives*, looks at adult exposure to organophosphate pesticides (OPs).

Scientists studied nearly 4,500 people from six U.S. cities and examined long-term dietary exposure to 14 OPs. This study group was restricted to those who reported rarely or never eating organic food ("conventional consumers"). Scientists looked for signs of organophosphate exposure via urinary dialkylphosphate (DAP) levels and compared these levels to those who reported organic produce consumption habits.

The scientists found that people who reported eating organic fruits and veggies at least occasionally had significantly lower DAP, or organophosphate residue, levels in their urine when compared to people who almost always ate chemically grown produce. The researchers say the study is among the first to predict adult exposures to OPs based on people's usual diets. OPs are the most commonly used insecticides on conventional fruits and veggies, thus making OP exposure extremely prevalent. In fact, organophosphate metabolites have been found in the urine of over 75 percent of the U.S. population.

The new "research provides another piece of evidence that consumption of organic foods may reduce pesticide exposure," said Jonathan Chevrier, Ph.D., an epidemiologist at McGill University in Montreal, Canada, who was not involved with the study.

Research Links Bee-Killing Insecticide to Monarch Butterfly Deaths

New research from the University of Minnesota presents some of the first evidence linking the bee-killing insecticides known as neonicotinoids to monarch butterfly deaths. The study finds that milkweed plants, which monarch butterflies need to survive, may also retain neonicotinoids from nearby plants, making milkweed toxic to monarchs. Monarch population numbers have fallen by 90% in less than 20 years. This year's population was the second lowest since careful surveys began two decades ago. The critical driver of monarch decline is the loss of larval host plants in their main breeding habitat, the Midwestern Corn Belt. Monarchs lay eggs exclusively on plants in the milkweed family, the only food their larvae will eat.

University of Minnesota entomologist Vera Krischik, Ph.D. fed butterflies milkweed plants treated with the neonicotinoid insecticide imidacloprid in amounts that might typically be found on backyard plants. While adult monarchs and painted lady butterflies were not affected, which, according to Dr. Krischik, may indicate the ability of the adults to detoxify the chemical, the larvae of both species of butterflies died.

During the course of the study, larvae fed on the treated plants for seven days.

Those monarchs that fed on treated plants did not survive, said Dr. Krischik, whose research has been accepted for publication by a scientific journal. "For the painted lady (butterflies), there were a few scattered larvae that made it to the end of their feeding period."

Dr. Krischik says her research shows a potential risk to monarchs when neonicotinoids are used in backyard plants near milkweed plants. She did not look at the impact of much lower insecticide rates used in farm fields.

"I would say if you're using it in your backyard and you're applying this to a rosebush right next to the milkweed, the risk is high," she said.

Study Shows the Benefits of Pesticide-free Pollinator Habitat

Foraging bumblebees would prefer to dodge traffic rather than pesticides and other agricultural chemicals, according to the results of a December 2014 study published in the *Journal of Insect Conservation*. Researchers at Plymouth University in England found that the number of bumblebees observed foraging plants along roadsides is over twice the number located in adjacent patches facing agricultural crops. As both native and managed bees continue to decline throughout the globe, this research strengthens calls from farming and environmental groups to improve agricultural practices through increased on-farm diversity, and sharp reductions in the use of pesticides, particularly systemic chemicals such as neonicotinoids.

Mick Hanley, Ph.D., lead author of the study, explains, "There have been hedgerows and field boundaries in these locations for centuries, and even if you go back 50 or 60 years, you would not have seen this phenomenon. Both sides of hedgerows would have been flourishing, and bees and other insects would have been numerous on both sides, but that was before an increase in the use of fertilizers."

Urban vineyard with pollinator hedgerow, photo by Patricia Algara, BASE Landscape Architecture.

However, it is likely that the use of agrichemicals has caused such a stark discrepancy between roadside and farm-side habitats. "Now what you see is the chemicals having impacted one side, with the hedgerows in effect acting as a filter to protect the road-facing edge. It decreases the bees' sources of food and, therefore, has the potential to impact on their numbers," Dr. Hanley explains.

Researchers reach the conclusion in the study that organic farming is likely to offer distinct advantages for pollinator conservation efforts. As a result of reduced chemical use, organic farms are likely to provide pollinators with a greater diversity of flowers, and thus increase food availability. "The pesticides and fertilizers in use today tend to mean plants such as nettles flourish, whereas honeysuckle and other bee-friendly species do not," said Dr. Hanley. "But we would argue that if farmers were a bit more sympathetic, any work they do to encourage bees and other insects could have reciprocal benefits for them and their crops."

Town Wins Award for First Community-wide Pesticide-Free Policy in Maine

The coastal town of Ogunquit, Maine has proudly accepted the 16th *Down East* Environmental Award, presented by *Down East* magazine, for passing a ballot initiative last November that prohibits the use of toxic lawn pesticides on all public and private land within the town –only the second community in the United States to do so, following Takoma Park in Maryland. To help the community implement the new law and provide hands-on technical information to people in town and the region, the area's local hardware store, Eldredge Lumber and Hardware, and the Ogunquit Conservation Commission, sponsored a training open to the public, landscapers, and officials on Saturday, March 14, with horticulturalist and Beyond Pesticides board member Chip Osborne of Osborne Organics, and Jay Feldman, Beyond Pesticides' executive director. Also attending was the head of the Conservation Commission and sponsor of the new ordinance, and other town officials.

Down East said the community members of Ogunquit demonstrated their dedication to conserving Maine's natural resources by banning toxic lawn insecticides and weed killers, as well as synthetic fertilizers. Before the ban was passed, the Ogunquit Conservation Commission launched a three-year education and awareness campaign to further its goal to "protect and maintain Ogunquit's natural resources, to conserve natural habitat, to procure and develop open spaces, parks and trails, to establish public access conservation easements through land trusts or town owned properties." This campaign helped to grow overwhelming support for the ordinance and it passed on November 4, 2014 with a vote by 60% in favor of the ban. Ogunquit has since become a leader within Maine and the wider United States, demonstrating to others how to best protect public health and create a sustainable environment within a community.

Photo: (left to right) Landscape Department manager John Bochert and Scott Eldredge of Eldredge Lumber and Hardware, York, Maine.

After the training session, Beyond Pesticides' Jay Feldman met with the owner and lawn and landscape manager of Eldredge's (pictured above), visiting their greenhouse and all the new organic-compatible products that have replaced the toxic chemicals that previously lined their store shelves. The owner and store's commitment to this transition to supporting organic is a model for hardware stores and nurseries nationwide. Beyond Pesticides has provided advice on products and practices, and the store is working with its suppliers to find nursery stock that is not treated with neonicotinoids or grown with neonic-treated seeds. They are selling organic seeds and providing instruction on how to get soil tested so that gardeners know how to structure a soil management plan to grow healthy plants.

First photo: (left to right) Down East magazine editor Kathleen Fleury, Ogunquit Conservation Commission Chair Mike Horn (receiving Environmental Award), and Down East publisher Bob Fernald; Second photo: (left to right) Jay Feldman, and Ogunquit residents Judy Baker, Mary Ross, and Conservation Commisioner Bill Baker.

Sowing Seeds of Doubt

By Nichelle Harriott

Addressing Industry Myths on Pollinator Decline

The accumulated studies and data have found that honey bees and other pollinators, such as wild bees, butterflies and birds, are in decline. So concerning is this phenomenon that the White House in June, 2014 issued a Presidential Memorandum directing federal agencies to form a Pollinator Health Task Force to reverse the trend and find solutions to protect the nation's pollinators. Scientists studying the issue have identified several factors that are contributing to bee decline, including parasites, improper nutrition, stress, and habitat loss. However, they have also identified pesticides as a major contributing factor, with the neonicotinoid (neonics) chemical class singled out as a major suspect due to its widespread use as a seed treatment, high toxicity to bees, systemic nature, and persistence.

Neonicotinoids are undoubtedly highly toxic to honey bees, and the U.S. Environmental Protection Agency (EPA) acknowledges this fact. However, little is being done at the federal level to protect bees and other pollinators from these pesticides. And while the report from the federal Pollinator Health Task Force is pending, industry –the pesticide manufacturers, landscaping, horticultural and agricultural trade groups, have all come out to deflect attention away from pesticides as a major culprit in pollinator decline.

With unlimited resources behind them, the chemical industry has developed a well-oiled public relations team to dismiss the science and sow seeds of doubt that its products and practices are contributing to pollinator losses. Although not a new occurrence, the pollinator issue has seen an increase in the intensity and aggressiveness of industry misinformation campaigns. In fact, industry groups have inserted themselves at the federal, state, and even local/municipal levels to influence decision makers and attack any science demonstrating that pesticides are associated with bee decline. The industry is also devoted to having its representatives take to the various forms of media (television, radio, online, print) to mislead the public on the wide-reaching impacts of its products.

The perpetuation of the myths sowed by industry jeopardizes efforts to understand the science behind pollinator decline, find long-term sustainable solutions, and stymies the efforts of local communities to protect themselves and their environment from pesticide contamination. The stakes are high, and industry has a billion dollar business that it is not ready to transition to least-toxic, organic-compatible products, but the public must be able to distinguish between myth and fact when it comes to pollinator decline.

Myths vs Facts:

Myth #1: Bees are not in decline.

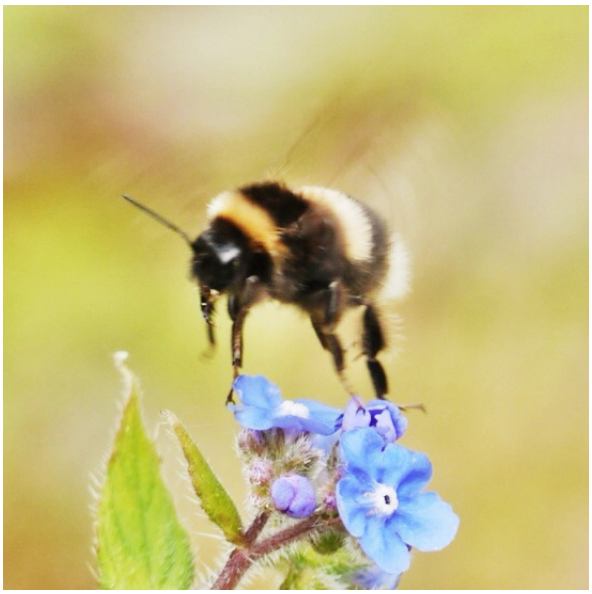
You may also hear: Managed honey bee colonies worldwide have increased. The loss of bee colonies is not a new phenomenon. Periodic increases in colony losses have been observed for centuries. Honey bee populations are stable.

Fact 1: Beekeepers are reporting honey bee and hive losses. According to government survey results, in the U.S., losses for the 12-month period (between April 1, 2012 and March 30, 2013) were 45.2%.[1] For the winter of 2013/14, 23.2% of managed honey bee colonies in the U.S. died and nearly two-thirds of the respondents (65.4%) experienced winter colony loss rates greater than the average acceptable winter mortality rate of 18.9%. Previous survey results document total colony overwinter losses as follows: 2012/2013–30.5%; 2011/2012–21.9%; 2010/2011–30%; 2009/2010–34%; 2008/2009–29%; 2007/2008–36%; and 2006/2007–32%.

In Europe, trends are similar. According to the OPERA Research Center,[2] high losses had been reported in Ireland, the Netherlands and Switzerland, and moderate losses were seen in Germany, Denmark and Northern Ireland. The average winter losses per country where data was available for the period 2008-2012 varied between 7% and 30%. EPILOBEE, an epidemiological surveillance program on honey bee colony mortality in 17 member European States, finds that European winter colony mortality rates ranged from 3.5 % to 33.6% with a south-north geographical pattern.[3] In Canada, overwinter losses for the 2013/14 season ranged from 15% in British Columbia to 58% in Ontario.[4] For the 2012/13 season, losses ranged from 17% to 46% across the provinces.[5]

Wild bee populations, including bumble bees, are also seeing reductions in populations and geographic range,[6] however, data on wild bee species are harder to come by. While the chemical industry may dismiss these numbers, beekeepers experiencing 20-30% reduction in their livestock is unsustainable and is a concern. Consider this: a

20-30% annual loss of cattle or dairy livestock in the U.S. would result in swift emergency action. Thus, action must be taken to protect creatures that are responsible for every one in three bites of food we eat.



Myth #2: Pesticides are important tools for pest management.

You may also hear: Only neonics can treat certain pests effectively. Neonics are needed to protect plants. Nursery plants will sustain losses without pesticides. Banning neonics will do nothing except devastate North American agriculture.

Fact 2: The pesticide industry argues that effective pest prevention and control systems cannot be achieved without toxic inputs. When lawn, landscape and cropping systems are highly dependent on specific chemical inputs, the health of both the soil and the plant suffers, leading to an increased insect susceptibility to disease and pests.[7] For chemical-dependent systems in transition, an effort must be made to rebuild soil health, beneficial microbial life in the soil, and beneficial insects. Growers who reestablish soil health in combination with least-toxic pest management tools can find success in transition from chemical dependency, resulting in less disease and pest problems and increased productivity. When it comes to agriculture, there is an existing model in organic agriculture's growing billion dollar industry that has been successful in managing pests and growing crops without toxic inputs. Organic methods, which focus on a 'feed the soil' approach, utilizes least-toxic inputs, crop rotation and cover cropping, among others, clearly provides evidence that growing without neonicotinoids and other toxic pesticides can be profitably accomplished.

In the horticultural sector, several nurseries and retail outlets have already begun to transition from using systemic neonicotinoids to grow their plants. For instance, Behnke Nurseries Co. in Maryland has issued a policy statement to their stores that prohibits the application of neonicotinoids to its plants and recommends using least-toxic alternatives. Bachman's 21 locations in Minnesota are eliminating neonicotinoid use on their nursery stock and outdoor plants. Local hardware stores, like Eldredge's Lumber and Hardware, ME, are looking for nursery stock that is neonic-free, selling organic seeds, and stocking their shelves with products that are compatible with organic systems. Cavano's Perennials, MD, Blooming Nursery, OR, North Creek Nurseries, PA, Suncrest Nurseries, CA, Desert Canyon Farm, CO, among others have either discontinued or never used neonicotinoid pesticides in their nursery operations. Additionally, BJ's Wholesale Club (over 200+ locations) is asking its vendors to discontinue neonicotinoid use. As these companies have shown, having a viable and productive growing system is possible and alternatives are available.

Myth #3: Factors other than pesticides are to blame.

You may also hear: The varroa mite remains the single most destructive source of infection that bees face. Colonies are not declining in Australia where there is not a varroa mite problem. Transportation of managed hives puts enormous unnatural stress on colonies. Commercial migratory beekeeping is spreading bee diseases, parasites and bee predators domestically and internationally.

Fact 3: While diseases, insect pests (such as the varroa mite), and loss of forage and habitat have all been identified as factors in bee decline, the science is demonstrating that neonics are a central contributor that reduces the ability of bees to function with normal stressors. The varroa mite is a parasite that attaches to bees, sucking bodily fluids, and eventually introduces disease. While these mites pose a threat to bees, beekeepers have been combating varroa mites since the 1980s and have had various levels of success. According to beekeepers, recent bee losses have been too high to attribute to varroa mite. In fact, many dead hives have been reported to have low or manageable varroa presence, indicating that mites were not a factor in hive loss.

The industry also points to Australia as having healthy bee populations in the presence of neonic use, and attribute this to a lack of varroa mite in that country. Luckily, Australia is one of the last remaining regions in the world still free of varroa. In fact, Australia, with its warm climate and abundance of nectar-rich plants is a haven for wild pollinating bees. As a result, Australian agriculture mostly relies on free pollination services from wild bees, and this reliance on native bees means there has been a relatively low demand for managed honey bee hives.[8] As a consequence, Australia's managed pollination industry is only in the early stages of development, which will explain a lack of information on whether bees are at risk in Australia. According to the Australian Pesticides and Veterinary Medicines Authority, "[A]s Australian beekeepers move away from traditional chemical-free sources of nectar and pollen (native scrub and forest) into providing agricultural and horticultural pollination services, there is a commensurate increase in the risk of exposure to agricultural chemicals."[9] Additionally, as of the writing of the report, one of the major neonicotinoids, clothianidin, was not registered for use as a seed treatment in Australia. Therefore, there may be enough different factors to account for the differences in bees' exposure patterns to neonics and other pesticides

to account for differences in bee declines. Better information would be available to ascertain these after the government establishes a monitoring program.

Other cited sources of bee decline include *Nosema* –another parasite that attacks bees, improper nutrition (e.g., dependence on sugar solution for managed bees, and loss of habitat for wild bees), and stressors incurred from migratory beekeeping practices. While these factors do play a role in overall bee health, consider the decades of experience beekeepers have had dealing with these stressors and maintained viable bee colonies (and operations) until recently. While industry has begun to attack beekeeping practices, bee losses above the accepted historical threshold cannot be suddenly attributed to improper beekeeping. It must be noted that elevated bee losses began to be reported in the U.S. in the early to mid-2000s, around the same time neonicotinoid pesticides were registered and begun widespread use as seed treatment (circa 2003).

Exposure to pesticides also weakens bees allowing them to be more susceptible to disease and parasites. Studies from USDA researchers and others find that parasitic infections increased significantly in bees from pesticide-treated hives when compared to bees from pesticide-free hives, demonstrating an indirect effect of pesticides on pathogen growth in honey bees.[10,11,12] Thus, bee colonies that suffer high infection rates of pathogens, most times also have high exposures to pesticides.

Myth #4: EPA registers and evaluates pesticides, and ensures they meet safety standards.

You may also hear: Neonics are safer than older pesticides and are "reduced risk" pesticides. There is no compelling evidence that neonics are any more harmful than other insecticides currently in use. EPA-approved product labels include use requirements that will protect bees.

Fact 4: Data gaps have historically plagued EPA's assessment of pesticides under the *Federal Insecticide, Fungicide and Rodenticide Act,* which establishes the pesticide registration process under a risk assessment and risk-benefit process. Oftentimes, pesticides are allowed on the market without all the required data to support a proper safety finding. In one instance in 2010/2011, the herbicide Imprelis killed large numbers of spruce trees before it was pulled from the market, after which it was determined that EPA did not have sufficient ecological information to register the chemical in the first place under a "conditional registration." In the case of neonicotinoids, long-term field studies for honey bees were not submitted for review at the time the pesticides were granted registration. This means that bees were put at risk because EPA did not have a full understanding of the long-term toxicity of the pesticides to bees.

Due to the systemic nature of the neonic pesticides (they translocate through the plant and express contaminated pollen and nectar), product label directions amended by EPA in June, 2014 do not adequately protect bees. Label warnings, such as 'do not spray when bees are foraging,' do not take into account that residues of these systemic pesticides remain toxic long after initial application, even in pollen and nectar. There is a growing scientific database that shows that neonics are highly toxic to honey bees, with studies finding that even at low levels, neonics can impair foraging, navigational, and learning behavior in bees, as well as suppress their immune system.

In 2014, an international meta-analysis of approximately 1,121 peer-reviewed studies on the impact of systemic pesticides, conducted by the International Union for the Conservation of Nature (IUCN), known as the Task Force on Systemic Pesticides (IUCN Task Force)[13] found that: (i) Neonics are present in the environment "at levels that are known to cause lethal and sublethal effects on a wide range of terrestrial (including soil) and aquatic microorganisms, invertebrates and vertebrates;" (ii) The active ingredients persist, particularly in soils, with half-lives of months and, in some cases, years, and they accumulate. This increases their toxicity by increasing the duration of exposure to non-target species; and, (iii) The weight of the published evidence is very strong that the acute and chronic effects pose a serious risk of harm to colonies/populations of honey bees, bumblebees and other pollinators.

The European Food Safety Authority determined that the most widely used neonics –imidacloprid, clothianidin and thiamethoxam, pose unacceptable hazards to bees, prompting the European Union to suspend their use on agricultural crops in 2013.

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Cultivating an Ecological Conscience

by Fred Kirschenmann, Ph.D.

This piece is an excerpted version of Dr. Kirshenmann's talk to the 32nd National Pesticide Forum, Advancing Sustainable Communities: People, pollinators and practices, April 12, 2014, held at Portland State University. The complete talk can be found at http://bit.ly/1E6Tg8X.

When the conference opened, the conveners said that the conferees would leave with a sense of hopefulness. I took that as a challenge. So, I'm going to talk about why we can and should all be hopeful. When Václav Havel became president of Czechoslovakia, the country was in a mess and everybody knew it. Somebody apparently went to him after he was elected president and said, "So are you optimistic that you can change things and actually make something happen here?" He apparently responded saying, "No I am not optimistic, because optimism doesn't help you. Because if you are optimistic, then you think that everything is going to work out eventually and then you don't do anything, and that's the problem." Then he said, "I'm also not pessimistic because pessimism is the same problem, because if you are a pessimist then you figure it's all going to go to hell anyway and there's not anything I can do about it and then you don't do anything, and that's the problem. "Then he said, "What I am is hopeful. And hopefulness is doing the right thing even though you don't know that it's necessarily going to turn out well." If you have the right convergence of events and you're doing the right thing, then significant changes can take place. Of course, that is exactly what happened in Czechoslovakia during his time as president. I have kept that in mind in my own work. I've been involved in sustainable agriculture issues now for 40 years and there have been a lot of times when there were reasons to be discouraged. So it's doing the right thing, even though you don't know that things are going to turn out well. I think this is the kind of concept of hopefulness that we should embrace. Wendell Berry referred to this as *difficult hope*. It's part of what inspires me.

As important as all of our work is, there is yet an even larger issue that provides the context for everything we're involved in –that is also important for us to acknowledge and embrace. And so I want to spend a little bit of time framing that issue and then talk more about the kind of things that are already happening that I think give us ground for hopefulness as we leave here.

Context and Science

We often forget the context because understandably we get so engaged in doing the things that are now, that need to be done. The work that you've all been doing, especially around pesticides, is such a great example of this, where we've got all of these important things to work on, whether it's the impacts on our children, the impacts on our food, and the impacts on all of us. And so, of course we get engaged in this and we have to do something to correct this. But I think as we do our important work to correct these problems, we must consider this larger context, that I call our *cultural meme*. The term *meme* was introduced by Richard

Dawkins with the sense that we have our own personal history and our personal experience that leads us to believe that certain kinds of things are the way they are. Within the scientific community, "seeing is believing" is a common statement. However, many of scientists are starting to recognize as a *cultural meme* that what we believe in determines what we see. So this is something that we have to come to terms with. One of my favorite scientists, Michael Pulanyi, a Hungarian scientist who spent a good bit of time in the United States after the conflict between Russia and Hungary, has written that you never can establish objectivity –that objectivity is not a reality. He determined that all of us operate from what he calls our tacit dimension, which comes out of who we are and what we believe, our personal history and experience. When we really want to know and exercise science, then we all have to operate outside of this tacit dimension and focus on what it is that we want to know. Then we get together around the same table and we share how we see things, and then we have to wrestle with that until we come to a consensus. It's really the consensus that we come to that we then can call objectivity. Then somebody comes to the table with a different tacit dimension and brings an observation that none of us at the table had thought about. Suddenly, we've got to look at the whole thing again. So, science is not an accumulation of facts, it's an ongoing process. That, to me, is what's exciting about science.

When I think about my own farm, what I thought was sustainable 35 years ago is absolutely not sustainable today. If I were locked in ideologically, because I knew I had objective truth back then, the farm would not be successful today. So that's the journey that we're on. The *cultural meme* that we have created today is primarily determined, from my perspective, by our industrial economy. The industrial economy really emerged as a result from our discovery of fossil fuels. That was the innovation that drove the industry, first coal and oil, then natural gas. It was this cheap energy that made it possible for us to really re-conceptualize the world.

Possessors of Nature

It was also built on a prior notion coming out of the enlightenment when we began to see ourselves as somehow being separate from nature –that we only had not only a right, but a responsibility, as René Descartes put it, to become the masters and possessors of nature. We began to see ourselves as being somehow separate not a part of what Aldo Leopold referred to as the *land community or the biotic community*. Our responsibility was to dominate it. And, being that we saw ourselves as separate from nature, we somehow saw ourselves as being sort of isolated. Therefore, what we did and also our conscience was oriented to our fellow humans. We take care of or cared for them, to the extent that some of us want to do that for fellow humans, but that doesn't extend to the rest of the biotic community because the humans are somehow special. And then, partly coming out of the enlightenment and then going on into the industrial era, this whole notion emerged that in order to really understand the truth about things we have to reduce them to their simplest equation. When we reduce them to their simplest equation, then we understand what they are like. Then we assume that's how the world works.

This led us to develop isolated disciplines. If you want to solve a problem, you have to understand it and address it in terms of the science within that discipline. There's almost no communication between the disciplines, as problems become isolated problems and the answers to those problems get answered in terms of what that discipline is designed to look at. As a result of all of this simplification, we come to the conclusion that technology and science are the two things that are the most important things for us to learn. Arts and humanities become sort of fringe stuff, as science and technology determines how we should respond to and solve problems in the world. However, these are not objective truths, but a part of the *cultural meme* that determines how our basic culture operates.

Importantly, we also operate out of specific kind of economics and industrial economy. The industrial economy operates on the basis of maximum efficient production for short-term economic return. If you want to be successful, whether you're a farmer or a manufacturer of computers or automobiles, that's how you have to operate. There isn't anything in this paradigm about resilience or sustainability. You have to simplify your management because that's the way you gain more efficiency. And you go for economies of scale because that's how you get maximum efficient production for short-

Fred Kirschenmann, PhD speaking at the 32nd National Pesticide Forum, Advancing Sustainable Communities, in Portland, OR.

term economic return. Huge crop monocultures are an example of the specialization. You're seeing technologies that are trying to solve problems more simply. Transgenic technologies are a perfect example of this. If you got Roundup Ready soybeans, instead of having to have very complex systems that you have to evolve in order to deal with your weed problems, you simply wait until the soybeans are up and then you spray Roundup (glyphosate) and kill all the weeds. The soybeans are going to grow and problem solved.

Rodale Institute, Kutztown, PA

Then, of course, the reason that our farms get larger and larger and larger now is that it's about the economies of scale. Farmers have been told to get big or get out, farm fence row to fence row. And that's exactly what we've done. Of course a number of the unintended consequences from this economic paradigm is that when you have highly specialized and simplified and scaled up systems they become very brittle and not resilient –with cheap inputs (energy, fertilizer) and a philosophy of maximum efficient production for short-term economic return. We are now reaching a point where this approach and this system operating by this *cultural meme* is not going to work anymore in the future.

This is where you can either look at this as really bad news and therefore not hopeful, or you can look at it as the trigger that is going to bring about the opportunity for the kind of changes we're all talking about. It's that second approach that led Thomas Berry, another hero of mine, to refer to *moments of grace* –that we're not likely to bring about the changes to get the kind of resilience, purpose, and ethics that we think we ought to until it gets to a point where the current system doesn't work anymore. Then the kinds of changes that we need to see begin to take place. They're moments of grace.

As resources become depleted, food prices skyrocket, civil and economic crises emerge, and civil unrest follows. Michael Klare's book, *The Race for What's Left*, tells the resource wars story, if we don't make the transition to a new future.

It is so important for us now to begin to relate to each other and to anticipate some of the changes coming at us. I always thought that my mission was to bring about change and to change people, but my thinking has transformed in the last six or seven years. I read Jared Diamond's *Guns, Germs and Steel* and *Collapse*, in which he found that those civilizations that anticipated the changes coming at them, not the ones who were worrying about change, recognized the value of their ecological capital and their ecological resources and got a head start preparing for those changes and tended to thrive. Those civilizations that failed in that exercise were the ones that tended to collapse. That really refocused how I think about things and how I think about the future. Ultimately, that makes me hopeful. When you anticipate the changes coming at you, then you can begin to look at the kinds of directions that we need to take. What are the kinds of relationships we need to develop? How do we get ready for that, recognizing the value of ecological resources? Ultimately, in our current *cultural meme.* Our current economy is all about financial capital. It's about how much money you get and how much stuff you can accumulate. That's what determines your value. But, financial value has absolutely no value without ecological value, natural capital, and social capital. It's the social capital and ecological capital that is ultimately the basis for financial capital. These are all the kinds of things that we need to be working on or thinking about now as we think about the future.

Since this conference is primarily focused on pesticides, I want to put that into context. Despite the negative comments about USDA, most of which I share, there was an individual in the Agricultural Research Service, a pest management specialist, who wrote an essay together with several of his colleagues entitled *A Total Systems Approach to Sustainable Pest Management*. The piece, written by Joe Lewis and published in the *Proceedings of the National Academy of Sciences* back in 1997 was one of the most brilliant analyses

of pesticide problems and how we need to deal with them. He said current methods, based on 50 years of experience now of trying to manage pests using what he called a *single tactic therapeutic intervention approach* (in other words, you have a pest problem you come in with a pesticide from outside and attack that pest to try and get rid of it), are absolutely not sustainable. The reason it's not sustainable is because you never get rid of all of the target pests, and you cause pest resistance –how many of us know about that now. You not only kill off organisms of the target pest, you also kill off other biological organisms, many of which previously served as predators in the system. So, you're actually creating a problem, worse than the one you're trying to solve.

He said we should not expect any different results from biotechnology than we got from chemical technology because it's still the same paradigm. It's still the *single tactic therapeutic intervention approach* to solving the problem. What we need to do, he said, is shift to what he called *natural systems management*. So how do we come to the point where we understand how natural systems function and then manage those natural systems in a way that prevent pests from emerging? And he finally boiled it down to a simple question which I've always loved. He said, what we ought to do, instead of asking how do I get rid of the pest, is ask why is the pest a pest. And I thought what a brilliant analysis. Why is the pest a pest? What are we doing to cause pests to emerge? Now we need to use this perspective in the context of a new *cultural meme* that we all need to develop and share.

The *single tactic therapeutic intervention approach* does not have the kind of diversity that is a part of a natural systems management. We know now that the fossil fuel system that drives not only our farming systems but our current economy will only last a very short period of time. We know that many of the inputs we're using are also on a very short period of time. We know that our fresh water systems are being depleted, so that's on a very short period of time. And then, of course, you add to that the whole issue of climate change and the impact with that over a very short period of time.

Historical Context

I want you to imagine a timeline of human history all the way across the room. An anthropologist, Ernest Schusky, wrote a book called *Culture and Agriculture* in 1989 and asked how have we fed ourselves as humans ever since we've been on the planet? Now imagine this timeline. For the first 190,000 years that we've been on the planet we've fed ourselves as hunter-gatherers. We were nonfood producers, but we were food collectors. Like other species, we tended to live in relatively small tribal societies. We would harvest out a place and then we would move on to another place. The author said from the point of view of energy efficiency this was the most efficient food system we ever had. He calculated that we were getting about 20 kilo calories of food energy for every one kilo calorie of energy that we invested to make that food available. It has been pointed out by Riane Eisler in her book *The Chalice and the Blade* that, because we were hunter-gatherers, we had to work together and cooperate together, so it was more the chalice than the blade which was the metaphor for our culture back then. We were not dominators.

It wasn't until we started to go into the second phase, three-quarters of the way down the timeline to the Neolithic revolution, when we start to practice agriculture. This was ten to eleven thousand years ago. And now you've got a space on the timeline that's about three inches long for this 10,000 year period, and here now we start to produce food and domesticate animals and plants. This is, Ernest Schusky says, a very land-intensive kind of agriculture. This is why I disagree a little bit about whether or not it was organic. Basically, it was a slash and burn kind of agriculture, because you could go out there and you could cut down the grass and trees and burn them. Then you get the fertility from the ash and the natural fertility of the soil, resulting in pretty good yields from that for a year or two. Now we were only getting about 10 kilo calories of food for every kilo calorie of energy we invested in making that food available, but still pretty efficient. Then, he says, around the beginning of the 20th century we entered into a third era of producing our food, which he calls the "Neocaloric Era," because it's entirely based on old calories. Then he makes an important observation. He said this era now will probably be 150 to 200 years at most. Now remember the first producing oil well in this country was in Titusville Pennsylvania in 1859 and that was about 150 years ago. So what do we have, another 20 or 50 years? It's anybody's guess. But what we do know is that we're using up the old calories and they're not going to be there for us in the future. We cannot simply concentrate on dealing with our current problems and pesticides, important as all these are. If that's all we do and then we don't anticipate the changes coming at us and get a head start preparing for those changes. We should recognize the importance of our ecological capitol, or we're not going to be very happy about the future that we are going to embrace or become a part of. And that is what we have to add to our plate and our agenda as we think about the future.

We're really talking about redesigning the food system, not just greening it up. Think about this transformation moving into the future under a different kind of *cultural meme* When the industrial kind of approached was first developed, botanist and organic farming pioneer Sir Albert Howard called it the NPK [nitrogen, phosphorous, potassium] mentality and already understood that it was not a direction we should be going in because, as he said, it is a form of banditry. It was a form of banditry because we were going to ignore restoring the biological health of our soil by using all these NPK synthetic inputs as a substitute for soil, and our future generations would be robbed of the healthy soil which they're going to need.

Liberty Hyde Bailey, one of the first deans of a college of agriculture, botanist, and author of *The Holy Earth*, understood the gifts, of nature and tried to cultivate a different kind of culture. Like Sir Albert Howard, who said we have to farm in nature's image, Liberty Hyde Bailey said we must have almost a spiritual approach and relationship to nature.

What We Have to Do Now

Then, of course, Aldo Leopold said one of the most important statements on ecological conscience: "A land ethic, then, reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land. Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity."

This is what we have to do now. It's not enough any longer for us simply to care about our fellow humans. We have to care for all of the life in the biotic community of which, as Aldo Leopold said, we are simply plain members and citizens. We are not the dominators. We are not the culture. We are not the conquerors of the biotic community. So, we have to find our place in that, because if it is not all healthy and if it doesn't all have the capacity for self-renewal, then none of it will include us.

This is the new consciousness that we have to develop. Leopold recognized that this was not going to happen simply because he wrote about it. It also wasn't going to happen with the free market because there are too many components of the biotic community that have no immediate economic return. It's also not going to happen through regulation, because you can't put in place that kind of control system, where you control everything, so that it operates correctly. That's why we have to develop an ecological conscience. He realized that was a huge challenge, that religion and philosophy were not going to help as much because they hadn't even heard of it yet. He understood there wasn't much that he could do as an individual to make this happen. He finally concluded that this had to become part of a social evolution. And, that's actually what's happening to us right now.

Let me give you a few examples of this social evolution that's taking place now and the direct hopefulness associated with it. The *Soil Health and Sustainability* program, spearheaded by Ray Archuleta at USDA's Natural Resources Conservation Service, is working with farmers, both organic and conventional. Even if you're a monoculture corn soybean farmer, with the right mixture of cover crops mixed in with your corn-soybean rotation over a period of six to seven years, you can reduce your fertilizer and pesticide input by 70%. You can do this and still maintain the same yields and the biological health of your soil improves to such an extent that, instead of having soil absorbing only a half inch of rain water an hour, it begins to absorb eight inches of rain water an hour.

This means that during heavy rains there is less flooding because the water actually goes into the soil and some of it back into the aquifers, essential to protecting fresh water resources. During drought periods, we have more moisture stored in the soil. Then, with your cover crops, you also have more biological activity and green manure, which provides a lot of benefits. This is a transformation that started to take place only about a year and half ago.

Secondly, we are beginning to recognize the importance of biodiversity. Matt Liebman, who is a weed ecologist at Iowa State University, has done 10 years of research now on a simple kind of project that dramatically reduces pesticides with a three or four crop rotation, instead of a two crop rotation. His research at the Marsdon Research Farm has one plot of corn-soybean rotation, the two crop rotation, with all those synthetic inputs like any conventional farmer would do today. His second plot is a corn-and-soybean rotation with small grain and red clover, a three crop rotation, and a modest amount of livestock manure. A third plot, where he has corn and soybeans and small grain and alfalfa is a four crop rotation. He's demonstrated that with the two crop and four crop rotation, the simple change of adding livestock manure can reduce pesticide and fertilizer input by almost 90%. The return to land and labor is actually slightly higher with the four crop rotation.

The evidence is there for what we can do. I've actually asked farmers in Iowa this question: so you got all these benefits, why wouldn't you do this? And what are they going to tell you is: Hey, you know, I can't take the alfalfa to a local elevator and sell it. Of course, what they're pointing out is that they feel caught inside of a market system and a market infrastructure that pays them and demands them to raise more corn and soybeans. With alfalfa, if you have drought years, you can get a pretty good price and, if you don't, you may not even be able to sell it. That drives the motivation of the farmers.

One of the reasons why that story is so important to me is that it's often so easy for us to simply say, well, the farmers are doing all these wrong things and they should change, or we have to get them to change. We have to recognize that we all have to change, and we have to change the market system. If we don't diversify the market system, then farmers are not very likely to diversify their farming system. We all have to become engaged in the process.

A third piece of good news is what we're discovering now is the benefits of perennialization. We're doing some prairie strip research now through the Leopold Center (Iowa State University) where we're putting strips of perennial prairie into critical places within a typical soybean rotation. The kind of benefits that you get from that in terms of soil preservation, in terms of absorbing more moisture, and all of that is quite dramatic. But we also now have people like Ivette Perfecto with the University of Michigan, who, together with her colleagues, has written this book, *Natures Matrix*, describing their work primarily with farmers in the global south who have taken land where forests have been destroyed and now reincorporating tree crops for food crops. The benefits of that are enormous, both in terms of restoring the biological health of soil and maintaining moisture, and less irrigation. Then there is Wes Jackson at

the Land Institute (Salina, Kansas), who has 30 years of research in perennial cropping systems. When Wes first did this, biologists said you're crazy because plants are either going to invest in the root system or they're going to invest in seeds. So, if you're going to invest in roots, you're never going to get the yields. Well, Wes thought the biology was more complex than this and he kept with the research. What he's demonstrated now is that you, in fact, can have yields almost comparable to annuals, with root systems that go eight feet into the ground instead of 18 inches in annuals.

You wouldn't expect John Deere to be big on the types of things I've been talking about because they're a part of the conventional system. However, the February 2013 issue of its magazine, *The Furrow,* was devoted to soil health, with stories about farmers using cover crops and other systems designed for soil health. And the next issue entitled, *A Matter of Taste*, is all about the type of quality that chefs and other people in our food system now want. Of course, there's a whole school of new chefs that call themselves the farm-to-table chefs who find farmers using methods to restore the biological health of their soil, which, in turn, produces the kind of food products that enable them to simply prepare it in a way that allows the flavors to express themselves.

Another thing that I think is important here is the role of the arts in all of this. We think we have to convince people to do things and it's the arts really that can help us to imagine a better world. I want to read to you a very brief piece written by Kathleen Dean Moore, who most of you know because she's the head of the Philosophy Department here at Portland State University. In her book, *The Pine Island Paradox*, she writes about the environmental damage that we're causing and then imagines her granddaughter writing her a letter from 100 years in the future. This is what she wrote and what she imagines her granddaughter would be saying:

How could you not have known? What more evidence did you need that your lives, your comfortable lives, would do so much damage to ours? Did you think you could wage war against nations without waging war against people and against the earth? Didn't you wonder what we would drink once you had poisoned the aquifers? Didn't you wonder what we would breathe once you had poisoned the air? Did you stop to ask how we would be safe in a world poisoned by war? Did you think that it all belonged to you, this beautiful earth? You, who loved your children, did you think we could live without clean air and healthy cities? You, who loved the earth, did you think we could live without bird songs and swaying trees? And if you knew, how could you not care? What could matter more to you than your children and their babies? How could a parent destroy what is life-giving and astonishing in her child's world? And if you knew and if you cared, how could you not act? What excuses did you make? And now, what would you have us do?

Now, when we think about where we are in relationship to this kind of imaginative letter that one of our grandchildren might write to us in the future, that can have at least the possibility of encouraging even more action than any of us are already doing. We need to create a new *cultural meme* that will provide us with the context for the kind of action that we need to take and how we need to relate to all of those other living beings and those other plain members and citizens together with us in that biotic community. Our approach has to become self-renewing, if we're going to have a productive and positive future, given the new challenges that we are all going to be facing with the end of cheap technology, the depletion of fresh water, the elimination of all the other inputs we've been using, and the challenges with climate change.

Fred Kirschenmann, Ph.D. is a farmer, philosopher, author and distinguished fellow for the Leopold Center at Iowa State University, and president of Stone Barns Center for Food and Agriculture in Pocantico Hills, New York. He also continues to manage his family's 1,800-acre certified organic farm in south central North Dakota. He is the recipient of Beyond Pesticides 2014 Dragonfly Award "for vision and leadership in advancing ecological farming, local empowerment, and environmental renewal."

The Time is NOW for Strong, Federal Protections for Farmworkers

Farm work is hard and dangerous work. Each year millions of farmworkers, including seasonal and migrant workers, toil in fields across the U.S. to bring food to dinner tables across the country. But in spite of their hard work, farmworkers and their families experience unjust hazards from pesticides utilized in agriculture. This is a serious environmental justice issue that requires urgent attention from consumers, producers, retailers, and policy makers. After an almost 20-year delay, the U.S. Environmental Protection Agency (EPA) released its long-awaited proposal to update the Farm Worker Protection Standard (WPS), which is designed to provide protections from pesticide exposure hazards for more than two million farmworkers and their families across the nation. Historically, farmworker advocates have criticized these protections as woefully inadequate in protecting the health of agricultural workers, but these new revisions attempt to strengthen the standards through increased training for workers handling pesticides, improved notification of pesticide applications, and a higher minimum age requirement for children to work around pesticides.

As described by EPA, "WPS is a regulation intended to reduce the risks of injury or illness resulting from agricultural workers' and handlers' use and contact with pesticides on farms, forests, nurseries and greenhouses." An analysis of EPA's proposed WPS rule reveals a mixed bag. In many regards, the proposed rule achieves the agency's stated intention and improves upon the outdated and inadequate standards that have plagued the agricultural industry. However, in far too many instances, the WPS fails by establishing standards that fall short of necessary protections. Farmworkers face disproportionate risks to pesticide exposures, with EPA stating that pesticide exposure incidents are vastly under-reported –in some case by as much as 90 percent. For this reason, we must ensure that WPS is as strong as it could be for workers.

Dangers Persist

The scientific literature confirms that farmworkers, their families, and their communities face elevated hazards from pesticide exposures, and existing farmworker data finds that the incidence rate of pesticide poisoning is extremely high. An average of 57.6 out of every 100,000 agricultural workers experience acute pesticide poisoning, illness or injury each year.

Pesticide application and resulting drift cause dermal, inhalation, and oral exposures that are typically underestimated. Agricultural pesticides are detected in farmworker homes that tend to be located near agricultural fields, meaning that, even after workers leave the fields, they are still exposed. According to a study involving seasonal and migrant workers, they experience repeated exposures to the same pesticides, evidenced by multiple pesticides routinely detected in their bodies. As a result of cumulative long-term exposures, farmworkers and their children, who often times also work on the farm, are at risk of developing serious chronic health problems, such as neurological impairments, autism, cancer, and Parkinson's disease.

Pesticides like the herbicide 2,4-D, and organophosphate (e.g., chlorpyrifos), and pyrethroid insecticides are routinely detected in the bodies and homes of farmworkers. The risks of exposure from these chemicals have long lasting impacts on farmworker communities. For instance, research finds that children exposed to high levels of chlorpyrifos had brain development delays, attention problems, attention-deficit/hyperactivity disorder problems, and pervasive developmental disorder problems at three years of age. Other research finds that those with long-term exposure to 2,4-D had poor semen quality, and higher rates of birth defects. Elevated rates of cancer is also a reality that many farmworkers face.

A recent Centers for Disease Control and Prevention (CDC) scientific report, *Worker Illness Related to Newly Marketed Pesticides — Douglas County, Washington,* (Calvert, 2014), identifies "at least three potential occupational hazards in agriculture: off-target pesticide drift, toxicity of some recently marketed pesticides, and a gap in worker notification requirements." The report recounts the poisoning in April 2014 of 20 farmworkers at a Washington State cherry farm who were trellising cherry tree branches when a new pesticide mixture being applied to a neighboring pear orchard drifted onto their work site, causing acute illness within

...continued on page 18B

Worker Protection Standard

Updates to the Rule: The proposed improvements to the Farm Worker Protection Standard (WPS) include many recommendations from farmworker advocates. Most importantly, workers and handlers will be made aware of their rights under the WPS and of the resources available to them in the event of a suspected act of retaliation or noncompliance with the standard.

Improvements made to the 2014 WPS proposed rule	Recommendations to strengthen and improve 2014 WPS proposed rule
Worker Training: Raising the level of training for workers and handlers from every five years to once a year. The training will include information on farmworker protections required, restrictions on entering pesticide-treated fields, access to information and use of personal protective equipment. It will also provide instructions on reducing pesticide exposure in the home.	**Provide more comprehensive training and information access.** Training that incorporates clear directions to report violations of pesticide use without fear of retaliation or intimidation must be prioritized. Further, workers should be provided with contact information of potential legal representation as a part of worker and handler training, should the worker need legal redress.
Notification: Requiring mandatory posting of no entry signs in treated areas that have a re-entry time of more than 48 hours rather than either oral or posted notification.	**Require notice of all pesticide applications, both on site and in central areas.** Pesticide application notices should be posted before and after application. Notices should be posted at the treated area and in central areas where workers converge. It should not be one or the other.
Minimum Age: Setting the minimum age of pesticide applicators and early entry works to 16 years of age; previous rules had absolutely no minimum age requirements.	**Protect all children.** The WPS should have a firmer stance on protecting children and establish a baseline age of 18 for all children. This includes farm owner children who are currently exempt. Science shows that adolescents are still vulnerable to pesticide exposures.
Buffer Zones: Expanding no-entry buffer areas around pesticide-spray zones from nurseries and greenhouses to also include farms and forests to reduce exposure.	**Establish broader, universal drift and volatilization protections.** The expansion of entry-restricted areas and buffer zones to include farms and forests, in addition to nurseries and greenhouses, is critical and should extend to areas neighboring treated sites where pesticides can drift and volatilize off the field after application. This must apply to all pesticides and application methods.
PPEs: Requiring personal protection equipment must be consistent with the Occupational Safety and Health Administration standards for ensuring respirators are providing protection.	**Institute the highest level of protective gear, supplies, and systems technology possible.** Equipment must be consistent and suited to the highest possible protective needs. Standards should also require improved technologies and systems shown to reduce hazardous exposure, such as closed mixing and loading systems, and dust/mist filtering masks and respirators.
Hazard Information: Requiring employers to communicate pesticide hazards to workers, handlers, or authorized representatives. Require employers to maintain pesticide application-specific information, labeling and safety data and make that information available to workers, handlers, or their authorized representatives.	**Provide medical monitoring and better accountability mechanisms.** Workers should be provided with medical monitoring, like those available in California and Washington, to better assess exposure and impacts while also providing them with access to medical care if needed.

Federal Protection for Farmworkers, *continued from page 18*

minutes. Several farmworkers sought medical treatment for symptoms ranging from headache and eye irritation to gastrointestinal disorders and respiratory problems. Half of the affected workers had symptoms that persisted over two weeks. Pesticide residues were found on not only the workers' clothing, but also on the portable toilets used by the workers, demonstrating that workers can be exposed directly and indirectly from drifting pesticides.

Despite federal regulations to reduce pesticide exposure among farmworkers (e.g., personal protective equipment or PPEs), research conducted in farmworker communities show that such regulations are only partially enforced. High levels of pesticides continue to be detected among farmworker communities across the country, providing evidence that PPEs and other controls do not go far enough to protect this highly exposed population.

Many of these exposure and disproportionate impact issues will not be reduced by the proposed WPS as long as pesticide use remains a rampant and escalating component of agriculture. If EPA is committed to environmental justice and the health and well-being of farmworkers, and is unwilling to remove certain toxic pesticides that have proven to impair farmworker health from agricultural use, then the WPS must ensure the very highest safety standards, and assist in moving the agricultural industry toward a less pesticide-reliant system.

Transition to safer practices

The consumer focus on pesticide residues on fruits and vegetables and other food commodities does not ensure that workers are being protected from hazardous pesticides. Some of the foods that have the least residues (e.g., onions) are grown with some of the most hazardous pesticides (e.g., chlorpyrifos). The situation is captured by the Beyond Pesticides' database *Eating with a Conscience*. The best way for consumers to advance protection of workers is to purchase food that is certified organic. The Agricultural Justice Project (AJP) is adding a social justice screen to organic production by working with growers to ensure adherence to workplace standards that protect worker rights, providing those growers in the program with an AJP label. The standards address fair wages and benefits for workers, housing, workplace health and safety, as well as children on farms, among others. For more information, visit the agriculturaljusticeproject.org. Others, including Coalition of Immokolee Workers, El Comite de Apoyo a Los Trabajadores Agricolas (CATA), Farm Labor Organizing Committee, and United Farm Workers, advance farmworker justice.

This is the expanded and fully cited version of an article by Nichelle Harriott, originally published in the Spring 2015 issue of Pesticides and You, Vol. 35, No. 1.

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Precaution: Science and Policy

By Terry Shistar, Ph.D.

In July 2014, the U.S. Fish and Wildlife Service (FWS), in announcing its decision to phase out the use of neonicotinoid pesticides on federal wildlife refuges, noted that the chemicals' prophylactic use (before identifying pest problems) and broad spectrum effect on non-target species runs contrary to its integrated and precautionary approach to pest management. The chief of the National Wildlife Refuge System, James Kurth, said, "We make this decision based on a precautionary approach to our wildlife management practices. . ." This statement introduces the concept of precaution into pesticide policy, an approach found in the *Organic Foods Production Act* (OFPA). However, the federal pesticide registration system managed by the U.S. Environmental Protection Agency under the *Federal Insecticide, Fungicide and Rodenticide Act* (FIFRA), operates with a bias against precaution, high allowable risk, and perpetual crisis management.

The Precautionary Principle

In 1998, a gathering of scientists, philosophers, lawyers, and environmental activists produced this statement of the Precautionary Principle (known as the Wingspread Statement):

> When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof. The process of applying the precautionary principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action.[1]

Organic Foods Production Act (OFPA)

Perhaps the clearest embodiment of the precautionary principle in United States law is in OFPA. The law establishes criteria for determining which synthetic materials may be used in organic production that are clearly precautionary:

> [7 U.S.C. 6504] **National Standards for Organic Production.** To be sold or labeled as an organically produced agricultural product under this chapter, an agricultural product shall—
>
> (1) have been produced and handled without the use of synthetic chemicals, except as otherwise provided in this chapter;
>
> [7 U.S.C. 6517] **National List.**
>
> **(c) Guidelines for Prohibitions or Exemptions.**— (1) Exemption for prohibited substances in organic production and handling operations.—
>
> The National List may provide for the use of substances in an organic farming or handling operation that are otherwise prohibited under this chapter only if—
>
> (A) the Secretary determines, in consultation with the Secretary of Health and Human Services and the Administrator of the Environmental Protection Agency, that the use of such substances—
>
> (i) would not be harmful to human health or the environment;
>
> (ii) is necessary to the production or handling of the agricultural product because of the unavailability of wholly natural substitute products; and
>
> (iii) is consistent with organic farming and handling;

These three criteria are further elaborated in OFPA and its implementing regulations. They are utilized by the National Organic Standards Board (NOSB), which consists of representatives of all aspects of the organic community (including producers, handlers/processors, retailers, consumers, environmentalists, scientists, and certifiers), in determining acceptable materials in organic production.

The presumption against the use of synthetic materials in organic production establishes the burden of proof that is the key element of precaution.[2] OFPA is also precautionary because the burden of proof to show that the synthetic materials meet the three criteria rests with those who want to have it used in organic production. To be allowed for use under certified organic standards, the NOSB must approve the material by a two-thirds "decisive" vote, adding a further element of precaution.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The burden of proof in many other regulatory schemes in the U.S. is anti-precaution and favors the allowance of risk. This is not always obvious in the statutory language. FIFRA, for example, is not explicitly anti-precaution. Rather, at least some of that bias has been added by EPA in its implementation.

FIFRA's safety standard allows a pesticide to be used if it does not result in "unreasonable adverse effects on the environment,"[3] defined as "(1) any unreasonable risk to man or the

environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under section 408 of the *Federal Food, Drug, and Cosmetic Act* (21 U.S.C. 346a)."[4] FIFRA's underlying standard is not as precautionary as OFPA's standard because OFPA requires that **both** need and lack of adverse effects be established. In addition to FIFRA allowing "benefits" to trump hazards (with its risk-benefit calculation), the greatest anti-precautionary aspect of U.S. pesticide regulation actually stems from the way EPA applies science to its unreasonable adverse effect determination.

A scientific test for toxicity or some other impact of a chemical is said to be "positive" when the a statistically significant number of test subjects (based on laboratory animal testing) exhibit a toxic effect that is greater in the dosed group than the control group. Those positive tests, which under FIFRA are performed by the manufacturer, other potential registrants, or a contractor hired by one of them, provide the potential support for denying a pesticide registration.

FIFRA requires EPA to register a pesticide if it does not cause unreasonable adverse effects on the environment, but the practice of EPA is to allow pesticide registration unless unreasonable adverse effects are demonstrated. Unlike OFPA, the burden of proof, as FIFRA is implemented by EPA, is on the agency to show harm.

Furthermore, because the tests that provide potential support for a decision to deny a registration require demonstration of statistically significant impacts without requiring a minimum power of the statistical test, the bias in favor of allowing the use of the pesticide is greater.

In the case of toxicological tests of pesticides, the experiment is attempting to disprove the hypothesis (known as the null hypothesis) that there is no difference between those test animals receiving doses of the pesticide and the controls (no exposure) –that is, that the pesticide has no effect. The experiment is arranged so that a positive result disproves the null hypothesis.

The **power** of a statistical test is the probability that it correctly rejects the null hypothesis when it is false. In the case of a test to determine whether a chemical is carcinogenic, for example, the null hypothesis is that the chemical does not cause cancer. Thus the power of the test is the probability that the test will determine that a carcinogen causes cancer. Scientists typically focus on **significance** or the **confidence level**, the probability that a test will not reject a true null hypothesis. In the example of carcinogenicity testing, the confidence level is the probability that the test will determine that a non-carcinogen does not cause cancer.

An investigation into statistical power and precaution

When a toxicological test is performed, the question as to whether or not there is an effect is determined by statistical tests performed on the data resulting from the test. Typically, the frequency of the effect (e.g., percentage of animals with tumors) in dosed animals is compared to the frequency in controls. One test that is often used is Fisher's Exact Test, and it is the one used in these calculations.

In statistical inference from the data, there are two types of errors that can be made:

- Type I errors are false positives –saying that a chemical causes tumors when it doesn't;
- Type II errors are false negatives –saying that a chemical does not cause tumors when it does.

Either kind of error can arise from random factors. When a result is judged to be "statistically significant," it means that the observed proportion of effects (tumors) is unlikely to have occurred by chance if the chemical has no effect. Usually, "unlikely" means it would happen less than 5% of the time. That means that the rate of type I errors that is allowed is less than 5%. The rate of type I errors is also called α , or the significance level. 1- α is called the confidence level.

The rate of type II errors is called β, and 1 - β is called the power of the test. It is the likelihood that the experiment would find an effect if there is one.

While α is generally reported, β almost never is. While there is a standard for statistical significance based on α, there is not a requirement for a minimum value of β. In a regulatory setting, type I errors hurt chemical manufacturers because they mean that a harmless chemical may be subject to regulation or restriction based on an effect that is not present. In the same setting, type II errors hurt consumers and the public because they mean that there may be exposure to a chemical that causes health impacts that were not recognized by testing.

If a regulatory program is precautionary, it should not be based on tests in which the allowed rate of false negatives is greater than the allowed rate of false positives.

According to the EPA test guidelines, each test group starts with 50 animals, but is permitted to be reduced to 13 animals by the end of the test. This number of animals is sufficient to detect an increase in the incidence of the effect from 10% to 100% that occurs 95% of the time. It is not sufficient to detect a fivefold increase from a back-

ground incidence of 10% that occurs even 80% of the time, or any increase up to 10X from a background rate of 5% or less that occurs 80% of the time. That means that unless the background rate is very low and the effect is very great, there will be many false negatives.

Furthermore, it is easy to manipulate the statistical power –if it is not controlled by oversight– to make it appear that a given experiment does not demonstrate a statistically significant effect. One need only reduce the effective total number of subjects (sample size, N), since EPA guidelines allow reductions of up to 75%. In reading reports of experiments submitted to EPA, one frequently sees evidence of the reduction of N over the course of the experiment. An animal may be found dead of causes unrelated to the experimental question. This may result from poor feed, unclean conditions, over-crowding, or other practices. It need not affect the control group more than the dosed animals. Any reduction in N will reduce the statistical power and make it less likely that the effect will be found to be statistically significant.

It is difficult, but possible, to find raw data on the underlying study and the possible reduction in N resulting in a lack of significance in the testing of pesticides. In Registration Eligibility Documents, the Integrated Risk Information System, and other documents, EPA reports study conclusions, but not details like the number of animals lost during the experiment. To find those details, it is necessary to file a *Freedom of Information Act* (FOIA) request for the EPA reviews of original study documents submitted by the registrant (chemical manufacturer). For example, in one study relied upon for the continued registration of atrazine, 50.5% of all the animals died over the course of the experiment, including 41% of the male controls and 57% of the female controls. Of the total, 41% were "found dead" in their cages. In addition to these, two mice were deleted for misidentification, two because they were mis-sexed, and one because the animal escaped from his cage. With these large reductions in the number of animals from the original 60/sex/dose, it is not surprising that the experiment failed to find a significant increase in the incidence of tumors.[5]

Thus, by requiring (1) that harm be demonstrated rather than the absence of harm, and (2) statistical significance while not explicitly controlling statistical power, EPA introduces a bias in favor of registration that goes beyond the statutory standard, and is thus anti-precautionary.

Conclusion

In addition to the complexities associated with establishing the "safety" or allowable hazards, given numerous gaps in information related to multiple exposures, mixtures, synergistic effects, pre-existing disease conditions, and individual vulnerabilities and genetic makeup, the scientific method behind policy implementation needs constant oversight and critiquing. It is not as simple as telling a regulatory agency to protect the health of the public, workers, and the environment based on risk assessment calculations that are subject to manipulation and false assumptions. The examination of statistical issues creates yet another urgent reason to embrace a national policy of precaution and prevention when it comes to the introduction of toxic chemicals, especially those being found to be unnecessary to achieving goals related to productivity, profitability, and quality of life.

This article was originally published in the Spring 2015 issue of Pesticides and You, Vol. 35, No. 1.

Endnotes

1. Wingspread statement. http://www.sehn.org/precaution.html.
2. The embedding of the precautionary approach in OFPA is evidence that the NOP justification for recent changes in the sunset procedures –that the standard for removing a material should be the same for adding it—is contrary to the spirit of OFPA.
3. FIFRA, Section 3(c)(5) APPROVAL OF REGISTRATION.—The Administrator shall register a pesticide if the Administrator determines that, when considered with any restrictions imposed under subsection (d)—
   (A) its composition is such as to warrant the proposed claims for it;
   (B) its labeling and other material required to be submitted comply with the requirements of this Act;
   (C) it will perform its intended function without unreasonable adverse effects on the environment; and
   (D) when used in accordance with widespread and commonly recognized practice it will not generally cause unreasonable adverse effects on the environment.
4. FIFRA Section 2(bb).
5. EPA, 1987. Data Evaluation Report of mouse oncogenicity study on atrazine, MRID #404313-02. Study sponsored by Ciba-Geigy Corp and performed at the Ciba-Geiby testing facility in Summit, NJ.

How to Repel Mosquitoes Safely

An Updated Beyond Pesticides Factsheet

With summer approaching, and the insects coming out in full force, along with some very itchy arms and legs, avoiding mosquitoes becomes a high priority. It not too early this spring to fight the bite first and foremost by practicing prevention. Remove any standing water where mosquitoes can breed around your home and schoolyard, such as plant pots, leaky hoses, clogged gutters, empty buckets, toys, and old tires. Trim back overgrown vegetation, and encourage natural predators like bats, birds, dragonflies, and frogs.

Protect yourself from mosquitoes by wearing long-sleeved, loose, light colored clothing. When sitting outside, use an oscillating fan, a screened area, or even a pop-up shelter. Burning citronella candles outside may also help repel mosquitoes. As a last line of defense, employ least-toxic mosquito repellents (but with the understanding that no acceptable repellent will provide complete protection from bites). Many common mosquito sprays contain harmful ingredients, so it is important to read labels carefully before buying and using repellents.

Least-Toxic Mosquito Repellents:

Registered Repellents: *Although many essential oil insect repellents are registered by the U.S. Environmental Protection Agency (EPA), only the following active ingredients in repellents are evaluated by EPA for health risks and product effectiveness, and also considered least-toxic by Beyond Pesticides. With any repellent, read the directions and follow the label carefully, and be sure to avoid contact with sensitive areas like the eyes and open wounds. These materials are all alternatives to the hazardous ingredient DEET. (See DEET hazards on next page.)*

Oil of Lemon Eucalyptus (OLE)

*******Best Choice!***

The U.S. Centers for Disease Control and Prevention (CDC) recommends OLE repellents as an effective alternative to DEET. OLE masks both carbon dioxide and lactic acid exhalations that alert mosquitoes to our presence, hiding humans from detection. Only formulated, refined OLE is registered by the agency as a repellent; note that "pure" lemon eucalyptus oil is registered for safety, but not repellent effectiveness by EPA. A synthetic version of the active ingredient in OLE, p-Menthane-3,8-diol, is also on the market, but Beyond Pesticides suggests considering the refined, natural extract. Protection times are similar to DEET-based repellents.

- ***Cautions:*** *Do not apply to children less than 3 years of age.*
- ***Product Examples:*** *Repel Lemon Eucalyptus Insect Repellent, Cutter Lemon Eucalyptus Insect Repellent.*
- ***Estimated Time of Effectiveness:*** *3-7 hours in areas with aggressive mosquito populations, up to 12 hours in other areas.*

Picaridin (Icaridin, or KBR 3023):

A synthetic version of the piperine compound in pepper, picaridin is a relatively new insect repellent that can be used as a least-toxic alternative to DEET. Although there is limited data available on this product, particularly concerning long-term toxicity, evidence does suggest that it has low potential for human harm if used as directed. Picaridin is synthetic, so those seeking a natural repellent should consider OLE.

- ***Cautions:*** *Do not apply to children less than 2 months of age.*
- ***Product Examples:*** *Avon Skin So Soft Bug Guard Plus Picaridin, Sawyer Premium 20% Picaridin Insect Repellent.*
- ***Estimated Time of Effectiveness:*** *Based on picaridin concentration: 3-6 hours at concentrations below 20%; up to 8 hours at concentrations of 20%.*

IR3535

Insect repellent 3535 is a synthetic repellent that was registered by EPA in 1999, after 20 years of use in Europe, with no reports of adverse effects in the scientific literature. Despite its synthetic make-up, IR3535 is registered as a biochemical pesticide because it is functionally identical to the molecular structure of beta alanine, a naturally occurring amino acid, and the end groups formed through its production are not likely to contribute to toxicity. Still, those looking for a natural repellent should

Federally Registered Repellents: Unless determined to be minimum risk and exempt from registration, repellents must undergo EPA's formal registration process, which includes a scientific assessment of the active ingredient that is included in pesticide products. Repellents with a public health claim (such as, 'protects against mosquitoes carrying West Nile virus'), must be evaluated by EPA for product effectiveness.

Unregistered Repellents (List 25(b) – Federally Exempt Minimum Risk Products): Minimum risk repellents and pesticides under section 25(b) of the *Federal Insecticide, Fungicide and Rodenticide Act* (FIFRA) are not required to undergo the federal registration process if their ingredients are "demonstrably safe for its intended use."

consider OLE.

- ***Cautions:*** *Eye irritant, avoid contact in or around eyes.*
- ***Product examples:*** *Avon Skin So Soft Bug Guard Plus IR 3535 Expedition, Coleman Skin Smart DEET-Free Pump Spray Insect Repellent.*
- ***Estimated Time of Effectiveness:*** *Based on IR3535 concentration: Around 2 hours at concentrations below 20%; up to 8 hours at concentrations of 20%.*

Unregistered Repellents (25b–see box): *Essential oil repellents are considered minimum risk, and are evaluated by EPA for safety concerns. Although EPA has not evaluated them for effectiveness, some independent data does suggest a varying degree of efficacy with certain essential oil repellents. All are considered least-toxic by Beyond Pesticides, but some can cause contact dermatitis, so apply to a small area of skin, such as the arm or leg first, before using on the rest of your body. With all essential oil bug repellent products, use caution around infants and toddlers, and always read the label.*

Soybean Oil

Many bug repellents are formulated with soybean oil, an extract of soybeans. Although soybean oil repellents have not been tested for efficacy by EPA, Health Canada recommends these products as an acceptable mosquito repellent. The agency also does not prescribe any frequency or age limitations to the use of soybean oil repellents.

- ***Cautions:*** *Avoid contact with eyes, follow label directions.*
- ***Product examples:*** *Buzz Away products, Bite Blocker Organic Extreme.*
- ***Estimated Time of Effectiveness:*** *1.5 to 4 hours, depending upon formulation.*

Citronella Oil

The classic all-natural mosquito repellent may not be as effective as word of mouth would have it. Although there is evidence that burning citronella candles and incense reduces backyard mosquitoes, spray-on products primarily made of citronella oil are not reported by many to be the most effective way to repel mosquitoes. For example, Natrapel products containing 10% citronella oil showed one hour efficacy under EPA tests, but now have been reformulated with picaridin. Natural products, such as the ones listed below, which contain citronella, but not as the active ingredient, have increased repellency.

- ***Cautions:*** *Citronella can contain human allergens and should not be applied to infants and toddlers.*
- ***Product example:*** *All-Terrain Herbal Armor DEET-Free Natural Insect Repellent.*
- ***Estimated Time of Effectiveness:*** *30 minutes to 3 hours, depending upon formulation.*

Other Essential Oils

Many of the products listed above also contain essential oils, such as lemongrass oil, castor oil, catnip oil, geraniol oil, cedarwood oil, peppermint oil, clove oil and others. There is limited data on the efficacy for many of the essential oils as standalone mosquito repellents. However, catnip oil shows the greatest promise. No essential oils should be applied to infants or toddlers. Beyond Pesticides suggests that you consider one of the many DEET-free formulated repellents.

Be Sure to Avoid:

Pesticide-Impregnated Clothing

Although clothing pre-treated with the insecticide permethrin, the only pesticide approved for this use, is less available in the marketplace, many companies nonetheless sell spray cans of permethrin intended to be applied to clothing. Beyond Pesticides strongly discourages the use of permethrin on clothing. Permethrin is classified as "likely to be carcinogenic" by EPA, and studies have linked childhood permethrin exposure to leukemia. Permethrin shows evidence of endocrine disruption and neurotoxicity,[1,2] and research has also linked pesticides in the pyrethroid class, which permethrin is a part of, to behavioral and emotional problems in children.[3]

DEET

Although recent scientific data calls into question evidence that DEET results in seizures in children, Beyond Pesticides suggests that people consider least-toxic repellents such as OLE and the others listed in this article be used in place of DEET. In humans, symptoms of acute exposure to DEET include headache, exhaustion and mental confusion, together with blurred vision, salivation, chest tightness, muscle twitching and abdominal cramps. Researchers have noted significant concerns related to the use of DEET, including nervous system disorders, adverse developmental effects, and neurotoxicity in children. One study found that DEET inhibits cholinesterase activity crucial for regulating nerve impulses.[4] Another study associated pregnant women's exposure to insect repellents, such as DEET, during their first trimester to an 81% increased chance of male children developing "hypospadias," a condition where the urinary opening is at the bottom rather that the tip of the penis.[5]

Studies have also shown synergistic effects as a result of combining DEET and permethrin together.[6] Scientists link the combined effect of these two chemicals to poor sensorimotor performance and brain damage. This is especially important when considering the widespread use of permethrin in mosquito spray programs, where governments may concurrently advise the use of DEET.

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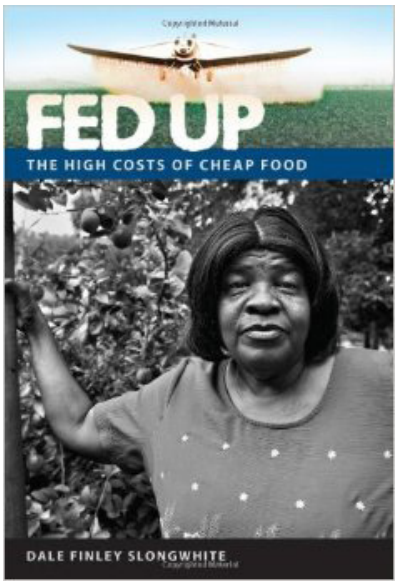
Fed Up: The High Cost of Cheap Food

Dale Slongwhite, University Press of Florida, 2014, 192pp.



In the book *Fed Up: The High Cost of Cheap Food*, author Dale Slongwhite documents the oral histories of American farmworkers who suffered from one of the most disturbing pesticide exposure incidents in U.S. history. Ms. Slongwhite's interest in the plight of farmworkers stemmed from an environmental justice summit she attended in the fall of 2009 in Orlando, Florida. Some of the most heart wrenching stories she heard at that event came from the former farmworkers of the Lake Apopka area, whose experiences span decades. As a self-described naïve consumer, she had little to no awareness of the toll placed on America's farmworkers in the harvesting of our fruits and vegetables. After hearing the farmworkers' experiences, she decided to meet with them personally to collect their stories. Here's one:

> *"As far back as 1974, we talk among ourselves because we knew that when we go home at night there was something going on with our bodies. When we come to work the next morning, we'd tell each other about the toothache we had that was so bad, how our eyes was burnin' so bad, that our skin was burnin' so bad. We talk about our headaches or that we was coughin' all night long.*
>
> *In the fields, if you go to talkin' about you got sick because of the pesticides, there was a hush mouth, because if you didn't keep your mouth closed, they would retaliate against you…You wasn't dumb. You knew chemicals was being used in the field and they was used against the body."—Geraldine Matthew*

Lake Apopka, the third largest lake in Florida, is located 15 miles northwest of Orlando in a region that used to be one of the most productive farmlands in the country. The high productivity of this region came with a dire price, however – the profligate use of organochlorine pesticides up until the mid-1990s was so extreme that the normally clear waters of the lake turned pea-green from decades of pesticide run-off, severely harming not only the surrounding wildlife, but the farmworkers who worked there at the time. Ms. Slongwhite's book is a collection of stories told to her by these former farmworkers. The stories, spoken from workers themselves, are essentially transcripts of the interviews that Ms. Slongwhite conducted with them, with little elaboration or editing.

It is easy to see why the author decided to share the stories as spoken to her. The hardships experienced by the farmworkers in the book are disturbing, both in their description and the fact that the conditions persisted for so long; in some cases, these hardships continue. The stories recount child abuse, racism, rape, poverty, exploitation, and corruption. They talk of women giving birth in fields, countless cases of diabetes and arthritis, children with seizures, and people born with no bones in their arms. A common and striking image was that of a cropduster flying overhead, spraying pesticides onto the fields and workers who were not given notice or evacuated from the area and had to try to shield themselves from the pesticide sprays with only their clothes and a hat. Oftentimes, workers talk of the spraying causing all sorts of health problems, including blindness, paralysis, and spasms.

The author at the beginning of the book offers important perspective that sums up how critical these stories are. Ms. Slongwhite states, "I learned that what happened on the farms surrounding Lake Apopka is not a 'local issue,' as some purport. The use of endocrine-disrupting chemicals, the exploitation of those willing to harvest our food, and the targeting of low-income neighborhoods to warehouse toxic waste and toxin-producing businesses is the way America operates." Clearly, Ms. Slongwhite is telling us that the way America operates does not work, at least from the experiences of farmworkers working in a deadly agricultural system. While the author certainly hopes that readers of *Fed Up* no longer take their food for granted, the collection of stories also delivers the message that the contribution of farmworkers to society, in ensuring that food makes its way to Americans' dinner tables, should not come at such a terrible price.

> *"It'd be hot, and we cuttin'. Airplanes be sprayin' the fields. It'd be flyin' and sprayin' that stuff right on top of us. That stuff just like some sticky on ya. Sprayed pesticides right on top of us. They knew. Yes, they did. Didn't care. All they wanted was for us to work and get that order out. For years they did that."—Betty Dubose*

Fed Up is an important read because the stories truly personalize the struggles of these former farmworkers, putting a face on the issues we work on at Beyond Pesticides. Today, Lake Apopka is still contaminated from nearly 50 years of pesticide use, and farmworkers' stories must be heard widely if we are ever to see changes that support a safe and just food production system.

Be a Model in Your Community with the Pesticide Free Zone Sign

Be a model for your community and show your neighbors that pesticide-free lawns and gardens are important for the health of children, families, pets, the environment and the community. Buy a Pesticide-Free Zone lawn sign for $13 and display it in your yard. Each sign you purchase comes with its own "Lawn Care Owner's Manual," which provides helpful information on how to maintain your pesticide-free landscape and spread the word about the benefits of pesticide-free spaces. Signs are available for $10 at the conference or for $13 (includes shipping) at http://bit.ly/ShopBeyondPesticides.

We hope you use your Pesticide-Free Zone sign to spark a conversation in your community about the use of pesticides. One yard at a time, we can transition toward a safer future without the hazards associated with unnecessary pesticide use. If you have any concerns about specific pesticide products, feel free to give Beyond Pesticides a call at 202-543-5450, or send us an email at info@beyondpesticides.org, or go to our *Gateway on Pesticide Hazards and Safe Pest Management* at www.beyondpesticides.org/gateway.

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BEE Protective

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BEE Protective Habitat

These painted signs are eight inches wide by eleven inches high, and have four holes with grommets to easily post. The sign comes with our beautiful full-color BEE Protective Habitat Guide publication, which is a comprehensive guide to the pollinator-friendly flowers you can plant in your region. Signs are available for $18 (includes shipping) at: http://bit.ly/ShopBeyondPesticides.

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