

Pesticides and You

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

Volume 34, Number 3

Fall 2014

Wastewater Irrigation on Farms Contaminates Food



Also in this issue:
Hedgerows for Biodiversity

Beyond Poison Poles

A BEE Protective Update

Ogunquit, Maine Voters Choose to Protect Health and the Environment

Rachel Carson would be proud of the Mainers in Ogunquit who on Election Day passed a ballot initiative, with 60 percent of the vote, to ban toxic pesticide use on lawns and landscapes within the town's jurisdiction. As if guided by Ms. Carson's 1962 book, *Silent Spring*, the Ogunquit Conservation Commission began the community discussion on this trailblazing ordinance –different from numerous pesticide ordinances in Maine and throughout the nation, including a previous one in Ogunquit, because it restricts lawn and landscape pesticide use on all property, public and private, throughout the town.

A bright spot on election day

The passage of Ogunquit's referendum is a bright spot during an election cycle that saw the defeat of referendums to label food products with genetically engineered ingredients in the West.

A marine biologist, Ms. Carson warned the nation that our appetite for pesticides raised grave concerns about the effects of chemical-intensive practices, our relationship to nature, chemical effects at the cellular level, and insect and weed resistance to chemical controls. Of the 30 most commonly used lawn pesticides, 17 are linked to cancer, 18 are endocrine disruptors, 19 are reproductive toxicants, 11 are linked to birth defects, 14 are neurotoxic, 22 cause kidney liver effects, and 25 are irritants. The U.S. Geological Survey has linked lawn pesticide use to runoff into waterways.

Ms. Carson wrote, "By their very nature, chemical controls are self-defeating, for they have been devised and applied without taking into account the complex biological systems against which they have been blindly hurled. The chemicals may have been pretested against a few individual species, but not against living communities." She warned us to protect the diverse organisms that make up a healthy ecosystem, including bees, birds, butterflies and other pollinators.

Protecting the pollinators

The Ogunquit ordinance is timely, given that we are currently experiencing the worst decline of bee populations in history. Their demise is linked to a constellation of factors, most prominently neonicotinoid insecticides. These are systemic pesticides that make their way through the vascular system of the plant and are expressed through pollen, nectar, and guttation droplets, effectively poisoning foraging or pollinating insects, and persisting in soil and waterways.

Ogunquit is on the leading edge of communities seeking to stop involuntary poisoning and non-target contamination from runoff, pesticide drift, and volatilization that occurs as toxic chemicals move off of treated private yards. The ordinance is similar to a law adopted by the city of Takoma Park, Maryland, following bans on cosmetic or aesthetic pesticide use on lawns that have been in place in Canadian provinces for many years. Maine is only one of seven states nationwide that allows municipalities to adopt standards more stringent than state restrictions. The remaining 43 states have some type of preemption law that limits ordinances to only locally owned public property.

The action in Ogunquit leads the way to the widespread adoption of effective non-toxic land management. As Ms. Carson wrote, "To assume that we must resign ourselves to turning our waterways into rivers of death is to follow the counsel of despair and defeatism. We must make wider use of alternative methods that are now known, and we must devote our ingenuity and resources to developing others."

Chemical-intensive turf and landscape management programs are generally centered on a synthetic product approach that continually treats symptoms. In fact, toxic chemicals are not needed for successful turf management. Rather, a systems approach incorporates preventive steps based on building soil biomass to improve soil fertility and turf grass health, organic products based on a soil analysis that determines need, and specific cultural practices, like mowing height, aeration, dethatching, and over-seeding.

Organic turf management, which meets the standards of the *Organic Foods Production Act*, is a "feed-the-soil" approach that centers on natural, organic fertilization, microbial inoculants, compost teas, and compost topdressing as needed. This approach builds a soil environment rich in microbiology that will produce strong, healthy turf able to withstand stress.

The Ogunquit ordinance is not just about banning pesticides, it is about respecting biological systems that are central to the sustainability of our environment.

Wastewater contaminates food supply

This issue features reporting on some troubling research findings on food contamination with pesticides and pharmaceuticals from treated wastewater used increasingly in agriculture. While the reuse of water is important with widespread water shortages, the chemicalization of society has resulted in contaminants of emerging concern (CECs) that are not removed even by high level water treatment. Therefore, we are seeing DEET, triclosan, antibiotics, caffeine, and the anti-depressant carbamazepine in food grown with irrigated wastewater.

Hedgerows

The wastewater debacle is yet another urgent reason to get off the chemical treadmill. The treatment technology either doesn't exist or is extremely costly. So, shifting to organic management practices, which, are less water dependent, provides the sane course forward, and as we explain in this issue, the development of hedgerows in communities and on farms improves the environment – protecting and improving biodiversity and a balanced ecology. This is where we must put our resources.



Best wishes for the holiday season!

Jay Feldman is executive director of *Beyond Pesticides*.

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Front cover image: Agricultural irrigation system, near Chualar in the Salinas Valley, Monterey County, California. Photo by Brendal, 2005.

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National Headquarters:

701 E Street, SE
Washington DC 20003
ph: 202-543-5450 fx: 202-543-4791
email: info@beyondpesticides.org
website: www.beyondpesticides.org

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Amila Weerasingha, *Public Education Assistant*

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Jay Feldman, *Publisher, Editor*
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Stephanie Davio, *Layout*

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The Mosquito Squad Kills Bees

Beyond Pesticides,

I was very disturbed when I received a mailing from the "Mosquito Squad" business in my town which advertised their services, including "bee elimination." I've never heard a case of stinging from solitary ground bees. They do not even rate a listing as a "pest" in a technician's handbook from Pest Control Technology. They ought to cease and desist such ads.

-Alan C.

Hi Alan,

Thank you for bringing this to our attention. Rather than kill ground dwelling bees, we hope that residents will encourage them! This advertisement might be playing on people's fears of wasps and hornets, which can mimic, and have similar habitats to many social and harmless wild pollinators. Certainly, if wasps or hornets are an issue, there are least-toxic products (such as boric acid or plant-based sprays) that can be employed to eliminate their threat without applying toxic pesticides around one's yard. People may mistake the numerous individual nests wild pollinators can create for hornet or wasps nests, so proper identification is important to avoid harming these valuable creatures. If one likes their ground dwelling bees, but simply not where they are at the moment, eliminating habitat is the easiest way to encourage them to move elsewhere. Usually, a solid drenching of water will do the trick (but do make sure you're not dealing with wasps/hornets before you do so!).

For long-term control, since most ground dwelling bees nest in bare dirt patches, simply plant a native perennial over the area. Those that want to encourage wild pollinators can plant some of the pollinator friendly flowers in the *BEE Protective Habitat Guide* (<http://bit.ly/BeePHabitatGuide>) or set up mason bee houses. The National Garden Club has a project called BeeGAP (<http://bit.ly/BeeGAP>) that helps concerned residents raise mason bees.

In addition to declines in domesticated honey bees, many of America's native pollinators are also experiencing dramatic drops in population. And their contribution to American agriculture is just as important. In fact, a study published in 2013 found that crops visited by wild pollinators enhanced fruit sets by twice as much as equivalent increases in honey bee visitation. Studies on solitary bees show that they are also highly susceptible to the negative impacts of exposure to systemic neonicotinoid pesticides, particularly in terms of their ability to reproduce. To Alan and all our readers, please let your local pest control companies know about the distinction between pollinators and pests! There should never be a reason to exterminate pollinators!



Top Gun Fighting Clams Lacrosse Team of Acton, Massachusetts.

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.

Go Top Gun Fighting Clams!

Beyond Pesticides would like to thank the Top Gun Fighting Clams of Acton, MA for their efforts to raise awareness about pesticide use, and their thoughtful donations to Beyond Pesticides. Below is the kind email we received from the team's president.

Hello Beyond Pesticides,

Two senior high school players from our organization contacted you in the spring, relaying to you that one of the teams in our program would play in honor of your organization throughout the summer. For each game the team won, we were to raise \$25 for your cause. Playoff and championship wins would count more, \$50 and \$100 respectively for wins of this nature.

I am happy to announce that over the course of the summer, the team playing in your honor—a group of our talented sophomore and junior lacrosse players from the New England area, mostly Massachusetts—raised

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/daily news blog](http://www.beyondpesticides.org/daily-news-blog). Want to get in on the conversation? Become a "fan" by "liking" us on Facebook, www.facebook.com/beyondpesticides, or send us a "tweet" on Twitter, @bpncamp!

Triclosan Found in Pregnant Mothers Transfers to Fetus

Excerpt from Beyond Pesticides original blog post (8/12/2014): New data to be presented at the 248th National Meeting and Exposition of the American Chemical Society, the world's largest scientific society, reveals that 100% of pregnant women in a multiethnic urban population in Brooklyn, New York tested positive for triclosan in their urine.

Jenn Q. Comments:

"Scary that our kids are using this every day at school in most hand sanitizers brought into the classrooms. Let's buy the ones with alcohol as the sanitizing agent, not triclosan. And plain old hand soap is effective without this antibacterial ingredient."

Minnesota City Passes "Bee-Safe" Policy

Excerpt from Beyond Pesticides original blog post (8/6/2014): Shorewood, Minnesota has become the first city in the state, and the third city in the nation to pass a bee-friendly policy.

Gloria M. Comments:

"Thanks so very much Shorewood, MN for taking this much needed action!! I would love to see every city and town take this stance against the use of harmful pesticides!"

Your Voice is Needed to Keep Organic Strong

Excerpt from Beyond Pesticides original blog post (10/22/2014): Help protect our organic farms and food from pesticides and genetically engineered organisms. Don't let a weakened public process for organic standards, which loom large, roll back the progress we've made in growing organic production, and undermine public trust in the organic food label.

Julie O. Comments to Regulations.gov:

"I am a mother of a teenage boy. I support organic because I want the best food for my son and family. I work at a university medical center and share the value of organic products with my co-workers and friends.

Organic foods are important to me because I have a medical condition that prevents my liver from breaking down toxins and chemicals. I am like the canary in the coal mine. If it hurts me, then it is hurting others even if they are not aware of it. This is why I want you to protect organic farms from outside contamination. Inputs into organic production should be managed in a way that protects organic crops, soil, and water from residues of pesticides and genetically engineered organisms."



\$400 for your organization. In addition, some supplemental money was raised by helmet sticker sales to younger players in our organization, and some money donated on top of the money raised by players' parents. This brought the overall total of money raised for your program to \$438.

At this time, we are eager to send this

money raised for your organization.

Thank you for allowing us to feel a part of the great work your organization does every day. Being able to play for a cause definitely felt like it added something to our overall experience this summer. And on behalf of my senior project participants Brendan G. and Shaun O., as well as myself

and all my coaches, players and parents, I want to thank you for what you do on a daily basis. We are glad to be able to donate the amount we're donating, and we certainly hope it helps your daily efforts in protecting health and the environment with science, policy, and action.

-Justin W.

President, Top Gun Fighting Clams

GAO Sounds Alarm on Poor Pesticide Controls

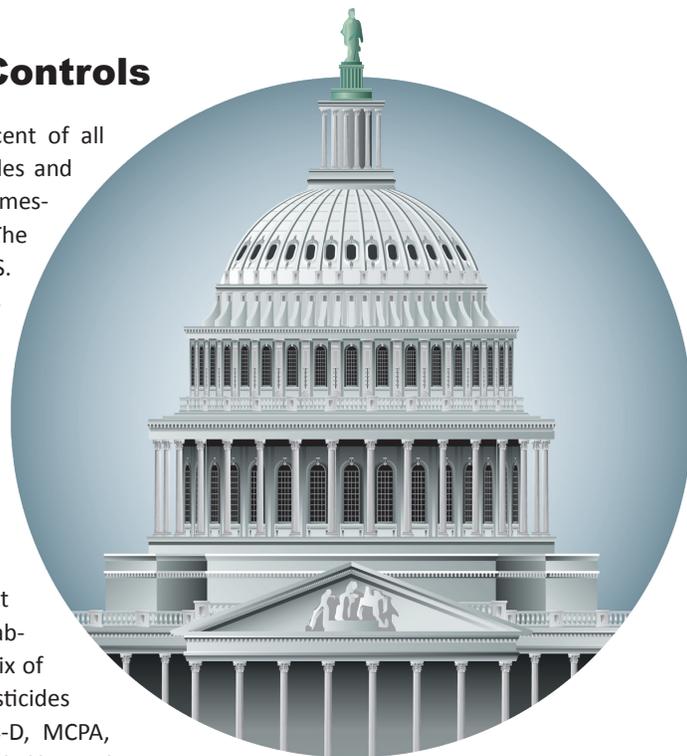
According to a new Government Accountability Office (GAO) report, the U.S. Food and Drug Administration (FDA) does not test food for several commonly used pesticides with established tolerance levels—including glyphosate, one of the most commonly used pesticides in the U.S. This and other findings documented in GAO's report sounds an alarm that GAO began sounding in the 1980's in several reports that identify shocking limitations of FDA's approach to monitoring for pesticide residue violations in food. The recent report, *Food Safety: FDA and USDA Should Strengthen Pesticide Residue Monitoring Programs and Further Disclose Monitoring Limitations*, was issued in early November.

GAO sharply criticizes FDA for not using statistically valid methods consistent with Office of Management and Budget (OMB) standards to collect information on the incidence and level of pesticide residues. In fact, GAO states that it "was unable to find publicly available estimates of the overall toxicity or risk associated with the use of agricultural pesticides in the United States." According to GAO, FDA is testing less

than one-tenth of one percent of all imported fruits and vegetables and less than one percent of domestic fruits and vegetables. The report is also critical of U.S. Department of Agriculture's (USDA) testing, finding limitations in its data.

Among its new findings, the report found that FDA does not disclose what pesticides it does not test for, and furthermore, the multiresidue methods that it uses cannot detect all pesticides with established tolerances, including six of the most commonly used pesticides in the U.S.: glyphosate, 2,4-D, MCPA, mancozeb, paraquat, and methyl bromide. According to the agency, one of the reasons cited for not testing these chemicals is cost. The total cost to implement selective residue methods for glyphosate and 2,4-D at its six testing laboratories would be approximately \$5 million each.

GAO recommends that FDA improve its



methodology and FDA and USDA disclose limitations in their monitoring and data collection efforts, given that FDA's limitations hamper its ability to determine the national incidence and level of pesticide residues in the foods it regulates, one of its stated objectives.

Groups Sue EPA for approval of 2,4-D Use on GE Corn, Soy

A coalition of farmers and environmental groups filed a lawsuit on October 23 against the U.S. Environmental Protection Agency (EPA) for its approval of Dow's Enlist Duo,® a blend of glyphosate and 2,4-D, on October 15. The herbicide will be used in six Midwestern states on corn and soybean crops that are genetically engineered (GE) to withstand repeated applications. While EPA proposed initially to restrict the use of Enlist Duo to Illinois, Indiana, Iowa, Ohio, South Dakota, and Wisconsin, it is anticipated that another 10 states will be added.

The lawsuit was filed by Center for Food Safety and Earthjustice in the U.S. Ninth Circuit Court of Appeals on behalf of Be-

yond Pesticides and other groups. The groups challenge the approval under the *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)*, arguing that EPA did not adequately analyze the expanded impacts of 2,4-D on human health.

On September 16, USDA issued its decision to deregulate (or allow without restrictions) GE Enlist corn and soy, paving the way for EPA to approve the herbicide's use on these crops. During the official public comment period on USDA's analysis of 2,4-D tolerant corn and soybeans this spring, 400,000 citizens submitted comments opposing the crops. In June, another half million people sent their objections to EPA during its public comment

period, and a quarter million people told the White House to reject Enlist crops and Enlist Duo this fall.

Beyond Pesticides has argued to EPA and USDA that the weed resistance in herbicide-tolerant cropping systems is escalating and not sustainable, contributing to a chemical-dependency treadmill. A 2011 study in the journal *Weed Science* found at least 21 different species of weeds to be resistant to applications of Monsanto's Roundup. Dow Chemical has presented 2,4-D resistant crops as a quick fix to the problem, but independent scientists, as well as USDA analysts, predict that the Enlist crop system will only foster more weed resistance.

White House Delays Government-wide Action on Pollinators

While the White House announced that it would miss its self-imposed December 20 deadline to provide a national pollinator health strategy, the White House Council on Environmental Quality (CEQ) announced in October new guidelines for federal agencies to incorporate pollinator friendly practices at federal facilities and on federal lands. Concurrent with CEQ's announcement, the General Services Administration (GSA) also stated it is in the process of internally reviewing pollinator-friendly guidelines for facility standards at "all new project starts." These announcements are in response to the Presidential Memorandum, issued at the close of National Pollinator Week 2014, which directed federal agencies to establish a Pollinator Health Task Force and tasked agency leads to develop a pollinator health strategy within 180 days that supports and fosters pollinator habitat.

CEQ's guidelines provide information on appropriate plants by region, encourage education, and prescribe neonicotinoid-free plant selection, however it does not encourage an organic management system for federal facilities. Within these guidelines is a requirement that agencies should "[a]cquire seeds and plants from nurseries that do not treat their plants with systemic insecticides." Further, the document states that, "Chemical controls that can adversely affect pollinator populations should not be applied in pollinator habitats." Although the report recommends against using chemical controls in established pollinator habitats, and indicates that "in general, the use of natural and mechanical strategies are preferred to the use of pesticides," the report does sanction the use of non-selective herbicides in site remediation "as safe and effective methods for controlling plants."

The new guidelines from CEQ are the first holistic response to an ongoing crisis that has put in jeopardy pollination services that contribute \$20-30 billion to the U.S. agricultural economy. Numerous nutrient dense crops, such as almonds, apples, cherries, cranberries, pumpkins and many more depend on bees and other pollinators to produce fruit and seed. Without healthy pollinator populations in a best case scenario the price of healthy food will increase, and in the worst, shelves may go bare.



EPA Delists 72 Already Discontinued Inert Ingredients in Pesticides

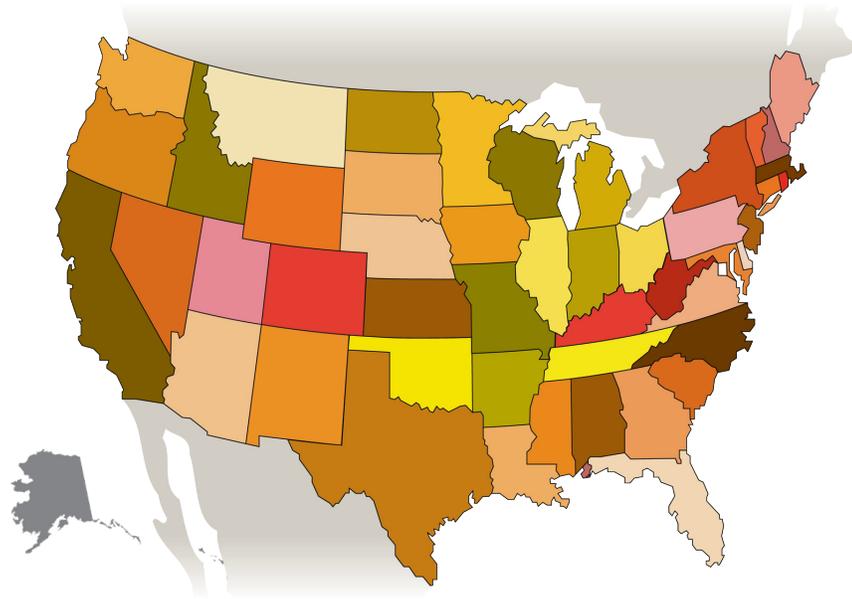
In a partial response to a petition filed by Beyond Pesticides, Center for Environmental Health, Physicians for Social Responsibility, and nearly 20 other organizations back in 2006, the U.S. Environmental Protection Agency (EPA) announced October 23 its proposal to remove 72 no longer used inert ingredients from its list of approved pesticide ingredients. The original petition called for the agency to require pesticide manufacturers to disclose all of the 371 inert ingredients on their pesticide product labels. The proposal only targets hazardous chemicals no longer being used as inert ingredients in any pesticide formulation, such as rotenone, turpentine oil, and nitrous oxide.

EPA says that it has "developed an alternative strategy designed to reduce the risks posed by hazardous inert ingredients in pesticide products more effectively than by disclosure rulemaking." According to Jim Jones, EPA's Assistant Administrator for the Office of Chemical Safety and Pollution Prevention, the agency "will review inert ingredients currently listed for use in pesticides, update that list, establish criteria for prioritization, and select top candidate inert ingredients for further analysis and potential action."

Under the *Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)*, pesticide manufacturers are only required to list on their product labels the active ingre-

dients. This leaves consumers and applicators unaware of the possible toxic ingredients present in pesticide products unless the EPA administrator identifies a public health threat associated with the chemicals.

An inert ingredient is defined as any ingredient that is not "active," or specifically included to kill a target pest. According to a 2000 report produced by the New York State Attorney General, *The Secret Ingredients in Pesticides: Reducing the Risk*, more than 200 chemicals used as inert ingredients are hazardous pollutants, and, from the 1995 list of inert ingredients, 394 chemicals were listed as active ingredients in other pesticide products.



Threatened Status Proposed for West Coast Fisher after Pesticide Poisonings

The U.S. Fish and Wildlife Service (FWS) announced in early October a proposal to list fishers, medium sized carnivores of the weasel family, as threatened under the *Endangered Species Act*, due in large part to the use of rodenticides in the cultivation of illegal marijuana grow operations. Fishers are the second species in the West that have been recognized by regulators as adversely affected by these operations. Coho salmon have also been affected as a result of pesticide and fertilizer use, water withdrawals, and clear-cut logging that have silted, dried up, and polluted streams where the salmon run.

Fishers, which are found throughout North America and have been part of the forests in Pacific states for thousands of years, have nearly disappeared in much of Washington, Oregon and California, according to FWS. Illegal marijuana grow operations have been a troubling source of wildlife deaths, since growers often use “industrial-sized quantities of poisonous products in forests to fend off rodents,” says Humboldt County District Supervisor Rex Bohn.

Although FWS does not know the full extent to which rodenticide exposure causes injury or mortality of fishers, rodenticide exposure in fishers has been documented in fisher populations in the Klamath Mountains and Southern Sierra Nevada, as well as in the reintroduced population at Olympic National Park in Washington.

A study, “Anticoagulant Rodenticides on our Public and Community Lands: Spatial Distribution of Exposure and Poisoning of a Rare Forest Carnivore,” published in *PLOS One* in 2012 found that 79% of fishers surrounding an illegal marijuana grow operation had been exposed to anticoagulant rodenticides. Fishers and other top predators can be exposed directly by ingesting rodenticide bait scattered around fields, or indirectly by consuming prey that was exposed. Predators that are not immediately killed by rodenticides can become more susceptible to disease and suffer lethargy, making it difficult, for example, to dodge oncoming traffic if crossing a road.

Seattle Joins List of Bee-Friendly Cities

The Seattle City Council voted unanimously September 22 to prohibit the use of neonicotinoid pesticides on land owned or maintained by the city. Resolution 31548, which was adopted and expected to be signed by Mayor Ed Murray, makes Seattle the largest U.S. city thus far to enact such a ban to protect pollinators in the absence of federal regulation. Numerous other localities, including Shorewood (Minnesota), Skagway (Alaska), Eugene (Oregon), and Spokane (Washington) have recently adopted bee-friendly or organic land management practices on public land, private land, parks, schools, and other land under their authority. See page 12 for a complete rundown of BEE Protective activity across the country.

The resolution states that the City of Seattle shall ban the purchase and use of neonicotinoid insecticides on city-owned property and calls for a national moratorium on the use of the toxic pesticides, urging the White House Task Force, U.S. Environmental Protection Agency, and Congress to suspend the registration of neonicotinoids. Along with encouraging federal action, the resolution asks retailers within Seattle to stop selling plants, seeds, or any other products that contain neonicotinoids.

“This is a modest step to help protect bees and other pollinators, which help make the Emerald City blossom every spring,” said Councilmember Mike O’Brien. “I hope the City’s move helps raise awareness about what we can all be doing to promote the health of pollinators through sustainable pest management practices.”

Neonicotinoid insecticides have been linked to colony collapse disorder (CCD) and declining bee health that has resulted in a near devastating decline in viable managed beehives, which are critical to pollination of one-third of the nation’s food supply.

Maine Town Upholds Private Property Pesticide Ban

The town of Ogunquit, Maine re-passed an ordinance banning the use of synthetic insecticides, herbicides, and fertilizers on private property. Residents voted 444 to 297 in favor of the ban, sending an even stronger second-time approval of the initiative.

The town passed a nearly identical ordinance earlier this year in June. However, it was decided that a procedural glitch of failing to notify the state's pesticide board before passage of the ordinance, as well as a lack of agricultural exemptions, should be corrected through an amendment of the ordinance and revote.

Ogunquit's ordinance makes the town the second local jurisdiction in the U.S. in the last year to ban pesticides on both public and private property. The ordinance, modeled in large part on the first private/public pesticide ban in Takoma Park, Maryland last year, was passed after a three-year education and awareness campaign, initiated by

the town's Conservation Commission.

According to Conservation Chairman Mike Horn, the ordinance was spurred by a complaint to the town council from a local resident who was experiencing constant pesticide exposure as a result of drift after lawn care company applications. While localities with state pesticide preemption law can put a stop to pesticide use on publicly-owned land, only private property bans can prevent these types of incidents from adversely affecting human health.

The now double-confirmed

law expands on existing pesticide use restrictions on town-owned property. Passage of this ordinance positions Ogunquit as a leader in the state for environmental sustainability and protection of public health, and supports the Ogunquit Conservation Commission's goals to ensure that the town's popular beaches are clean and healthy.



Photo of Perkins Cove in Ogunquit, Maine by Hinweise zur Weiternutzung.

Maryland County Introduces Landmark Pesticide Ordinance

A landmark ordinance to protect children, pets, wildlife, and the wider environment from the hazards of unnecessary lawn and landscape pesticide use was introduced in October in Montgomery County, Maryland by County Council Vice President George Leventhal, chair of the Health and Human Services Committee. Bill 52-14 responds to growing concern in the community about the health and environmental hazards associated with exposure to pesticides, and creates a safe space for residents in Montgomery County by prohibiting the use of non-essential land care pesticides on both public and private property.

Introduction of this ordinance follows successful lawn pesticide regulations on private and public property in the City of Takoma Park in Montgomery County, and provides equal safeguards for human health and the environment. Similar cosmetic pesticide policies have been in place in Canadian provinces for many years, and Ogunquit, Maine passed a ballot initiative in November with similar restrictions. Most U.S. jurisdictions are unable to enact these same basic safeguards for their citizens because private property restrictions are only possible in seven states that do not preempt local governments from enacting protections from pesticides that are stricter than state laws.

The bill, stewarded by Safe Grow Montgomery, a coalition of individual volunteers, organizations and businesses, represents the latest in a growing movement to prevent exposure to chemicals that run-off, drift, and volatilize from their application site, causing involuntary poisoning of children and pets, polluting local water bodies such as the Chesapeake Bay, and widespread declines of honey bees and wild pollinators.

"This bill is aimed at protecting the health of families, and especially children, from the unnecessary risks associated with the use of certain cosmetic pesticides that have been linked to a wide-range of diseases, and which provide no health benefits," said Council Vice President Leventhal. "This is a bill that balances the rights of homeowners to maintain a beautiful lawn with the rights of residents who prefer to not be exposed to chemicals that have known health effects. I view this bill as a starting point in our discussion, which can be tweaked along the way."

Maui County Bans GE Crops

In a narrow but meaningful victory (50.2 percent to 47.9 percent), the voters of Maui County on November 4 passed an initiative to temporarily ban genetically engineered (GE) crops unless companies' practices are tested and deemed safe. This achievement represents the first ever citizen driven initiative in Maui County, which encompasses Maui, Molokai, and Lanai islands.

According to *Honolulu Civil Beat* reporters, opponents of the measure outspent advocates more than 87 to 1, amounting to \$300 for every "no" vote. This is a rare but powerful instance of big ag and big money not buying a victory. However, Maui has an intense and expensive fight ahead. Monsanto, along with Dow AgroSciences, the Maui Farm Bureau and other businesses filed a lawsuit against the county November 13 to invalidate the memorandum. In

anticipation of the litigation, Maui County residents filed a lawsuit against the County, Monsanto, and Dow AgroSciences one day earlier to seek more influence on how the law will be enforced.

Previously, agrichemical giants filed a lawsuit on January 11 against neighboring Kauai County to prevent a similar GE law, Ordinance 960, from being implemented. While Kauai's law did not impose a full ban of GE farming, it did require mandatory notification concerning pesticide applications and buffer zones for crops and pesticide spraying in certain areas. Even with these more moderate restrictions, the Kauai law was stuck down by a federal court in August. While attorneys defending the law filed an appeal in the 9th Circuit in September, some Kauai county councilmen have introduced a bill to repeal the challenged law, which would invalidate the appeal.

Hawaii's premier growing conditions have made it a prime target for agrichemical companies to test new, experimental forms of GE crops. Data released earlier this year reveals that high levels of restricted use pesticides, in some cases almost double the pounds per acre average of other states, are being used in Kauai County. Residents of the Hawaiian Islands that live, work, or go to school near these fields are subject to incessant pesticide spraying, as the climate provides a year-round growing season for GE crops. A May 2014 report found 25 herbicides, 11 insecticides, and 6 fungicides in Hawaii's waterways, underscoring residents' concern for both the land and human health.

The initiative in Maui is part of a growing movement on the Islands that seeks to protect health and the environment while strengthening local food economies and resiliency.

Vermont Releases Draft Rules for GE Labeling

The Vermont Attorney General's Office, as part of an effort to label GE food and increase transparency for consumers, released a draft of the rules written to govern the state's law to require the labeling of food produced with genetically engineered (GE) ingredients. The Attorney General introduced the draft rule in October after holding public meetings in Burlington, Montpelier, and Brattleboro.

The nine-page rulemaking addresses a range of issues, from the definition of "food" and "genetic engineering" to the required disclosures that will read "Produced with Genetic Engineering" or "Partially Produced with Genetic Engineering." Attorney General William Sorrell said his office is moving to write the rules as quickly as possible so that the industry has time to prepare before the law takes effect in 2016.

The law, which was signed by Governor Peter Shumlin in May and is the first of its kind in the nation, has been met with substantial backlash. The state is currently facing a legal battle by major trade associations, including Grocery Manufacturers of America (GMA). In a statement, GMA has called

the labeling requirement "a costly and misguided measure." However, a new analysis of published research repudiates this claim. The median cost to consumers of labeling genetically engineered food is only \$2.30 per person annually. The report was commissioned by Consumers Union, the policy arm of Consumer Reports, and conducted

by the independent Portland-based economic research firm, ECONorthwest. Additionally, genetically engineered foods are already required to be labeled in 64 foreign countries, including many where U.S. food producers sell their products. Labeling has not increased food prices in those countries, according to Consumers Union.

GE Labeling Measures Fail in Two States

While labeling advances forward in Vermont, two other state ballot initiatives that would have required labeling of GE food were defeated on November 4. Oregon's Measure 92, which would have confirmed Oregon consumers' right to know whether the foods they purchase are produced with genetically engineered ingredients, suffered a nail-biting defeat, with a scant 1.2 percent separating the nays and yays in the final vote count. Colorado's Proposition 105, on the other hand, suffered the strongest rejection of the right-to-know initiative than any previous state attempt to adopt such laws, with 66 percent voting against the proposed law and 34 percent in favor.

In both states, opposition funding flooded in from Monsanto and other food giants, like Pepsico and Coca-Cola, contributed to the proposition's defeat. According to *The Oregonian*, the controversial initiative brought in more money on both sides of the vote than any previous ballot measure, although opponent contributions were more than double that of supporters.





Hedgerows for Biodiversity

Habitat is needed to protect pollinators,
other beneficial organisms, and healthy ecosystems

by Terry Shistar, Ph.D.

(Eds note. Hedgerows, a planted border or divider between managed or built land areas, in urbanized, rural, and agricultural environments, provide important habitat for all kinds of organisms, supporting ecosystem balance. This is an especially important tool in the face of habitat decline, given fence row to fence row cultivation practices in agriculture, manicured lawns and landscapes, urban sprawl, and the use of broad spectrum pesticides that threaten the diverse organisms that make up a healthy ecosystem. With severe loss in recent years of pollinators, including bees, butterflies, and birds, natural and diverse hedgerows take on a new importance in nurturing and restoring populations in decline. Of course, hedgerows alone will not counterbalance the widespread use of systemic pesticides that are poisoning food sources (pollen, nectar, guttation droplets, earthworms and insects) that various pollinators depend on as a clean food source, but they can be a critical tool in slowing pollinator decline and creating zones of protection until land managers (agricultural and nonagricultural) make the shift to sustainable practices that protect biodiversity. – JF)

What Are Hedgerows?

Hedgerows, or hedges, come in many forms and serve a number of different purposes. The celebrated hedgerows of Britain served as fences for livestock. The urban/suburban hedge marks a boundary and provides privacy. As a response to the Dust Bowl, hedgerows

were planted throughout the Great Plains to act as windbreaks, preventing soil erosion. Other hedges are planted just for their ornamental value. There are many benefits to planting hedges – woody vegetation helps sequester carbon, thus mitigating global warming; they can provide a source of food for humans, including nuts, berries, and wild mushrooms; they provide shade, which can relieve heat stress on domestic and wild animals and provide added diversity of plant habitat; they can provide firewood; and they act as a refuge for predators and parasites of “pest” species.

Whatever the primary reason for planting a hedge, it can also support biodiversity. Even a highly manicured privet hedge provides shelter, nesting sites, and berries for birds, as well as some nectar for bees and other pollinators. However, hedgerows planted with biodiversity in mind can do much more.

At the opposite extreme from the manicured ornamental and often flowering (e.g., privet) hedge is the mature windbreak. Windbreaks have multiple rows from low-growing shrubs to trees so that they can block wind, redirecting it up and over the windbreak in the winter or cooling it as it filters through in the summer. Over time, other species of plants arrive via wind, birds, squirrels, and other animals, and the windbreak begins to resemble the edge of a forest.

Edges –where two environments meet– provide high habitat and species diversity. All hedges –even the privet hedge surrounding a lawn– are edges. Hedges can be planted and managed to maxi-

mize biodiversity and the benefits that biodiversity brings. If they join existing habitats—for example, woodlands, grasslands, and riparian zones along rivers—they provide corridors for movement of animals and other organisms. Such a corridor effectively increases the habitat size for species that could not survive in a small island of habitat isolated from others.

Biodiversity Benefits of Hedgerows on Farms

The flowering plants in hedgerows—from flowering herbaceous plants (or forbs) to shrubs to trees—can provide nectar and pollen over the entire growing season. This season-long supply helps to bridge the gaps when cultivated plants are not blooming. While honey bees can live off of stored honey and pollen, most pollinators do not store food and require a constant supply. Without a constant supply, they will go elsewhere. Among these pollinators are the parasitoids that attack caterpillars and other “pests,” such as tachinid flies and parasitoid wasps. They also rely on nectar as food in their adult stages. A number of predaceous arthropods are also found in hedgerows, including bigeyed bugs, syrphid flies, predatory wasps, lady beetles, minute pirate bugs, lacewings, and spiders. Many insectivorous birds eat berries when the insect supply is low, so hedges that include berry-producing trees and shrubs can help maintain populations of birds like the Eastern phoebe who help to keep insect populations below troublesome levels. Among the many insects consumed by these predators and

Guidelines for Planting a Hedgerow

- Choose plants that meet multiple goals, including plants you like.
- Prepare the site well ahead of planting—in summer or fall.
- Plant in late fall, winter or early spring, depending on your location.
- Think diversity—plant fast growing and slow growing, tall and short, evergreen and deciduous, a variety of blooming times.
- Be prepared to give extra attention to the plants until they are established.

parasites are aphids, mealy bugs, leaf hoppers, scales, mites, whiteflies, lygus bugs, thrips, squash bugs, stink bugs, codling moths, corn earworms and other caterpillars.

Trees in hedgerows provide nesting and roosting sites for hawks and owls, whose rodent prey are a perennial concern of farmers. Mammalian predators of rodents like coyotes, foxes, and weasels also like the shelter of hedgerows. Insectivorous birds and bats may find nesting sites in hedgerows. These include the least flycatcher, red bat, hoary bat, Carolina wren, Eastern screech owl, which

nest in trees; gray catbird, brown thrasher, yellow-breasted chat, and indigo bunting, which nest in shrubs; and rufous-sided towhee, field sparrow, and song sparrow, which nest on the ground. Snakes and other reptiles that prey on insects and rodents also choose the forest edge habitat. They include the Eastern garter snake, rough green snake, mole king snake, milk snake, Eastern coachwhip, and five-lined skink.

Biodiversity Benefits of Urban/Suburban Hedges

Even the manicured privet hedge can offer some minimal biodiversity benefit. However, an urban hedge that is maintained with biodiversity in mind can do much more. The urban hedgerow will probably not include trees, so it would not attract those species that nest or roost in tall trees. However, with a careful choice of plants, the urban hedgerow can provide a steady supply of nectar

for pollinators as well as predators and parasitoids, and nesting sites and shelter for birds, including those who eat garden “pests.” It can provide berries as an alternative source of food for insectivorous birds. It can also be a pleasing feature that attracts birds and butterflies.

Planting and Managing a Hedgerow for Biodiversity

“The best time to plant a tree is 20 years ago; the second-best time is now.”—Chinese proverb

The design of a hedgerow depends on how much space is available and the functions it must serve. The following section will address the farm windbreak/refuge hedgerow and the urban hedge that provides privacy and attracts pollinators. Other related designs are possible.

Planting and Managing a Farm Windbreak for Biodiversity

Windbreaks are tall and dense. They protect



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

Hedgerows in Organic Production

Hedgerows provide a simple and effective way for organic producers to promote biodiversity, as required by organic regulations.

Organic production is defined by the National Organic Program (NOP) regulations as, "A production system that is managed in accordance with the Act and regulations in this part to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity." The preamble to the rule explained that, "The use of 'conserve' establishes that the producer must initiate practices to support biodiversity and avoid, to the extent practicable any activities that would diminish it. Compliance with the requirement to conserve biodiversity requires that a producer incorporate practices in his or her organic system plans that are beneficial to biodiversity on his or her operation." In addition, organic producers are required to "use management practices to prevent crop pests, weeds, and diseases."

The importance of conserving biodiversity on organic farms has been repeatedly stressed by the National Organic Standards Board (NOSB). At its fall 2009 meeting, the NOSB unanimously approved a recommendation that called for (1) explicit incorporation of bio-

diversity into questions asked in reviewing substances for the National List of Allowed Synthetic Substances, and (2) the adoption of measures to promote biodiversity conservation by producers, inspectors, certifiers, and the NOP. Some of the measures have been implemented while others have not. As of June 10, 2014, the NOP has put biodiversity guidance on hold, but according to NOP instruction, an organic farmer's Organic System Plan (OSP) must describe practices designed to maintain or improve biodiversity. Some certifiers have adopted guidance created by the Wild Farm Alliance (WFA) for evaluating the adequacy of a farmer's OSP. The use of hedgerows figures prominently in the WFA guidance.

Despite the support of the NOSB for biodiversity, not all organic farmers incorporate hedgerows or other sources of biodiversity into their farms. Indeed, comments to the NOSB suggest that not all certifiers are clear about the requirements. When organic farmers do not sufficiently support biodiversity, their need for other inputs is increased. This appears to happen most frequently when operations transition from industrial scale non-organic practices, but there are organic farms of all sizes that do not provide for the needs of wildlife. Hedgerows require dedicated land and an investment of time and capital for establishment, but they (or equivalent biodiversity support) should be required as part of the transition process.

farmsteads and crops from wind damage and damage from agricultural chemicals that might be carried in dust particles. Windbreaks that are designed to protect from winter winds need to have more evergreens than those designed to protect from drying winds and dust in the summer. A winter windbreak would have at least two rows of evergreen trees and a row of deciduous trees or shrubs. A summer windbreak would have at least one row of tall deciduous trees and a row of deciduous shrubs. Typically, rows of trees and shrubs are planted at least 10-15 feet apart to leave room for trees to grow. To serve as a source of nectar for pollinators, the windbreak should also contain perennial herbaceous plants, which can be planted more closely. The biodiversity benefits will be multiplied if the hedgerow connects existing patches of woodland, and especially if it makes the connection to a riparian zone or other source of water.

The choice of species depends on your location. Native species generally become established, serve native pollinators and other animals, and are less likely to interfere with other plants. State forestry departments or extension programs can recommend trees and shrubs that are suitable for windbreaks and wildlife. Some sell seedlings at a reduced

price for windbreaks and wildlife plantings. See the Resource section for help in finding appropriate plants for hedgerows.

Planting and Managing an Urban Hedge for Biodiversity

Some ways that the urban hedge biodiversity benefits can be increased are: linking the hedge to trees, water sources, woodland habitat or neighboring hedges; choosing shrubs that provide nectar and fruit; including a variety of shrubs that flower and fruit over the growing season; merging the hedge into a planting of perennial flowering plants that provide nectar over the entire growing season; and avoiding the use of pesticides, including herbicides targeting dandelions, an important early season nectar source. Choose plants that are appropriate for your area. The flowering plants can also include annuals and biennials, especially those in the family Umbelliferae (such as coriander, dill, fennel, parsnip, parsley, and carrots), which are very attractive to pollinators.

Resources

BEE Protective Habitat Guide <http://bit.ly/BeePHabitatGuide>

Pollinator-Friendly Seeds and Nursery Directory <http://www.beyondpesticides.org/pollinators/seed.php>

Hedgerows for California Agriculture (Mostly specific to California, but contains general information about planting hedgerows) http://www.goldridercd.org/project/pollinators/CAFF_hedgerows-4-CA-ag.pdf

Xerces Society Pollinator Conservation Resource Center <http://www.xerces.org/pollinator-resource-center>

Bee Friendly Plant lists: <http://www.xerces.org/providing-wildflowers-for-pollinators>

Habitat Installation Guides: <http://bit.ly/XercesHabitatInstall>

A guide to finding native plants <http://findnativeplants.com>

Community Alliance with Family Farmers Hedgerow information (CA) <http://caff.org/programs/bio-ag/hedgerows>

California Plants for Native Bees http://www.goldridercd.org/project/pollinators/CA_plants_for_native_bees.pdf



A BEE Protective Update

Large and small, communities and organizations throughout the country take action to protect pollinators

Brittany Phillips, Dunbarton NH, "Skies are clear, enjoy your flight!"

by Drew Toher

The continuing pollinator crisis has galvanized governments, universities, and concerned residents across the U.S. to take action in an attempt to stem the decline of honey bees and wild pollinators. As the science continues to confirm the role that neonicotinoids (neonics), a class of highly toxic, persistent and systemic insecticides, play in pollinator declines, organizations of all sizes are taking bee-friendly action by restricting the use of these unnecessary pesticides. Beyond the role these chemicals play in pollinator decline is a growing recognition of the toxicity of pesticides in general, and an understanding that they are not required for the maintenance of quality landscapes. The policies enacted below acknowledge this point, revealing steps that should be taken to reduce the overall chemical burden in managed landscapes across the country. These efforts support a Memorandum issued by President Obama on June 20, calling on federal agencies to, "promote the health of honey bees and other wild pollinators." However, overarching action must still be taken by Congress or the U.S. Environmental Protection Agency (EPA).

Federal Level

Fish and Wildlife Service (FWS), Pacific Region National Wildlife Refuges: In mid-July of 2014, the Pacific Region (Region 1) National Wildlife Refuge announced in an internal memorandum that it intended to phase out the use of bee-toxic neonics. "The Pacific Region will begin a phased approach to eliminate the use of neonicotinoid insecticides (by any method) to grow

agricultural crops for wildlife on National Wildlife Refuge System lands, effective immediately," the memo states. "By January 2016, Region 1 will no longer use neonicotinoid pesticides in any agricultural activity." The new guidelines go on to explain that the change in policy will also affect the transition period through 2016. During that time, refuge managers must exhaust all remedies before an application or use of

neonics, including the use of neonic-treated seeds. Additionally, starting in 2015, all refuge managers must prepare and submit a Pesticide Use Proposal (PUP) in order to apply any neonics during the transition to the ban. Beyond Pesticides hopes that these requirements assist land managers in developing a strategy to manage pests without the use of any toxic pesticides, particularly neonicotinoids.

Fish and Wildlife Service, All National Wildlife Refuges: Shortly after the decision in the Pacific Region, FWS announced that all National Wildlife Refuges would join in the phase-out of neonics (while also phasing out genetically engineered crops) by January 2016. “We have determined that prophylactic use, such as a seed treatment, of the neonicotinoid pesticides that can distribute systemically in a plant and can potentially affect a broad spectrum of non-target species is not consistent with Service policy. We make this decision based on a precautionary approach to our wildlife management practices and not on agricultural practices.” Given the widespread use of risk-benefit analyses from other government agencies, FWS’ appeal to a precautionary approach sets a positive, refreshing tone for U.S. federal agencies. The news from FWS comes partially in response to the President’s Memorandum, and after Beyond Pesticides, along with Center for Food Safety and Public Employees for Environmental Responsibility, conducted a nearly decade-long legal campaign urging FWS to prohibit genetically engineered crops, and, more recently, neonics in National Wildlife Refuges. This move will not only protect honey bees that have suffered average losses above 30% since 2006, but also the federally threatened and endangered pollinators that live in our National Wildlife Refuges.

State Level

Minnesota: Under HF2798, signed into law by Minnesota Governor Mark Dayton, plants may not be labeled as beneficial to pollinators if they have been treated with and have detectable levels of systemic insecticides. The law specifically states, “A person may not label or advertise an annual plant, bedding plant, or other plant, plant material, or nursery stock as beneficial to pollinators if the annual plant, bedding plant, plant material, or nursery stock has been treated with and has a detectable level of systemic insecticide that: (1) has a pollinator protection box on the label; or (2) has a pollinator, bee, or honey bee precautionary statement in the environmental hazards section of the insecticide product label.” Concurrently,

as part of an omnibus spending bill, Minnesota legislators also created an emergency response team to react to honey bee losses that are suspected to be related to pesticides, and the requirement that beekeepers be compensated as a result of pesticide poisoning.

Cities, Towns

Shorewood, Minnesota: In addition to restricting the use of bee-killing pesticides, the self-described “bee-safe” resolution passed by the City of Shorewood in August 2014 encourages the planting of bee-friendly habitat. This action will help strengthen local pollinator populations and create natural resilience to pest pressures. Earlier in the year, Shorewood city leaders had sent a letter to the state legislature in support of HF2798, described previously.

Eugene, Oregon: In March 2014, Eugene, Oregon became the first community in the nation to specifically prohibit the use of neonicotinoid pesticides on city property. Showing the power of the pollinator crisis to spur the need for a systems approach to pest management, legislation was added to a revision of the city’s pesticide-free parks program, which now requires all departments to adopt integrated pest management standards, and halt the use of bee-toxic pesticides in all city land management. Action by Eugene’s City Council can be traced in part to a massive bee kill that occurred in Oregon in 2013, where 50,000 bumblebees died after being sprayed in a Target parking lot. The incident only resulted in a small fine of under \$3,000, just six cents per bee, infuriating beekeepers, environmentalists, and advocates.

Spokane, Washington: The City of Spokane, Washington in June became the second in the nation to move towards alternatives to the use of bee-toxic pesticides. Spokane City Council President Ben Stuckart noted to *The Seattle Times*, “Bees are so important we should be leading the way to protect them.” The ordinance stops the use of neonics on 32% of land in the city. Council President Stuckart is hopeful that the parks department,

which controls another 18% of land under separate governance, will follow the city’s lead in prohibiting use of the products.

Skagway, Alaska: Signed in mid-September, Skagway, known as the “Garden City of Alaska,” banned both the public and private sale and use of neonics. Pollinator concerns were part of a comprehensive pesticide ordinance crafted by city leaders that also restricts the use of pesticides on lawns and near waterways, again showing the need for a change in approach to all pesticide use in order to protect human health and the environment. Because Alaska municipalities are not subject to regressive preemption laws that prevent local governments from enacting pesticide restrictions that are more stringent than the state’s, Skagway was able to ban the private sale and use of neonics, making it the strongest bee protections in the country.

Seattle, Washington: In late September, Seattle, Washington became the largest U.S. city to protect bees and other pollinators. The resolution, signed by Seattle Mayor Ed Murray, discontinues the purchase and use of neonics on city-owned property and calls for a national moratorium on the use of the toxic pesticides, urging the White House Pollinator Health Task Force, EPA, and Congress to suspend the registration of neonics. Along with encouraging federal action, the resolution asks retailers within the city to stop selling plants, seeds, or any other products that contain neonics. As City Councilmember Mike O’Brien notes, this action is a “modest step,” and further movement toward alternative pest management should be considered in order to promote long-term pollinator health.



Universities

University of Vermont Law School (VLS):

The first BEE Protective campus was officially recognized in August, as Vermont Law School took action to halt the purchase and use of neonics on its campus. "Honey bees and other pollinators play a critical role in agricultural systems," said Laurie Ristino, director of the Center for Agriculture and Food Systems (CAFS) and VLS associate professor of law. "Protecting their health and safety is a reflection of Vermont Law School's commitment to the environment and CAFS' mission to support sustainable food and agricultural systems. We hope more will follow our lead."

Emory University: In September, Emory University's Office of Sustainability Initiatives released a campus pollinator protection commitment based on the philosophy that "protecting pollinators will further Emory's sustainability vision to help restore the global ecosystem, foster healthy living, and reduce the university's impact on the local environment," said Ciannat Howett, the school's sustainability director. In addition to banning the use of neonics on campus, Emory also plans to make sure that replacement products for neonics also do not harm bees. The university will only purchase plants that are not pre-treated with neonics, increase pollinator friendly plantings, and conduct campus outreach and education on the importance of pollinators.

Voluntary Initiatives

Bee Safe Boulder: News of "Bee Safe" communities made national headlines as a group of concerned residents mobilized their neighborhood into caring for the pollinators that dot their yards and landscapes. Bee Safe Boulder, led by Anne Bliss, Molly Greacen, and David Wheeler, now has over 200 contiguous neighbors in the Melody-Catalpa neighborhood that have pledged to not use neonics and plant bee-friendly spaces. And the group puts a premium on homeowners completely eliminating chemical pesticides in order to truly protect pollinators. As the Bee Safe website notes, "We will also encourage people to stop using all poisons so a healthy ecosystem can develop wherein

all pests become food for their predators." Numerous other communities across the country, from Virginia to the San Juan Islands are hitting the pavement and knocking on doors to protect their backyard pollinators. Beyond Pesticides has provided a \$5,000 grant to Bee Safe Boulder to forward their efforts to educate and enact pollinator protective policy.

Need for Overarching Action

The actions described above are critical for pollinators on a local or regional level, and help contribute to the public and political pressure required to save our bees. However, the pollinator crisis is global, and comprehensive changes must be taken at the federal level in order to have the broad impacts that are urgently needed to safeguard the food diversity and agriculture productivity that pollinators provide for society. One in three bites of food depends on pollinators, including nutrient dense crops such as apples, cranberries, almonds, and blueberries, and pollination services contribute \$20-30 billion to the U.S. agricultural economy. A world without bees would mean a bland unwholesome diet, and certainly higher food prices.

Overarching action must come from Congress or federal agencies. Either EPA needs

to suspend the use of neonic pesticides, or Congress must pass the *Saving America's Pollinators Act*, introduced by U.S. Representatives John Conyers (D-MI) and Earl Blumenhauer (D-OR). EPA has indicated that it does not plan to conduct a review of neonic pesticides until 2018 –far too long to wait. The *Saving America's Pollinator Act*, which would suspend the registration of neonics until a scientific review establishes that they are safe for pollinators, is supported by over 70 cosponsors. Federal legislators and regulators should follow the lead set by the European Union and now the Interior Department's Fish and Wildlife Service. Given evidence showing little improvement in yield and pest control from use of these chemicals, and widespread availability of alternative products and practices through organic methods, these chemicals should have no place in our environment.

The silver lining in this crisis is that neonics have alerted communities to the broad impacts of pesticide use in general, and, in restricting their use, are now looking at alternative methods to manage pest problems. Whether through the creation of resilient habitat, or employing least-toxic and organic alternatives, there is a growing recognition that simply moving to another toxic chemical is not the solution.

Organize in Your Community

While we encourage our members and supporters to continue to submit comments to EPA and write letters to Congress, with more communities enacting bee-friendly policies our collective voice will be stronger. Encourage your own community or campus to be pollinator-friendly and make changes that will protect your local pollinator population. Get the Model Community Pollinator Resolution (<http://bit.ly/modelBEEpolicy>) in the hands of local elected officials or school administrators. For help with your campaign, visit the BEE Protective webpage (www.beeprotective.org), and contact Beyond Pesticides at 202-543-5450, or by email at info@beyondpesticides.org.





Beyond Poison Poles

Elected officials say no to toxic utility poles in their communities

by Nichelle Harriott

Some of the most toxic pesticides known to humankind are widely used as wood preservatives to treat utility poles that line the streets of communities across the U.S. Now, a group of residents on Long Island, New York (Long Island Businesses for Responsible Energy (LIBFRE)), joined by local elected officials in the Town of North Hempstead (population over 226,000) and state legislators, are shining a light on human health exposure risks and environmental contamination associated with their use. Efforts underway will require notification signs to warn of the toxic hazard of treated poles, and state legislation seeks to ban the use of one wood preservative, pentachlorophenol (penta or PCP).

In September, North Hempstead's Council passed a new law requiring warning labels on utility poles treated with PCP. Labeling for treated poles in the town is now required to have the following warning: *"This pole contains a hazardous chemical. Avoid prolonged direct contact with this pole. Wash hands or other exposed areas thoroughly if contact is made."*

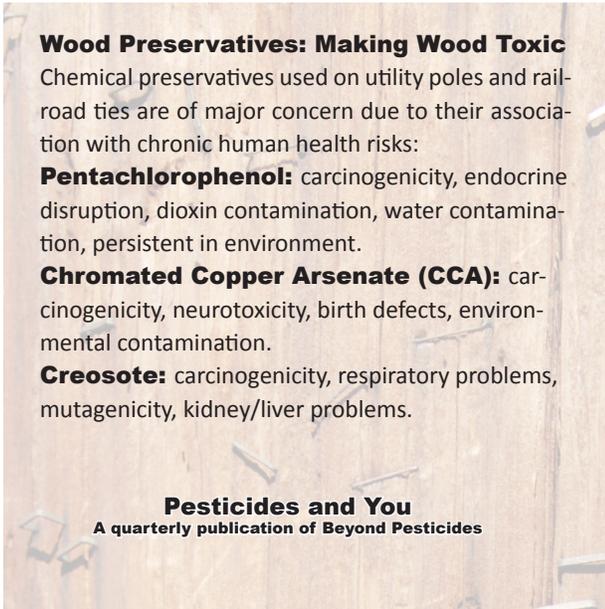
Following the town's action, a bill to ban PCP was introduced in the New York State Legislature by State Senator Kenneth LaValle and Assemblyman Fred Thiele. This legislation would be the first in the nation to do so.

Utility poles are typically treated with pentachlorophenol, chromated copper arsenate (CCA), or creosote. The chemicals, also used to treat railroad ties and some outdoor structures, had their previous residential uses pulled from the market ten years ago following decades of controversy on health effects and environmental contamination associated with their use. Penta and creosote are persistent chemical mixtures that contain dioxins, furans, and hexachlorobenzene, which are linked to cancer, neurological effects, reproductive disorders, and endocrine system disruption, and their production and use contaminate soil and water. CCA-treated wood leaches out arsenic, a known human carcinogen.

History

It has been close to two decades since Beyond Pesticides raised concerns surrounding the use of PCP and other wood preservatives used to treat utility poles

across the country. The organization's publication of the 1997 investigative report, *Poison Poles*, and a follow-up in 1999, *Pole Pollution*, drew critical attention to the highly toxic nature of these chemicals and their use patterns. Prior to the focus on utility poles, these chemicals were widely used on decks and playgrounds. The residential uses of these chemicals have been gradually phased out, but the treatment of utility



Wood Preservatives: Making Wood Toxic

Chemical preservatives used on utility poles and railroad ties are of major concern due to their association with chronic human health risks:

Pentachlorophenol: carcinogenicity, endocrine disruption, dioxin contamination, water contamination, persistent in environment.

Chromated Copper Arsenate (CCA): carcinogenicity, neurotoxicity, birth defects, environmental contamination.

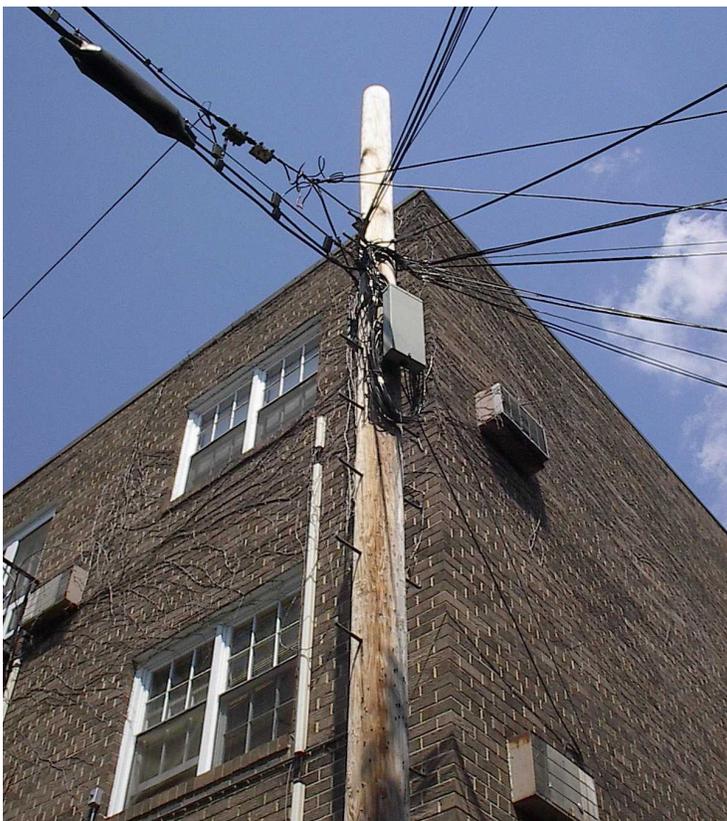
Creosote: carcinogenicity, respiratory problems, mutagenicity, kidney/liver problems.

poles with PCP and other wood preservatives continues across the country.

What is Pressure Treated Wood?

In order to combine wood with the chemical preservative, it undergoes a process known as *pressure treatment*, whereby the wood is placed into a closed cylindrical pressure chamber under high pressure and vacuum. These conditions force the chemical deep into the core of the wood instead of the surface. This treatment ensures that the wood can endure decades of moisture and insect pressures without decay. The chemical preservative over this period, however, leaches to the surface of the wood.

Even though the availability of PCP products has drastically reduced over the years, it remains a restricted use pesticide only for sale and use by certified applicators. PCP is currently banned in all European Union member states, China, India, New Zealand, Indonesia, and Russia, and has been recommended by a United Nations committee for listing under the Stockholm Convention as a persistent organic pollutant for worldwide phase-out. The signatories to the convention will make its decision in May, 2015. Meanwhile, alternative materials used for utility poles exist, including recycled steel, concrete, and composite, and lines can be buried.



International Scrutiny: Persistent Organic Pollutants (POPs)

The Persistent Organic Pollutants Review Committee (POPRC) of the United Nations' Stockholm Convention adopted recommendations for the global elimination of PCP in November 2014. The Convention is an international treaty established to control highly hazardous chemicals. Previously, the Committee decided that the "pentachlorophenol and its salts and esters is likely, as a result of its long-range environmental transport, to lead to significant adverse human health and/or environmental effects such that global action is warranted and that the Committee should proceed with the development of a risk management evaluation for that chemical."¹ This recent recommendation says that PCP, its salts and esters, should be added to Annex A of the Convention.² The Annex A entry would specifically ban the production and use of PCP for utility poles and cross-arms. In its recommendation for the Stockholm Convention, the Committee again cited PCP's persistence, bioaccumulation, long-range transport, and its toxic impacts. The Committee also found wide availability of non-chemical alternatives that were much safer than PCP. Governments around the world will decide on the recommendation in May 2015, but typically accept the recommendations of its expert committees. If adopted, this would lead to a ban on its production and use in countries that are parties to the Convention. Despite overwhelming evidence of the harms posed by PCP, the U.S. led a campaign to oppose international efforts to ban the use of PCP. While the Stockholm Convention's decision would impact PCP production and use around the world, it would have no binding effect on the U.S. which has not ratified the convention.

Watch Out! That Treated Pole Can Be Dangerous to Your Health

Pentachlorophenol is a chlorinated aromatic hydrocarbon closely related to other chlorophenols, and is typically contaminated with hexachlorobenzene, polychlorinated dibenzo-p-dioxins, and furans. All of these substances can be found in technical grade PCP. There is extensive documentation of the acute and chronic toxic effects of PCP. Inhalation and dermal exposures are to be expected with use of PCP as a wood preservative for utility poles, and people who live or work near treated poles have an elevated risk of being exposed. Skin, eye, and respiratory irritation are typical acute exposure symptoms.³

Studies find that long-term low and elevated exposures to PCP can cause damage to the liver, kidneys, blood, and nervous system. Laboratory animal studies suggest that the endocrine and immune systems can also be damaged following long-term exposure to low levels of PCP.⁴ The U.S. Environmental Protection Agency (EPA) has classified PCP as a '*probable human carcinogen*' and the International Agency for Research on Cancer (IARC) has classified it as '*possibly carcinogenic to humans*.' In 2014, PCP was added to the National Toxicology Program (NTP) *13th Report on Carcinogens* as "*reasonably anticipated to be a human carcinogen*," citing that the chemical is associated with an increased risk of non-Hodgkins lymphoma in studies in humans and the incidence of tumors in the liver and other organs in mice.⁵

Even though specific inhalation and dermal studies have not been conducted for PCP, EPA has determined that PCP is readily ab-

sorbed via all routes of exposure, including oral, inhalation, and dermal. Based on the observance of systemic tumors following oral exposure, and in the absence of information to indicate otherwise, EPA has also assumed that exposures/residues throughout the body will be achieved regardless of the route of exposure. Accordingly, the agency believes that PCP can be considered “likely to be carcinogenic to humans” by all routes of exposure.⁶

Other animal studies on reproductive toxicity in rats show that exposure to PCP is associated with decreased fertility, delayed puberty, testicular effects, decreases litter size, decreased viability, and decreased pup weights.⁷ PCP acts as an endocrine disruptor by affecting the levels of circulating thyroid hormones.^{8,9} One 2011 study found that PCP significantly decreases production of the hormones testosterone and 17 β -estradiol, and may inhibit steroidogenesis (production of steroid hormones).¹⁰ The Centers for Disease Control and Prevention’s *National Report on Human Exposures to Environmental Chemicals* notes that acute, high dose exposure to PCP can “induce a hypermetabolic state and excessive heat production” in the body, with effects that include hyperthermia, hypertension, and metabolic acidosis. These have been observed in adults and children highly exposed to PCP through ingestion, inhalation, or skin absorption. This CDC report, which measures levels of environmental chemicals in the human body, finds that while PCP levels in adults and children are lower than they have been in the past (mostly due to regulatory restrictions), residues are still measurable in the U.S. population.¹¹ Human biomonitoring studies find PCP in umbilical cord blood plasma and breast milk, with the risk of exposure to developing fetus and infants.¹²

Off-Pole Migration

In addition to human health concerns, PCP can migrate from treated poles into the air and soil. As used as a wood preservative treatment for utility poles, human and environmental exposures can occur. PCP is released into the air from treated wood surfaces. While this phenomenon (off-gassing or volatilization) would not result in large ambient concentrations of PCP in the atmosphere, residues quickly bind to soil and can make their way into surface water and groundwater,¹³ where they can persist and accumulate in fish and other organisms. Increased temperature and leaching from rain will contribute to PCP migration from utility poles to the surrounding soil. PCP’s major metabolite, pentachloroanisole (PCA), is also highly toxic. According to data compiled by NTP there is evidence of the carcinogenic activity of PCA.¹⁴

PCP is also a common contaminant in water,¹⁵ and studies with fish find that PCP’s endocrine disrupting effects eventually result in abnormal fish development.^{16,17} In one study, field soil samples were collected around six PCP-treated wooden poles (in clay, organic matter, and sand) and found concentrations of polychlorodibenzo-p-dioxins and furans the highest in organic matter and clay soils. The study also found that high levels of polychlorodibenzo-p-dioxins and furans can be found in the first two meters below the surface.¹⁸

A study published in the *American Journal of Public Health* finds that treated utility pole placement on roadway rights-of-way near private water sources increases the likelihood of drinking water contamination, especially in areas with high water tables.¹⁹ According to this study, which was conducted in Vermont, tested water samples had a PCP concentration of 2.06 milligrams per liter, and 1.15 milligrams per liter, about 2000 and 1000 times the EPA maximum contaminant level (0.001 mg/L). In this case, treated poles were eventually replaced with non-treated cedar poles.

New York Residents Take Action!

Residents of East Hampton, NY, first raised concerns about PCP when they objected to the installation of 200 60-foot poles in village neighborhoods earlier this year by the electric company Long Island Power Authority (LIPA), operated by Public Service Enterprise Group (PSEG). Water tests requested by the residents detected PCP. Soon thereafter, residents of East Hampton filed a lawsuit against LIPA and PSEG Long Island, charging that the new utility poles in their neighborhood not only lowers property values, but threatens groundwater and their health. The suit charges LIPA and PSEG with negligence, fraud, violation of environmental law, and trespass.

The local organization, Long Island Businesses For Responsible Energy, Inc. (LIBFRE), born out of residents’ concern about the use of PCP-treated poles, is now working to ensure that in the future Long Island utilities focus on a safe and responsible energy infrastructure that does not include PCP-treated poles. LIBFRE is seeking the removal of all newly installed toxic PCP-treated wood utility poles and advocates for the rerouting of transmission lines underground along major public corridors away from residential neighborhoods.

Neighboring North Hempstead, NY also saw the installation of new utility poles in its neighborhoods, when the town board unanimously passed a law requiring that all newly-installed poles must have a permit, and that utility companies must place warning signs on all PCP-treated utility poles installed after January 1, 2014. The Board notes that the intent of the law is to alert people that the poles have been treated with a hazardous chemical and that anyone coming into contact with a pole should wash their hands immediately. Penalties for noncompliance with the law include a fine of \$500 for the first conviction and \$1,000 for the second. The law requires every fourth pole to have the warning sign placed at adult eye level.

These neighboring communities have enacted the first law in the nation to require treated utility poles to be labeled. Meanwhile, the legal challenge by LIBFRE seeks to require the electric provider to protect the community’s health and the environment.

Toxic Playgrounds?

Children, who face unique dangers from pesticides due to their developing bodies and elevated proportional intake of pesticide residues via oral, dermal and inhalation routes, are at greater risk from exposure to treated wood. Prior to 2004, wooden playground equipment, patios, decks and other residential wood sites were treated with PCP, CCA, and other toxic preservatives. Children who play on these surfaces, as well as on the soil into which these chemicals can leach, face elevated hazards from exposure. A study investigating the potential exposures of 257 preschool children, ages 1 1/2-5 years found that potential exposures to PCP were predominantly through inhalation, where the estimated exposures to PCP (based on urine analysis), exceeded their estimated maximum potential intake. This led the researchers to conclude that "further research on the environmental pathways and routes of PCP exposure, investigation of possible exposures to other compounds that could be metabolized to PCP, and on the human absorption, metabolism, and excretion of this phenol.." should be done.²⁰

While many wood preservatives like PCP, CCA and creosote are no longer registered to be used on residential sites such as patios, decks, picnic tables or playground equipment, wood treated with these chemicals may still be found in homes and playgrounds across the country.



Treated Wood and Its Dioxin Legacy

PCP formulations include technical-grade pentachlorophenol, which usually contains toxic impurities such as polychlorinated dibenzo-p-dioxins and dibenzofurans. In addition, a number of other environmental contaminants, including hexachlorobenzene, pentachloro-benzene, pentachloronitrobenzene, and hexachlorocyclohexane isomers, are also associated with pentachlorophenol manufacture and use. While modern manufacturing processes have reduced the levels of these contaminants, they still pose risks to human and environmental health. The scientific database has linked these chemicals with carcinogenicity, teratogenicity and endocrine disruption.²¹ Dibenzo-p-dioxins in particular are known to be human carcinogens that are extremely persistent and bioaccumulative.²² Hexachlorobenzene has also been classified as a 'probable human carcinogen.' Continued use of PCP on utility poles presents an opportunity for these dangerous chemicals to enter into the environment, despite measures to mitigate risks.

Disposal of Treated Wood

Many may find that their old deck was once treated with a wood preservative (CCA, creosote or PCP), and may want to dispose of the treated wood. According to EPA, treated wood should be disposed of in either construction and demolition landfills, municipal solid waste landfills, or industrial non-hazardous waste landfills. Treated wood should NOT be burned (i.e. fireplace or outdoor fire), as particulate matter and toxic gases released during burning can cause eye and nose irritation, breathing difficulty, coughing, and headaches. Treated wood should also not be used to make compost or mulch, nor should it

be recycled in gardens to create raised beds, since leaching from the wood can contaminate crops. Unfortunately, treated railroad ties have been known to end up in garden sites.

Contact your county solid waste office for information on how to dispose of treated wood as some County waste sites do not accept treated wood of any kind.

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Have a Home Improvement Project?

Alternatives to chemically-treated wood

There are non-wood alternatives to treated-wood, including recycled steel, concrete, and composites, that can be used for utility poles, along with plastic and cement for railroad ties. There are, however, other chemical alternatives that have been used to treat wood in residential settings, but their long-term safety is still under debate. To be on the safe side, here are some options for consideration:

- **Recycled plastic and wood-plastic lumber.** These would not leach toxic chemicals into soil or water and costs less to maintain.
- **Redwood, cedar, and cypress.** These woods are naturally resistant to insects and rot. Be sure to purchase wood products that come from responsibly-managed forests.
- **Reclaimed wood.** This typically has been recycled from old barn structures, and river-recovered ("sinker") logs from the days of river-based log drives. However, be sure to know where the wood originated from.
- **Stone or metal.** Stone and landscape blocks can be used for gardens and landscaping, while metal can be used in place of some treated wood applications.

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Wastewater Irrigation on Farms Contaminates Food

The use of recycled wastewater in agricultural fields has implications for human health and the environment

by **Nikita Naik**

The use of recycled wastewater, an increasingly attractive option in face of growing water shortages and droughts in the U.S. and abroad for uses such as agriculture, landscaping, and drinking water, raises serious questions about dietary exposure to toxic chemicals such as antibacterial pesticides. Concerns about chemical exposure through the food supply are being raised just as water recycling is being advanced as a sound environmental alternative that reduces strain on water resources and vulnerable ecosystems, decreases wastewater discharge, and cuts down on pollution.

Recycled wastewater presents a risk to human health and the environment due to contaminants of emerging concern (CECs) that are not removed even by high level water treatment processes, and can persist in the water for long periods of time, especially when used for agricultural irrigation. Residues of pesticides, pharmaceutical drugs, and other chemicals in irrigation water can end up on plant surfaces, be taken up by crops, or contaminate the soil, thus increasing human exposure risk and environmental contamination, as evidenced by a recent study conducted in Irvine, California. The study, "Treated Wastewater Irrigation: Uptake of Pharmaceutical and Personal Care Products by Common Vegetables under Field Conditions," published in *Environmental Science & Technology* (2014), found that 64% of vegetables irrigated with treated wastewater contained traces of CECs, including DEET (a repellent) and triclosan (an antibacterial).¹ Wastewater recycling, which is typically regulated at the state level in the U.S., lacks specific criteria governing the presence of these CECs in agricultural irrigation and on crops due to significant data gaps, such as lack

of information on the chronic effects of CEC exposure on human health, their persistence in and effects on the environment, the effectiveness of various treatments in removing these contaminants from wastewater effluents, lack of analytical detection methods, and more. Additionally, the cost of decontamination, if technologically feasible, is typically left to taxpayers and local water and sewage authorities.

Background

The U.S. Environmental Protection Agency (EPA) describes the recycling of wastewater or "water recycling" as "reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing, and replenishing a ground water basin."² While the terms "water recycling" and "water reuse" may seem redundant since all water is reused in one way or another within the water cycle, the distinction suggests the use of technology to hasten the reuse process or multiple use before returning to the natural water cycle.

The practice of reusing wastewater in the U.S. has been established for nearly 100 years. The earliest history of large-volume water reuse involved applications like pasture irrigation near wastewater treatment plants (WWTP) that did not require high-quality effluent. In 1912, the first small urban reuse system was the irrigation of Golden Gate Park in San Francisco. By the 1960s, landscape irrigation had become a major use for wastewater recycling. As urban populations grew, so did municipal reuse systems. In 1977, St. Petersburg, Florida built the first large-scale urban reuse system in the country. Over the years, other countries followed suit, including Israel, Japan, and Spain.³ Now, as water shortages increase due to growing populations and climate change, cities are beginning

Table 1: Categories of trace chemical constituents (natural and synthetic) potentially detectable in reclaimed water and illustrative example chemicals

End use category	Examples
Industrial chemicals	1,4-Dioxane, perfluorooctanoic acid, methyl tertiary butyl ether, tetrachloroethane
Pesticides, biocides, and herbicides	Atrazine, lindane, diuron, fipronil
Natural chemicals	Hormones (17 β -estradiol), phytoestrogens, geosmin, 2-methylisoborneol
Pharmaceuticals and metabolites	Antibacterials (sulfamethoxazole), analgesics (acetaminophen, ibuprofen), beta-blockers (atenolol), antiepileptics (phenytoin, carbamazepine), veterinary and human antibiotics (azithromycin), oral contraceptives (ethinyl estradiol)
Personal care products	Triclosan, sunscreen ingredients, fragrances, pigments
Household chemicals and food additives	Sucralose, bisphenol A (BPA), dibutyl phthalate, alkylphenol polyethoxylates, flame retardants (perfluorooctanoic acid, perfluorooctane sulfonate)
Transformation products	NDMA, HAAs, and THMs

From EPA's Guidelines for Water Reuse (2012)

to view wastewater reuse as a viable option for everything from agricultural irrigation to drinking water.

Implications for Health and the Environment

While wastewater recycling has many benefits, there are a host of issues that must be addressed, chief among them being contaminants of emerging concern. Contaminants of emerging concern are chemicals that typically have not been monitored in the environment, but have only recently been detected in waterways and municipal wastewater and include chemicals like flame retardants, personal care products, pharmaceuticals, and pesticides. CECs can enter municipal wastewater through bathing, cleaning, and the disposal of human waste and unused pharmaceuticals. Although they typically exist at extremely minute concentrations, there is a growing concern regarding their impact on public health and ecology. Table 1 contains examples of trace chemical constituents that are potentially detectable in recycled wastewater.

The uptake of contaminants by crops treated with recycled wastewater present a serious human exposure risk. The recent Irvine, California study measured levels of 19 commonly occurring pharmaceutical and personal care products (PPCPs) in eight types of vegetables irrigated with treated wastewater under field conditions. The analytes studied included 16 pharmaceuticals (e.g., acetamino-

phen, caffeine, meprobamate, atenolol, trimethoprim, carbamazepine, diazepam, gemfibrozil, and primidone) and three personal care pesticide products (DEET, triclosan, and triclocarban). The vegetable species, such as lettuce, carrots, and tomatoes, include those often consumed raw by people and are among the most important cash crops in arid and semi-arid regions, such as

southern California, where there has been a rapid increase in irrigation with treated wastewater. The study finds that 64% of the edible portions of vegetables grown with treated wastewater have at least one PPCP detected, while fortified water-irrigated vegetables, in which treated wastewater was deliberately spiked with 15 PPCPS, have a detection frequency of 91%. In treated wastewater-irrigated vegetables, meprobamate (31%) and carbamazepine (31%) are the most frequently detected compounds. In fortified water-irrigated vegetables, the detection frequencies of carbamazepine, dilantin, and primidone significantly increased to 89%, 57%, and 39%, respectively.

The study's researchers found that, based on their results, the greatest annual exposure due to the consumption of contaminated vegetables is caffeine, followed by the antibacterial pesticide triclosan, then carbamazepine, while meprobamate is the lowest.

Triclosan is a toxic antimicrobial pesticide that contains the contaminant dioxin and is associated with a range of adverse effects, from skin irritation, endocrine disruption, bacterial and compounded antibiotic resistance, to the contamination of water and its negative impact on fragile aquatic ecosystems. The Centers for Disease Control and Prevention (CDC) reports



The Deer Island Massachusetts wastewater plant and surrounding park area. Photo by Fletcher6.

document triclosan in the urine of 75% of the U.S. population, with the most recent 2010 update finding that the levels of triclosan in the U.S. population continue to increase.⁴ The researchers in the California study also note that caffeine and triclosan are mostly detected in carrots, while carbamazepine is detected widely in all vegetables. The study also finds that some PPCPs display a higher tendency for accumulation in plants than others, which may have harmful implications for vulnerable human populations like pregnant women. For example, carbamazepine, an anticonvulsant and antidepressant drug used to treat epilepsy, bipolar disorder, and other conditions, is detected consistently in all plant samples, including roots, leaves, and fruits. According to the study, the chemical is known to be immune to wastewater treatment processes and is found ubiquitously in wastewater treatment plant effluents. There is evidence that pregnant women's exposure to carbamazepine may result in congenital malformations in offspring.⁵

The use of recycled wastewater in agriculture may have indirect health effects resulting from antibiotic resistance in soil bacteria. Samples taken and archived in the Netherlands between 1940 (when antibiotic use began increasing) and 2008 supported evidence that resistance to antibiotics is increasing in both pathogenic and nonpathogenic bacteria.⁶ Wastewater effluent from hospitals, which contain major discharge of chemicals that are difficult to remove in WWTPs, may also result in the contamination of soils by trace levels of antibiotics.⁷

Certain pharmaceuticals have been shown to be phytotoxic (e.g., plant growth inhibition) to various wild and cultivated plant species, but these effects are still not fully understood.⁸

Regulations Governing Wastewater Recycling

According to EPA's *Guidelines for Water Reuse* (2012), wastewater recycling standards are the responsibility of state and local agencies. The majority of states have regulations governing quality for recycling of reclaimed water from centralized treatment facilities, and these can vary considerably according to region. As of 2012, 30 states and one territory have adopted regulations, and 15 states have guidelines or design standards. A few states have no specific regulations, but may permit programs with approval on a case-by-case basis. *Guidelines for Water Reuse* serves as a resource for states that desire to develop new regulations and guidelines for wastewater

reuse. The guidelines also exist to inform and supplement state regulations and guidelines by providing technical information and outlining key implementation considerations.

State regulations for wastewater recycling must be consistent with and, in some cases, function within the boundaries imposed by other federal and state laws, regulations, rules, and policies. State regulatory programs are affected or superseded by federal water laws where reuse affects international boundaries, Native American rights, multiple states with a claim on limited water supplies, or instream flow requirements to support threatened or endangered fisheries under the *Endangered Species Act*. Federal and state agencies have jurisdiction over the quantity and quality of wastewater discharge into U.S. public waterways. The primary federal law is the *Clean Water Act* (CWA) for water quality management designed to ensure that all surface waters are "fishable and swimmable." CWA requires states to set water quality standards, establishing the right to manage the pollution that comes from wastewater treatment plants, as long as the standards, at minimum, meet federal rules. Another federal standard regulating recycled wastewater end use is the *Safe Drinking Water Act* (SDWA) for water diverted to potable use.

Standards governing recycled wastewater irrigation on crops can differ in stringency by state. For example, California's *Water Recycling Criteria* requires some of the most stringent water quality standards for disinfection. Some states ban the practice altogether, by prohibiting the use of recycled wastewater on food crop irrigation or allowing it only if the food is to be processed or not eaten raw. Florida, Nevada, and Virginia require that recycled wastewater does not come in contact with the crop or that the crop is to be peeled or heated before eating. While California does not have these requirements, the state does have stringent, near-potable quality standards for food crop irrigation. For other states that allow food crop irrigation with treated wastewater, treatment

The Future of Recycled Wastewater Use in Agricultural Irrigation in California

California has been at the forefront of wastewater reuse, propelled by necessity due to frequent water shortages in the state. The Recycled Water Policy, adopted in 2009, establishes a set of goals to help move California toward more sustainable management of surface waters and groundwater, along with water conservation, water reuse, and the use of storm water. One of these goals include the increase in use of recycled water over 2002 levels by at least one million acre-feet per year (afy) by 2020 and by at least two million afy by 2030, as well as the substitution of as much recycled water for potable water as possible by 2030. The State Water Board has mandated the increase in use of recycled water by 200,000 afy by 2020 and by an additional 300,000 by 2030.⁹

In California, water reuse for agricultural purposes makes up a hefty chunk of total recycled water use at approximately 37% (roughly 240,000 afy). Future demand is estimated to increase agricultural reuse by a factor of 3.2 to 3.5 times current reuse levels by 2030.¹⁰ California's Department of Public Health requires varying levels of water treatment requirements depending on purpose of use: orchards and vineyards for which there is no contact with edible crops (undisinfected secondary treatment); food crops with edible portion above ground, no contact (disinfected secondary); and food crops, parks and playgrounds, golf courses (disinfected tertiary).¹¹

Table 2: Reclaimed water quality and treatment requirements for irrigation on food crops

		Arizona	California	Florida ¹	Hawaii	Nevada
Unit processes		Secondary treatment, filtration, disinfection	Oxidized, coagulated, filtered, disinfected	Secondary treatment, filtration, high-level disinfection	Oxidized, filtered, disinfected	NP
UV dose, if UV disinfection used		NS	NWRI UV Guidelines	NWRI UV Guidelines enforced, variance allowed	NWRI UV Guidelines	NP
Chlorine disinfection requirements, if used		NS	CrT > 450 mg min/L; 90 minutes modal contact time at peak dry weather flow	TRC > 1 mg/L; 15 minutes contact time at peak hr flow ²	Min residual > 5mg/L, actual modal contact time of 90 minutes	NP

From EPA's Guidelines for Water Reuse (2012)

NS = not specified by the state's reuse regulation

TR = monitoring is not required but virus removal rates are prescribed by treatment requirement

NP = not permitted by the state

NWRI = National Water Research Institute

¹In Texas and Florida, spray irrigation (i.e. direct contact) is not permitted on foods that may be consumed raw (except Florida makes an exception for citrus and tobacco), and only irrigation types that avoid reclaimed water contact with edible portions of food crops (such as drip irrigation) are acceptable.

²In Florida when chlorine disinfection is used, the product of the total chlo-

requirements can range from secondary treatment and disinfection, to oxidation, coagulation, filtration, and high level disinfection. See Table 2 for more information on state requirements regarding the treatment of wastewater for agricultural irrigation.

Guidelines for Water Reuse recommends that as human exposure levels increase, so should the level of treatment. For example, for non-food crop irrigation, wetlands, wildlife habitat, and stream augmentation, and industrial cooling processes, EPA suggests both primary (sedimentation) with secondary (biological oxidation, disinfection) treatment. For landscape and golf course irrigation, toilet flushing, and food crop irrigation, EPA suggests pri-

mary, secondary, and tertiary/advanced (chemical coagulation, filtration, disinfection) treatment.¹²

Additional Concerns

Lack of Treatment Technology. Nearly all wastewater treatment plants provide a minimum of secondary treatment as a result of CWA requirements. Treatment levels beyond secondary are called advanced treatment and can include physical-chemical separation techniques such as adsorption, flocculation/precipitation, membranes for advanced filtration, ion exchange, and reverse osmosis.¹³ In 2008, only 37 percent of municipal facilities produced and discharged effluent at advanced levels of treatment that were

Table 3: Indicative percent removals of organic chemicals during various stages of wastewater treatment

Treatment	Percent Removal							
	Antibiotics ¹	Pharmaceuticals					Hormones	
		DZP	CBZ	DCF	IBP	PCT	Steroid ²	Anabolic ³
Secondary (activated sludge)	10–50	nd	–	10–50	>90	nd	>90	nd
Soil aquifer treatment	nd	nd	25–50	>90	>90	>90	>90	nd
Aquifer sotrage	50–90	10–50	–	50–90	50–90	nd	>90	nd
Microfiltration	<20	<20	<20	<20	<20	<20	<20	nd
Ultrafiltration/powdered activated carbon (PAC)	>90	>90	>90	>90	>90	nd	>90	nd
Nanofiltration	50–80	50–80	50–80	50–80	50–80	50–80	50–80	50–80
Reverse osmosis	>95	>95	>95	>95	>95	>95	>95	>95
PAC	20–>80	50–80	50–80	20–50	<20	50–80	50–80	50–80
Granular activated carbon	>90	>90	>90	>90	>90		>90	
Ozonation	>95	50–80	50–80	>95	50–80	>95	>95	>80
Advanced oxidation	50–80	50–80	>80	>80	>80	>80	>80	>80
High-level ultraviolet	20–>80	<20	20–50	>80	20–50	>80	>80	20–50
Chlorination	>80	20–50	<20	>80	<20	>80	>80	<20
Chloramination	<20	<20	<20	50–80	<20	>80	>80	<20

From EPA's Guidelines for Water Reuse (2012)

CBZ = carbamazepine

DBP = disinfection by-product

DCF = diclofenac

DZP = diazepam

IBP = ibuprofen

nd = no data

PAC = powdered activated carbon

PCT = paracetamol

¹erythromycin, sulfamethoxazole, triclosan, trimethoprim

²ethynylestradiol; estrone, estradiol and estriol

³progesterone, testosterone

New Jersey	North Carolina		Texas ¹	Virginia ³	Washington
	Processed Foods ⁴	Unprocessed Foods ⁵			
Filtration, high-level disinfection	Filtration (or equivalent)	Filtration, dual UV/chlorination (or equivalent)	NS	Secondary treatment, filtration, high-level disinfection	Oxidized, coagulated, filtered, disinfected
100 mJ/cm ² at max day flow	NS	Dual UV/chlorination (or equivalent)	NS	NS	NWRI UV Guidelines
Min residual > 1 mg/L; 15 minutes contact at peak hr flow	NS	Dual UV/chlorination (or equivalent)	NS	TRC CAT > 1 mg/L; 30 minutes contact time at avg flow or 20 minutes at peak flow	Chlorine residual > 1; 30 minutes contact time

rine residual and contact time (CrT) at peak hour flow is specified for three levels of fecal coliform as measured prior to disinfection. If the concentration of fecal coliform prior to disinfection: is $\leq 1,000$ cfu per 100 mL, the CrT shall be 25 mg min/L; is 1,000 to 10,000 cfu per 100 mL the CrT shall be 40 mg min/L; and is $\geq 10,000$ cfu per 100 mL the CrT shall be 120 mg min/L.

³The requirements presented for Virginia are for food crops eaten raw.

⁴ Processed foods include those that will be peeled, skinned, cooked or thermally processed before consumption.

⁵Unprocessed food refers to crops that will not be peeled, skinned, cooked or thermally processed before consumption.

higher than the federal minimum.¹⁴

Currently, there is no single treatment process that can provide a complete barrier to all chemicals (see Table 3) and most municipal wastewater treatment plants are not specifically designed to remove these types of contaminants from wastewater due to barriers such as cost and lack of research and data.

Data and Regulatory Gaps. In addition to the presence of CECs in treated wastewater, these contaminants have been shown to occur in natural bodies of water as well, which indicates lack of sufficient wastewater treatment technology. A major study published in 2002 as a part of the U.S. Geological Survey discovered the presence of numerous pharmaceuticals and organic wastewater contaminants (OWCs) in 139 streams located across 30 states. Eighty-two (out of 95) OWCs were detected at least once in the study, with 80% of the streams sampled containing one or more OWC. Compounds included steroids, insect repellents, disinfectants, and detergent metabolites. While the majority of the compounds rarely exceeded drinking water guidelines, many did not have any guidelines.¹⁵ The lack of regulatory standards, data on metabolites and potential synergistic effects, and other sources of incomplete data on these chemicals show a failure in the regulatory framework.

Conclusion

Contaminants of emerging concerns (CECs) in recycled wastewater present a risk to both human health and the environment. However, their presence in natural bodies of water as well as recycled wastewater points to a much larger problem, most notably lapses within federal laws, including

the *Toxic Substances Control Act*, *Federal Insecticide, Fungicide, and Rodenticide Act*, *Clean Water Act*, and others that govern both the introduction and use of toxic materials in commerce without an adequate assessment of their life-cycle (from manufacture, use, to disposal) effects. The *Organic Foods Production Act* establishes a model for analyzing life cycle impacts of synthetic chemicals that should be used when determining allowances of any synthetic chemical – thus prohibiting materials not eliminated by wastewater treatment. Until that happens, contaminated wastewater presents a serious challenge across all agricultural production where it is used.

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Who should pay for the removal of CECs?

Widespread water contamination with the herbicide atrazine, used to control broadleaf weeds and annual grasses in crops, golf courses, and residential lawns, has been found across the U.S. Atrazine is used extensively for broadleaf weed control in corn. The herbicide does not cling to soil particles, but washes into surface water or leaches into groundwater, and then finds its way into municipal drinking water. It is the most commonly detected pesticide in rivers, streams and wells, with an estimated 76.4 million pounds of atrazine applied in the U.S. annually. It has been linked to a myriad of environmental concerns and health problems in humans, including disruption of hormone activity, birth defects, and cancer, as well as effects on human reproductive systems.

A class action settlement, *City of Greenville v. Syngenta Crop Protection, Inc.*, between plaintiffs and the manufacturer of atrazine, Syngenta, paid out \$105 million in 2013 to settle this nearly eight-year-old lawsuit and help reimburse community water systems (CWS) in 45 states that have had to filter the toxic chemical from its drinking water. It provided financial recoveries for costs that have been borne for decades by more than 1,887 CWSs that provide drinking water to more than one in six Americans.¹⁶

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The Holistic Orchard

Tree Fruits and Berries the Biological Way

Michael Phillips, 2011, 432 pp

I love reading books that spring from an ecological understanding. For Michael Phillips, growing fruit trees and berries is not just applied ecology, but living ecology, and the role of the orchardist is similar to that of the holistic health practitioner. This two-pronged approach is stated at the beginning of the chapter Orchard Dynamics, “Stewarding what needs to be right while intelligently setting limits on what might go wrong describes health-based orcharding to a tee.”

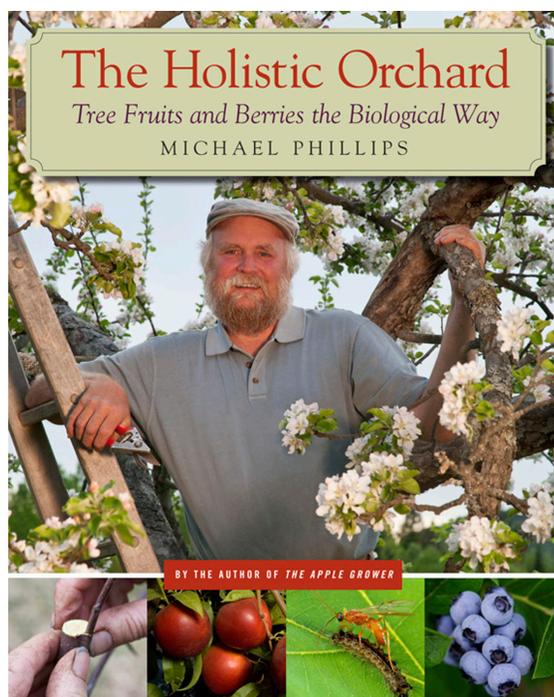
The key to understanding orchard ecology, according to Mr. Phillips, is that fruit trees live in forest edge environments. Forest edges have fungal soils like forests, but more light—and hence a greater diversity of understory plants—than the forest. Forest soils, unlike the soils of grasslands, turf, and cropland, are dominated by fungi that break down the high-carbon debris from woody plants. Like the food web in the bacteria-dominated grassland soils, nutrients are constantly moving among bacteria, fungi, nematodes, protozoans, and arthropods, storing nutrients in their cells and excreting wastes that feed plants.

Understory plants also contribute to the forest edge ecology that feeds fruit trees. The orchard community might include, for example, fruit trees, berries, woody herbs, wild greens, flowering plants supporting pollinators, predators, and parasites, wild berries for birds, and tap-rooted plants that bring deep nutrients to the surface. A diverse understory thus contributes to the health of the orchard. The cornerstone to the holistic orchard is building the fungal soil—through frequent additions of ramose wood chips and other fungal nutrients.

Mr. Phillips quotes from his earlier book, *The Apple Grower*, to explain the difference between his approach and the “old school” organic approach:

Two terms from medicine lend far more credence to describing how we as orchardists relate to our trees in the quest to produce healthy, locally grown fruit. I would argue that each of us makes allopathic and holistic choices within the approach we’ve chosen to grow fruit. Every organic sulfur spray, for instance, works in an allopathic manner just as does every organophosphate spray. Both are aimed at removing the perceived threat by toxic means. Holistic actions on the other hand undertake to embrace the orchard system as a whole rather than address recurring symptoms. The more toxic a procedure, of course, the further we remove ourselves from integrating soil and tree health into self-sustaining solutions.

As a holistic health practitioner working with fruit trees, Mr. Phillips stresses building health through nutrition and occasional supplements—“Choosing to spray to build orchard health is far different from choosing to kill to spray.” As an ecologist he reminds us that, “The words weed and pest do not show up in ecology books.”



Despite the impression I may have given, *The Holistic Orchard* is not a book of philosophy and ecological theory. The author’s wisdom is derived from many years of organic orcharding experience, and those highly quotable bits of ecological wisdom are scattered within a book that is eminently practical. Early chapters deal with orchard design, specifics of planting, building orchard soils, pruning, pollination, thinning, and managing the health of the orchard. Later chapters deal specifically with pome fruits, stone fruits, and berries. There he treats individual fruits, recommended varieties, rootstocks, pruning and solutions to problems—using both allopathic and holistic approaches. He says, “There are times in the organic orchard when you may think it best to reach for old

school ways. That’s OK in the short-term. Just understand that there will be more and more biological ramifications the farther you go down that road.”



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