Regulatory Failures Mount, Threatening Health and Safety

The complexities associated with regulating pesticides with complete information to a standard of safety that is protective of all populations groups by age, sex, gender, race, ethnic identity, location, and occupation are beyond the reach of the U.S. Environmental Protection (EPA) and the state agencies. Pointing to the fact that a pesticide is regulated by EPA has become less meaningful over time in the face of the complexities of exposure and individual vulnerabilities or comorbidities. EPA decisions of the last several years have brought into focus many of these deficiencies and has contributed to the urgent need to transition society away from toxic pesticide use. The following represents some of the EPA decisions that undermine public safety just since July 2020.

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EPA Gives Thumbs Up to Chlorpyrifos

EPA announced a proposed interim decision in December, 2020 on the highly neurotoxic pesticide chlorpyrifos, functionally continuing its registration for many agricultural uses which remained after EPA negotiated a phase out of most uses in 2000. *(See full story on p.35.)* The interim decision ignores the serious neurotoxic effects to young children, most concerningly brain function, as well as to farmworkers, critical species and ecosystems, and the public generally.

Glyphosate Banned in Mexico

The Mexican government announced in June that it will begin a four-year phase out of glyphosate/Roundup importation and use. This comes several months after EPA reapproved the herbicide's use. The announcement means that Mexico will join other countries, such as Luxembourg, Vietnam, and Germany, in prohibiting the chemical and the toxic consumer products, like Roundup. International watchdogs are keeping an eye on reactions from the U.S., which in recent years has worked to intervene in other countries' decision-making on toxic pesticides. The government's announcement cites the Precautionary Principle as the basis, in part, for its decision. According to the Wingspread Statement on the Precautionary Principle, "Where an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically." In the case of glyphosate, there is strong evidence, per a 2015 review by the International Agency for Research on Cancer (IARC), that glyphosate is carcinogenic. Since 2015, several more publications have added weight to IARC's cancer finding on glyphosate. A February 2018 meta-analysis finds "a compelling link between exposures to GBH [glyphosate-based herbicides] and increased risk of NHL [non-Hodgkin lymphoma].

Endocrine Disrupting Atrazine Reapproved

Use of the highly hazardous, endocrine disrupting weed killer atrazine is likely to expand following a decision made by EPA in September. With a claim of "regulatory certainty," the agency is reapproving use of this notorious herbicide, as well as its cousins simazine and propazine in the triazine family of chemicals, with fewer safeguards for public health, particularly young children.

Triazines are well-known to interfere with the body's endocrine, or hormonal, system. Disruptions within this delicately balanced mechanism in the body can result in a range of adverse health effects, including cancer, reproductive dysfunction, and developmental harm. These weed killers interfere with the pituitary gland's release of luteinizing hormones, which regulate the function of female ovaries and male gonads. In comments written by Beyond Pesticides to EPA, the organization notes, "Of the numerous adverse effects associated with this disruption, the two that appear to be the most sensitive and occur after the shortest duration (4 days) of exposure are the disruption of the ovarian cycles and the delays in puberty onset."

As EPA's November draft Biological Evaluation shows, wildlife is particularly hard hit by exposure to endocrine-disrupting atrazine. The chemical was found likely to harm 1,013 endangered or threatened species—56% of all

species listed under the *Endangered Species Act*. Specific studies have found atrazine exposure to result in "chemical castration" of certain frog species. It was recently found to harm the reproductive health of marsupials. Stranded dolphins and whales along the U.S. Eastern Seaboard have recently tested positive for atrazine. Despite the risk the herbicide poses to aquatic species, the Trump EPA this year waived requirements that atrazine manufacturer Syngenta-ChemChina monitor U.S. waterways for presence of the chemical.

In a press release announcing the decision, EPA Administrator Andrew Wheeler, at the time, was joined by representatives from the Missouri Farm Bureau and the head of the Triazine Network, a chemical industry group dedicated to defending these toxic herbicides. "The benefits of atrazine in agriculture are high, so these new protections give our nation's farmers more clarity and certainty concerning proper use," Administrator Wheeler said.

Beyond Pesticides joined health and environmental groups suing EPA in November over its decision to reapprove atrazine with fewer protections for children's health. Despite the chemical being banned across much of the world, EPA continues to make decisions that benefit chemical industry executives. "EPA's failure to remove atrazine represents a dramatic failure of a federal agency charged with safeguarding the health of people, wildlife, and the environment," said Jay Feldman, executive director of Beyond Pesticides. "We seek to uphold the agency's duty to act on the science, in the face of viable alternatives to this highly toxic weed killer."

Bringing Back Aldicarb?

EPA in January announced that it is reapproving the toxic, widely banned insecticide aldicarb for use on citrus fruits in Texas and Florida. Aldicarb is a highly toxic, systemic carbamate insecticide that was first manufactured in 1965. The chemical is a fast-acting neurotoxicant that binds to the active

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site of the essential enzyme for normal nerve impulse transmission, acetylcholinesterase (AChE), and deactivates the enzyme. In doing this, the chemical causes damage to the central and peripheral nervous systems, interrupting neurological activity. Aldicarb is subject to the Rotterdam Convention, an international treaty established to stop global trade of hazardous chemicals, with over 100 countries banning its use. Both EPA and the World Health Organization (WHO) classify the chemical in the highest toxicity category. However, the U.S. is one of only a few countries around the world that does not regulate aldicarb via the treaty, but had previously cancelled.

Aldicarb was among the first pesticides to be recognized to leach and contaminate pristine groundwater, first in the Central Sand region of Wisconsin and then on Long Island, New York, during the early 1980s. The chemical persists in groundwater for decades due to its long half-life between 200 to 2000 days and ingestion of aldicarb-contaminated groundwater by residents adversely affects immune system function. Furthermore, aldicarb is a systemic pesticide that plant roots and leaves readily uptake, leading to toxic chemical residues in pollen and guttation droplets easily accessible to vulnerable pollinators, like bees. In 2010, BayerCrop Science negotiated an agreement with EPA to cancel the production of Temik 15G, the sole aldicarb pesticide on the market, ending distribution by 2017.

Federal Court Blocks EPA from Weakening Farmworker Protections

Application Exclusion Zones (AEZs) are buffer zones that restrict worker entry during and after a pesticide application, with the intent of limiting dangerous exposure. EPA issued final rules in October weaking AEZ restrictions. The agrichemical Industry began pushing rollbacks to farmworker protections early in the Trump administration, starting with the 2017 announcement under former EPA Administrator Scott Pruitt that EPA would revise its Worker Protection Standards that were updated under the Obama Administration.

The agency is: i) removing responsibility for chemical-intensive farms to keep bystanders out of off-site spray areas; ii) allowing pesticide applications to stop and start when individuals enter and exit AEZs (rather than establish set safety requirements); iii) exempting on-farm families from AEZ protections, allowing dangerous pesticide applications to take place near buildings and other shelters where family members reside within an AEZ ("rather than compelling them to leave even when they feel safe remaining inside," the agency notes in a disturbingly unscientific fashion), and; iv) "simplifies" or weakens criteria for determining the appropriate buffer size for an AEZ. The rule was blocked by a temporary restraining order in December by U.S. District Court for the Southern District of New York after the agency was sued by farmworker groups.

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Scientific Studies Raise the Alarm on Pesticide Dangers

28 Pesticides Linked to Mammary Gland Cancer

Research out of the Silent Spring Institute identifies 28 registered pesticides linked with development of mammary gland tumors in animal studies. The authors, Bethsaida Cardona and Ruthann Rudel, focus on endocrine disruption as the common mechanism of the compounds. The research results, published in the journal *Molecular and Cellular Endocrinology*, supports the criticism that EPA's registration process is substantially inadequate to protect human health. Of the 28 pesticides the research identified as causing mammary tumors, EPA has only identified nine. In their study, "US EPA's regulatory pesticide evaluations need clearer guidelines for considering mammary gland tumors and other mammary gland effects," Mss. Cardona and Rudel, conclude, "It has been previously reported that chemically induced effects on the mammary gland are not assessed in the types of guideline toxicology studies required for pesticide registration, and that when mammary tumors are observed in two-year rodent cancer bioassays they are often dismissed and not carried forward into risk assessments. Some of these decisions may reflect limited appreciation for the interaction of endocrine pathways in breast carcinogenesis."

Household Pesticide Use Linked to Depression

Residential exposure to household pesticide products increases the risk of developing symptoms associated with depression, according to a study published in *Environmental Research* by researchers at the Medical College of Georgia—Augusta University, School of Medicine—Jinan University, and Guangzhou Center for Disease Control and Prevention (CDC), China. Research on pesticide-induced diseases commonly investigates pesticide exposure concerning the development of various physical illnesses, and previous studies show there are occupational risks of developing depression, especially in agriculture.

Researchers used data from 2005–2014 National Health and Nutrition Examination Surveys (NHANES), statistically designed to represent the general U.S. population, to assess the association between pesticide exposure and mental illness. The study findings establish a one-and-a-half times higher incidence of depression symptoms for those exposed to household pesticides.

For over two decades, research concerning pesticide exposure and psychiatric disorders, like depression, focused on occupational hazards, especially for agricultural farmworkers. Exposure to agricultural pesticides puts farmers at six times greater risk of exhibiting depressive symptoms, including chronic anxiety, irritability, restlessness, and sadness, according to a 2002 study, "Pesticide Poisoning and Depressive Symptoms Among Farm Residents" (*Annals of Epidemiology*). Specifically, exposure to organochlorines and fumigants (gaseous pesticides) heighten an individual's risk of depression by 90% and 80%, respectively.

Pesticide Use Linked to Lung Cancer

Chronic pesticide use, and subsequent exposure, elevate a person's risk of developing lung cancer, according to a study published in *F1000Research* by researchers at the Nakhon Sawan Provincial Public Health Office and Naresuan University, Thailand. This case control study, "Pesticide exposure and lung cancer risk: A case-control study in Nakhon Sawan, Thailand," finds a three to 12.5 times elevated lung cancer risk from exposure to herbicides, insecticides, and fungicides, controlling for age, sex, cigarette smoking, occupation, cooking fumes, and exposure to air pollution. The study compares lifetime exposure of 233 lung cancer cases, and 447 healthy neighbors matched for sex and age.

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There is a body of science linking pesticide exposure to lung cancer. A 2004 study, "Pesticides and Lung Cancer Risk in the Agricultural Health Study Cohort" (*American Journal of Epidemiology*), demonstrates a positive association between lung cancer and seven widely used agricultural pesticides (e.g., dicamba, metolachlor, pendimethalin, carbofuran, chlorpyrifos, diazinon, and dieldrin). A 1994 study, "Cohort mortality and nested case-control study of lung cancer among structural pest control workers in Florida" (*Cancer Causes Control*), finds that the risk of developing lung cancer increases with the number of years working as a pesticide applicator.

Common Pesticide Exposure Linked to Brain Effects in Fetal Development

Research has found that that agricultural and household exposures to pesticides increases the risk of a relatively rare fetal disorder called holoprosencephaly (HPE), in which the embryo's forebrain fails to develop into two distinct hemispheres. The study, "Prenatal exposure to pesticides and risk for holoprosencephaly: a case-control study" (*Environmental Health*), published in June, finds that pre-conception and the first few weeks of pregnancy is the most vulnerable period for the onset of the illness.

The study, conducted from 2016 through 2019 and led by Yonit Addissie (a MD/PhD student) and others at the National Institutes of Health and the University of Wisconsin–Madison, is a case-control study—one that compares subjects who have a disease or disorder with "controls" who do not have the disorder, comparing the frequency of exposure to a particular risk factor in each group to determine the incidence relationship between the risk factor and the disease. The 91 subjects for the study were found through the National Human Genome Research Institute's ongoing research projects on HPE.

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The 56 "controls" are children with Williams-Beuren syndrome, a genetically caused disorder unrelated to HPE, but which is also characterized by congenital malformations (e.g., by pre- and post-natal growth delays, short stature, varying degrees of mental deficiency, and distinctive facial features). Subjects in both groups were predominantly from the U.S. HPE is the most common malformation of the forebrain in humans, occurring in one of 8,000 live births. The prognosis and lifespan of fetuses with HPE vary significantly, and depend to great extent on the severity of the abnormalities.

Respiratory System Threatened by Pesticides, Elevating Vulnerability to COVID-19

A review of scientific literature on the correlation between respiratory diseases and pesticides exposure—published in August in the journal *Annals of Agricultural and Environmental Medicine* (AAEM), "Influence of pesticides on respiratory pathology—a literature review"—finds that exposure to pesticides increases the incidence of respiratory pathologies (i.e., asthma, lung cancer, and chronic obstructive pulmonary disease [COPD]—or chronic bronchitis). The review by researchers at the Iuliu Hatieganu' University of Medicine and Pharmacy Cluj-Napoca, Cluj-Napoca, Romania, looks at how pesticide exposure adversely propagates and reinforces respiratory diseases in humans. This review highlights the significance of evaluating how pesticide exposure impacts respiratory function, especially since contact with pesticides can happen at any point in the production, transportation, preparation, or application/treatment process. Study researchers note, "Knowing and recognizing these respiratory health problems of farmers and their families, and also of [pesticide] manipulators/retailers, are essential for early diagnosis, appropriate treatment, and preventive measures." These study results are critically important at a time when exposure to respiratory toxicants increases vulnerability to Covid-19, which attacks the respiratory system, among other organ systems.

The respiratory system is essential to human survival, regulating gas exchange (oxygen-carbon dioxide) in the body to balance acid and base tissue cells for normal function. However, damage to the respiratory system can cause a plethora of issues—from asthma and bronchitis to oxidative stress that triggers the development of extra-respiratory manifestations like rheumatoid arthritis and cardiovascular disease. Therefore, the rise in respiratory illnesses over the last three decades is highly concerning, especially as research fails to identify an exact cause for the increase in respiratory disease cases.

Pesticide Effects on Ecosystems Stress the Foundation of LIfe

Glyphosate Weed Killer Threatens Nearly All Endangered Species

EPA in December released a draft biological evaluation (BE) of glyphosate, finding that the use of this ubiquitous weed killer likely threatens nearly every animal and plant species on the U.S. list of threatened and endangered species —93% of them. Glyphosate is the active ingredient in many herbicides, including Roundup, Monsanto's (now Bayer's) ubiquitous and widely used weed killer; it is very commonly used with genetically modified companion seeds for a variety of staple crops, as well as for weed control on managed landscapes. These seeds are genetically engineered to be glyphosate-tolerant. Glyphosate-based herbicides are the most widely used pesticides worldwide, and deliver human, biotic, and ecosystem harms.

The regulatory context for this biological evaluation is this: EPA is legally bound to review each registered pesticide every 15 years to see whether it continues to meet the FIFRA *(Federal Insecticide, Fungicide, and Rodenticide Act*) standard for registration. The re-registration review of glyphosate has been underway since 2009. During these 11 years, the herbicide has been the subject of massive public, advocacy, and regulator attention, much of it subsequent to both the 2015 declaration by the International Agency for Research on Cancer (IARC) that the compound is a likely human carcinogen, and several successful high-profile lawsuits against Monsanto that found the chemical to cause non-Hodgkin lymphoma.

EPA has issued proposed interim decisions on glyphosate's reregistration that have allowed these herbicides to remain on the market. In May 2019, the agency declared, ignoring broad scientific consensus, that glyphosate is "not likely to be carcinogenic to humans." In January 2020, EPA issued a favorable interim review decision on reregistration, stating, "After a thorough review of the best available science, as required under the *Federal Insecticide, Fungicide, and Rodenticide Act*, EPA has concluded that there are no risks of concern to human health when glyphosate is used according to the label." Some ask, where's the science?

Beyond Pesticides and other public health, conservation, and farmworker advocacy organizations brought suit against EPA in March 2020 for that interim approval. The plaintiffs charge EPA with bias, ignoring and using incomplete scientific data, and delay in finishing "any assessment of [glyphosate's] impacts on thousands of potentially harmed endangered species, delaying it until a future decision." Represented by the Center for Food Safety (CFS), plaintiffs, including the Rural Coalition, Farmworker Association of Florida, Organización en California de Lideres Campesinas, and Beyond Pesticides, filed the federal lawsuit in the Ninth Circuit Court of Appeals. The groups seek to have the pesticide prohibited from use or sale because of its unlawful approval.

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EPA Underestimates Contamination of Waterways with Insecticide

The insecticide fipronil is more toxic to aquatic insects than previously thought, often present in U.S. waterways, and can trigger trophic cascades that disrupt entire aquatic ecosystems, finds Colorado State and the U.S. Geological Survey (USGS) researchers. The research, "Common insecticide disrupts aquatic communities: A mesocosm-to-field ecological risk assessment of fipronil and its degradates in U.S. streams," is published by the American Association for the Advancement of Science in the October issue of *Science Advances*. The data have important implications for waterways throughout the country, but particularly in the Southeast U.S. where the chemical was found at hazardous levels in over half of sampled steams. Despite the high quality of the findings by a U.S. government agency, pesticide regulators at EPA do not adequately consider ecosystem-level effects when determining whether to register a pesticide.

According to a USGS press release, "Concentrations of fipronil compounds determined to be toxic by the new mesocosm study are 3 to 2,600 times lower than those reported in the literature, depending on the fipronil compound. . ." The release continues, "18% of the streams sampled nationally had fipronil compound concentrations, averaged over a 4-week sampling period, that exceeded the benign level determined by the mesocosm experiment. In the Southeast, where fipronil was detected more frequently than in the other four regions, 52% of streams sampled had fipronil compound concentrations that exceeded the benign level."

Fipronil has both wide residential and agricultural uses, including for the control of ants and termites and on crops

including corn, potatoes, and orchards. According to the authors, "Although fipronil has been found in high concentrations (6.41 μg/liter) in streams of some agricultural areas with high application rates, urban streams across the United States typically have more detections and greater concentrations than agricultural streams, with storm events being positively correlated with detection."

Replacements for Neonic Bee-Toxic Pesticides Just as Harmful

With neonicotinoid (neonic) insecticides coming under fire for their widespread adverse effects on a broad range of beneficial insects—including their major contributions to the decline of critical pollinators—more such "novel" pesticides are being brought to market in response, raising the same problems. So, it is important, that the September publication, "Do novel insecticides pose a threat to beneficial insects?", critiques the hazards of the replacement pesticides, flupyradifurone and sulfoxaflor. These insecticides share the same mode of action as neonics, although they are (nominally) from different chemical classes. Both Dow Agrochemicals' (now Corteva) sulfoxaflor (classified as a butanolide) and Bayer CropScience's flupyradifurone (classified as a sulfoximine) are now being considered as replacement products for pest species that resist neonics, and where neonic compounds are restricted or banned.

The research was conducted by Harry Siviter, PhD and Felicity Muth, PhD of the Department of Integrative Biology at the University of Texas at Austin; the subsequent paper was published by the *Proceedings of the Royal Society B: Biological Sciences* in September 2020. The researchers' meta-analysis extracted useful data from 19 of the 26 studies they reviewed, and paid particular attention to impacts on beneficial insects—dominantly, on bee species—and evaluated outcomes related to organism mortality, reproduction, and behavior. In addition, the scientists evaluated impacts on predator species, such as wasps, lacewings, and beetles.

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The researchers learned that flupyradifurone can have lethal impacts at field-realistic levels, with some kinds of bees being more vulnerable than others; further, and unsurprisingly, exposures to the compound were more likely to be harmful in combination with other environmental stressors, such as poor nutrition, pathogens, or other agricultural chemicals. The coauthors note that the lethality of sulfoxaflor, which is toxic to bees at high levels of exposure, may vary at lower doses, depending on the interactions with other environmental factors. But given certain combinations of those variables, sulfoxaflor exposures at field-realistic levels appear to increase bee mortality.

The study also shows that sulfoxaflor has negative impacts on bee reproduction similar to those of neonics, particularly reduced reproduction (egg laying) and poor larval development, and that flupyradifurone exposures impair bees' flight behavior, foraging success, and bodily temperature regulation. Findings include impacts on beneficial predators, including a huge increase (40–60%) in the mortality of flupyradifurone-exposed rove beetles, and 100% mortality of exposed insidious flower bugs (also known as pirate beetles).

Sulfoxaflor shows harmful effects on many taxa: hymenoptera (bees, wasps, ants), coleoptera (beetles), and hemiptera (cicadas, aphids, planthoppers, leafhoppers). At field-realistic exposure levels, for example, the parasitic activity of some wasps was reduced, and mortality increased; lacewings showed increased mortality and reduced fertility; ladybug larvae suffered 100% mortality; and pirate beetle mortality was 96% within 24 hours of exposure to sufoxaflor.

Flea Pesticides Contaminate Waterways

Many pet owners likely do not consider what is actually in the flea treatments they administer to their animals. That should change, and recent research demonstrates why. Scientists sampling rivers in England found extreme contamination with two neurotoxic pesticides commonly used in flea products for dogs and cats: fipronil and the neonicotinoid imidacloprid. In many instances, the concentrations in the waterways are far higher than accepted "safe" levels, according researchers Dave Goulson, PhD and Rosemary Perkins, PhD at the University of Sussex in the study, "Pesticides commonly used as flea treatments for pets are contaminating English rivers" (*Science News*).

Though these compounds are banned for agricultural uses in the United Kingdom (UK), risk assessment for them, as used on animals, has been minimal because of the assumption that the amounts used for veterinary treatments would result in far less significant environmental impact than might be expected with agricultural-scale use. This research challenges that assumption, and the researchers recommend "re-evaluation of the environmental risks posed by pet parasite products, and a reappraisal of the risk assessments that these products undergo prior to regulatory approval."

Court Challenge Speaks to Need for Stronger Environmental Law

Petitioners who mounted a legal challenge to the Environmental Protection Agency's (EPA) registration of Enlist Duo, a relatively new and highly toxic pesticide product combining 2,4-D and glyphosate, learned in July of a mixed decision from the U.S. Ninth Circuit Court of Appeals in the case. The good news is that Judge Ryan D. Nelson, writing the opinion for the court, found that EPA, in registering the herbicide Enlist Duo, had failed to protect monarch butterflies. On the other and disturbing hand, the court concluded that EPA registration of the product was otherwise lawful—which means that this toxic compound will for now remain on the market. Represented by Center for Food Safety and Center for Biological Diversity, the plaintiffs—Beyond Pesticides, Pesticide Action Network North America, National Family Farm Coalition, and Family Farm Defenders—are adamant that this product should not be registered for use by EPA.

In December, the Fish and Wildlife Service found that "adding the monarch butterfly to the list of threatened and endangered species is warranted but precluded by work on higher-priority listing actions." According to the agency, "With this decision, the monarch becomes a candidate for listing under the Endangered Species Act (ESA), and its status will be reviewed each year until it is no longer a candidate."

The combined herbicide, Enlist Duo, was developed to be used on genetically engineered (GE), herbicide-tolerant crops, such as corn, soybeans, and cotton—the notion being that when applied, it would knock down broadleaf weeds, but not affect the GE crops. Enlist Duo was created in response to target weeds' development of resistance to glyphosate herbicides, most notably, Monsanto's (now Bayer's) Roundup, which has been used intensively during the past two decades. Dow Chemical (now Corteva) rushed to offer Enlist Duo as a quick fix to the problem, but independent scientists and USDA analysis predict that its use will inevitably foster more weed resistance.

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Agent Orange Benefits Finally Become Law

The Vietnam War ended in 1975, but it was December 2020—45 years later—that Congress passed and the President signed the *Fair Care for Vietnam Veterans Act*, providing health care benefits and disability compensation for Agent Orange (2,4-D and 2,4,5-T) exposure. The legislation, introduced by Rep. Josh Harder (D-CA) and Senator Jon Tester (D-MT) and included in the *National Defense Authorization Act*, establishes a service connection for Parkinson's disease, bladder cancer, hypertension, and hypothyroidism resulting from the use of the herbicide to defoliate the Vietnam jungle. According to the Disabled American Veterans (DAV), 83,000 former service members suffer from these diseases. The scientific literature has linked Agent Orange to the range of adverse effects and a robust report published by the National Academy of Medicine in 2016 recommended expanding coverage.

Elevating the Pest Resistance Problem in Genetically Engineered Crops

Another example of trading health and environmental protection for the support of special interests, EPA in October announced the misleading and fraudulently named, "EPA Supports Technology to Benefit America's Farmers." This time, EPA announces plans to "streamline the regulation of certain plant-incorporated protectants (PIPs)." Named to sow confusion, PIPs are plants engineered with pesticides in them. They are known in general for

two problems arising from incorporating pesticidal ingredients into crops: residues that cannot be washed off and production of crop-eating insects that are resistant to the incorporated pesticide that blankets the agricultural landscape.

EPA is proposing to exempt from regulation certain PIPs created by biotechnological techniques that are cisgenic (using genes derived from sexually compatible species), such as CRISPR. The distinction that EPA seeks to make between cisgenic plants and transgenic plants (in which the gene of interest may come from any species) is not supported by science. In fact, cisgenic techniques make use of genetic material other than the targeted genes, and that may come from species that are not sexually compatible with the crop. The bottom line: these genetically engineered organisms introduce havoc into biological systems and the local ecology.

Two important confounding aspects that EPA ignores are the likely move by the biotech industry to use multiple genetic manipulations—EPA has never been good at assessing risks of multiple stressors—and pleiotropy. (Pleiotropy is the fact that a single gene controls more than one trait, so that introduction of a genetic change may have unanticipated impacts.)

The other important effect of the use of PIPs is the certain development of resistance in pest organisms. Resistance creates severe economic impacts on farmers and the food production system because it leads to crop failures and requests to use more toxic compounds on for so-called pest emergencies. These resistance events are predictable outcomes that should not qualify for emergency use of unregistered pesticides under a loophole in the federal pesticide law. Because PIPs present a constant exposure to the pesticide, they present a constant selection pressure for resistance. Resistance to *Bacillus thuringiensis (Bt)* arising from its incorporation as a PIP in corn has resulted in the loss of effectiveness of this biological insecticide and the use of more toxic insecticides as a replacement.

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Pollinators Under Continuing Threat

Court Upholds Fish and Wildlife Service Reversal on Environmental Protections

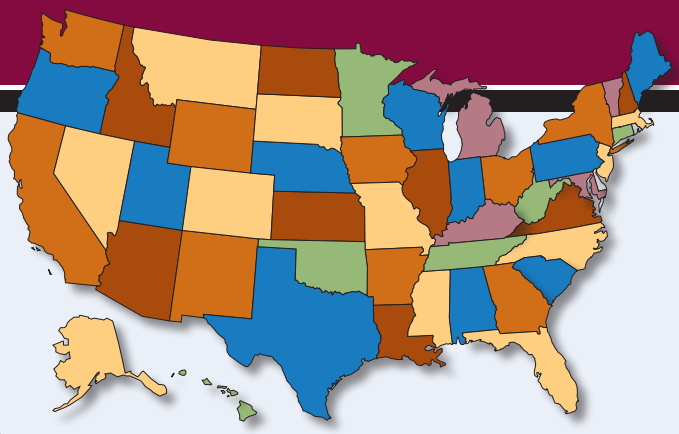
A federal judge in September dismissed an environmental lawsuit seeking to reinstate a U.S. Fish and Wildlife Service (FWS) rule, killed by the Trump Administration, which banned the use of neonicotinoid insecticides and genetically engineered (GE) crops, and adopted a precautionary approach to pest management. The decision comes on the heels of a Center for Biological Diversity (CBD) analysis that reports a 34% increase in the pesticide use on U.S. national wildlife refuge acres over a two-year period from 2016–2018.

In 2012, Beyond Pesticides and other environmental groups, led by Public Employees for Environmental Responsibility and Center for Food Safety, won a court battle to halt genetically engineered crops, and related herbicide-tolerant herbicides, on wildlife refuges in the southeast. This led to a grassroots campaign and public pressure from advocates and environmental groups, resulting in a FWS decision to adopt a national phase out of GE crops and ban neonicotinoid (neonic) insecticide use on national wildlife refuges. However, in 2018, FWS reversed the prohibition on GE crops and neonicotinoids via a memorandum that allows the refuge system to make decisions on the use of GE crops and neonics on a case-by-case basis in compliance with the *National Environmental Policy Act* (NEPA).

Pesticides Deprive Bees of Sleep, Adding to Decline

Neonicotinoid insecticides inhibit honey bee sleep cycles, leading to stress and population declines, according to the study "Neonicotinoids disrupt circadian rhythms and sleep in honey bees" out of Vanderbilt University and published in the November issue of *Scientific Reports*. Although there is already ample evidence of the dangers these systemic insecticides pose to pollinators—as evidenced by recent bans in the European Union and Canada—this new line of investigation adds further detail to the ongoing crisis in the pollinator world.

"Graphically, normal circadian rhythms look like steady waves," said Giannoni-Guzmán, PhD, the paper's co-first author. "When we observed bees that consumed neonicotinoids over several days, we saw a loss of waves, movement at random times or signs of barely any sleep at all." Disruption of the circadian clock has far-reaching implications on complex social insects like the honey bee. Many are familiar with the evidence that neonicotinoids disrupt navigation, foraging, memory, and learning in exposed bees. Circadian rhythms and sleep patterns support those critical functions. Sleep deprived honey bees are thus more likely to have difficulty returning home after foraging, and remembering or communicating through waggle dance the location of pollen and nectar.



IMPERATIVE FOR SAFER CHEMICALS

Pesticides Exacerbate COVID-19 Hazards

Responsible Response to COVID-19

There are many levels at which we confront the coronavirus with measures that prevent transmission and exposure in three areas—(i) safer disinfectants, (ii) cultural practices, equipment, and ventilation, and (iii) factors that elevate risk for contracting the virus.

Safer Disinfectants: Beyond Pesticides has provided information and a frequently updated webpage that offers information on safer disinfectants and sanitizers, given that so many on the market are hazardous materials. (See *bp-dc.org/disinfectants.*)

Cultural Practices, Equipment, and Ventilation: We have learned about social distancing, wearing face masks that block the virus without antimicrobial materials *(see "Antimicrobial Face Mask Unnecessarily Toxic" at* bp-dc.org/facemask), hand and surface washing with soap and water. Key to returning to public indoor spaces are ventilation systems for the indoor environment that filters the air. Of concern is the adoption of adequate protocol and effective ventilation equipment that enables the safe return to school buildings and other places *(see p.26,* Can Schools Be Opened Safely During the COVID-19 Pandemic?).

Factors that Elevate Risk for Contracting the Virus: It is critical in personal and institutional decision-making to understand vulnerabilities, comorbidities, disproportionate risk, and those exposures to pesticides in our daily lives that increase our risk of contracting the virus and, in fact, exacerbate potential harm. We can manage the threat of coronavirus with safer products and chemicals that do not actually increase the threat. To that end and in an effort to ensure informed and protective decision-making, the studies cited here are of concern, as we track the scientific literature on best strategies for staying safe. *(See also the new scientific data linking pesticides to respiratory illness on p.7.)*

Toxic Disinfectants Used during Pandemic Can Cause Harmful Skin Reactions

Prolonged dermal (skin) exposure to hazardous disinfectants through handling and/or residue on surfaces can induce adverse skin reactions (i.e., inflammation, burns, necrosis), according to a review analysis published in *Clinics in Dermatology.* Researchers of the review, "Dermatologic reactions to disinfectant use during the COVID-19 pandemic," examine skin reactions associated with dermal exposure to various disinfectants approved for use against COVID-19 by the European Chemical Agency (ECA) and the U.S. Environmental Protection Agency (EPA).

With the outbreak of SARS-CoV-2 (COVID-19), the global demand for disinfectants and sanitizers has increased substantially as a means of preventing illness in residential and nonresidential settings. Initially, public health officials considered disinfection highly trafficked areas as the most effective way to combat COVID-19. This notion has led to improper disinfection practices in many countries where trucks, drones, or robots disperse massive amounts of disinfectants into public areas. Furthermore, the Centers for Disease Control (CDC) has reported a sharp increase in calls to poison control centers regarding illnesses resulting from the use of toxic disinfectants during the pandemic. The World Health Organization (WHO) and other infectious disease specialists condemn indiscriminate and vast amounts of disinfectant spraying in public areas, as it is both ineffective and a health hazard on contact or when combined with other disinfectants.

The review includes ten different chemical classes: alcohols (i.e., isopropanol, ethanol), biguanides (i.e.,

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polyhexanide), α-hydroxy acids (AHA) (i.e., citric acid, lactic acid, glycolic acid), chlorine and chlorine compounds (i.e., sodium hypochlorite/bleach, sodium chloride), metal ions (i.e., silver, nano-silver), aldehydes (i.e., glutaraldehyde), peroxygen compounds (i.e., hydrogen peroxide, peroxyacetic acid), iodophors (i.e., containing iodine and a surfactant/wetting agent), phenolic compounds (i.e., cresols, hexachlorobenzene, chlorophenols), anionic surfactants (i.e., dodecylbenzene sulfonic acid), and cationic surfactants (i.e., quaternary ammonium compounds).

According to the findings, most disinfectants cause some form of acute skin irritation. Although certain disinfectants are less harmful upon dermal contact than others, many of these chemicals cause irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). ICD is a nonimmune response that manifests into a localized skin inflammation by directly damaging the skin following toxic agent exposure. ACD is an immune response to skin contact with a dermal allergen to which an individual is already allergic or sensitized, causing non-localized skin inflammation and/or systemic bodily response. However, chronic, cumulative exposure to more mild chemical irritants can still elicit a skin reaction.

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Antioxidant Deficiency, Induced by Pesticide Exposure, Linked to Deadly COVID-19 Cases

Research at the University of Wisconsin–Madison (UWM) suggests that fludioxonil—a commonly used agricultural fungicide—decreases the human body's ability to defend itself against illnesses, like COVID-19, and promotes disease permanency. Tristan Brandhorst, PhD, a scientist at UWM, notes that a pesticide-induced reduction in the antioxidant glutathione, produced in the liver (covered in "Highly Destructive Pesticide Effects Unregulated," Spring 2020, *Pesticides and You*), could be responsible for this lack of bodily defense against disease. Although many studies examine how pesticides adversely affect the human body (i.e., cancer, respiratory issues, etc.), very few studies assess how pesticides reinforce chemical disruption patterns that reduce levels of vital chemicals needed for normal bodily function. The steady rise in U.S. pesticide use, including disinfectants, threatens animals and humans, as exposure to indiscriminate dispersal of pesticides cause a whirlwind of health risks. Dr. Brandhorst stresses the need for proper reevaluation of pesticide risks, stating, "The issue needs more study [and] might also warrant a reworking of how [EPA] evaluates pesticides."

Professor Alexey Polonikov, MD, PhD, director of the Research Institute for Genetic and Molecular Epidemiology, Kursk State Medical University in Kursk, Russia—"Endogenous deficiency of glutathione as the most likely cause of serious manifestations and death in patients with the novel coronavirus infection (COVID-19): a hypothesis based on literature data and own observations"—shares his experiential and research data, which appears to intersect with Dr. Brandhorst's findings: "Based on an exhaustive literature analysis and [my] own observations, I proposed a hypothesis that glutathione deficiency is exactly the most plausible explanation for serious manifestation and death in COVID-19 infected patients. The major risk factors established for severe COVID-19 infection and relative glutathione deficiency found in COVID-19 infected patients with moderate-to-severe illness have converged me to two very important conclusions: (1) oxidative stress contributes to hyper-inflammation of the lung leading to adverse disease outcomes, such as acute respiratory distress syndrome, multiorgan failure and death; (2) poor antioxidant defense, due to endogenous glutathione deficiency as a result of decreased biosynthesis and/or increased depletion of GSH [glutathione], is the most probable cause of increased oxidative damage of the lung, regardless which of the factors (aging, chronic disease comorbidity, smoking or some others) were responsible for this deficit."

Communities Ban Biosolid Fertilizer Use, Questioning COVID-19 Contamination

Communities across the U.S. are restricting the use of biosolids (sewage sludge) in their jurisdictions, as researchers at Michigan Tech plan to study whether COVID-19 can persist in wastewater

and sewage sludge. While relatively unknown to many city-dwellers, the use of recycled human waste on farm fields is a common practice in many rural communities throughout the country. Issues associated with smell, runoff, and contamination are often the impetus for local leaders to investigate and consider banning their spread, but the potential for the waste to vector coronavirus gives the issue a new sense of urgency.

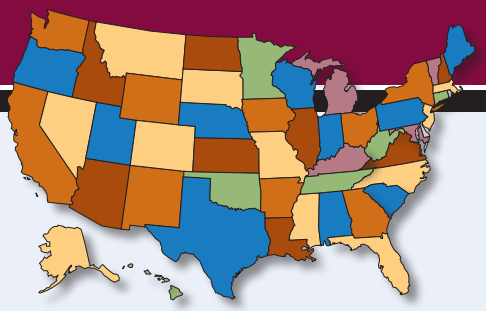
In Oklahoma, the small town of Luther voted to ban the use of biosolids on farmland in June. Local leaders looked into the safety of biosolid use, and found concerning information, including a report from the U.S. Environmental Protection Agency's Office of Inspector General, which identified over 350 pollutants in biosolids, 61 of which are considered hazardous. "The more research I did, the more I realized this is something we really need to fight and we have to all come together," said local resident and farmer Saundra Traywick to reporters. "The EPA only requires testing for nine to 12 contaminants. There's 250 contaminants that aren't being tested for."

Local leaders in Indian River County, FL have also taken action against sewage sludge use in their community. After first banning use in 2018 due to concerns over runoff into Blue Cyprus Lake causing toxic algae blooms, *TCPalm* reports that the county approved a six-month extension on the moratorium. Some county commissioners are calling on the community to make the ban permanent.

EPA Allows American Airlines to Use Unregistered Disinfectant under Emergency Authority

EPA in August granted "emergency" permission to the State of Texas to allow the use of SurfaceWise®2, an unregistered pesticide, as an antiviral surface coating. The manufacturer, Allied Bioscience, says the compound can kill coronaviruses (including SARS-CoV-2) starting at two hours post application and for up to seven days, but it is not included on EPA's List N of disinfectants effective against SARS-CoV-2. EPA has permitted this use via the authority of Section 18 of the *Federal Insecticide, Fungicide, and Rodenticide Act* (FIFRA), which allows for "emergency" use of unregistered pesticides, typically to deal with extreme threats to agricultural activities. It is rarely used for public health emergencies. Beyond Pesticides recognizes the need for protection from transmission of the novel coronavirus, and maintains that it ought to and can be done without exposing people to toxic synthetic pesticides that have not undergone evaluation for safety.

The Texas Department of Agriculture secured the EPA exemption, making the state the first to do so; Allied BioScience is pursuing this emergency waiver across all 50 states. The exemption grants American Airlines and two health care facilities in the state the ability to use the unregistered pesticide, which is applied by electrostatic spraying. Usually, a Section 18 exemption would be made absent other viable alternatives to address the problem and when there are at least minimal health and environmental safety data available for the compound; neither is the case for SurfaceWise®2.



Allied BioScience touts the compound as "non-toxic, non-irritating, odorless and contain[ing] no chemicals that produce harmful vapors or gases." Yet, on EPA's List N are a legion of products with active ingredients known as quaternary ammonium compounds or "quats," about which there are toxicity concerns. In fact, roughly half of the List N products contain a quat as the single active ingredient. An active ingredient in SurfaceWise®2 is a quaternary ammonium.

Quats have been linked to a range of human health harms, including increased risks of asthma and allergic response; mutagenicity (e.g., some quats have been shown to damage DNA in human lymphocytes at much lower levels than are present in cleaning chemicals); contact dermatitis and other skin irritation; lowered fertility; and potential and significant disruption of key cellular processes. The National Institutes of Health designates quaternary ammonium as "asthma-causing and irritable to eyes and skin, flammable and corrosive, harmful to aquatic ecosystems, and persistent in the environment." There are also concerns about quats' ability to catalyze antibiotic resistance, and impacts on the human respiratory system—of particular concern in the era of COVID-19, which in many people damages lung tissue and compromises oxygen delivery to the body's cells. The use of quats, which have been on the market since the early 20th century (before EPA began regulating potentially harmful chemicals) should be less facile—particularly during a massive public health pandemic. *(See p.30 for fact-sheet on quaternary compounds.)*

Urban Wildlife Threatened from Toxic Coronavirus Disinfectant Use

An alarming new scientific report finds that excessive, indiscriminate toxic disinfectant use against COVID-19 puts wildlife health at risk, especially in urban settings. The analysis, "Massive use of disinfectants against COVID-19 poses potential risks to urban wildlife," published in the journal *Environmental Research*, finds many of the chemical ingredients in disinfectant products are "acutely toxic to both terrestrial and aquatic animals," causing death following exposure.

Additionally, these chemicals have implications for human health, as infectious disease specialists at the World Health Organization (WHO) warn that excessive disinfectant use can cause respiratory problems, especially for those with underlying respiratory conditions. With the total U.S. COVID-19 cases rising, lack of proper disinfection guidelines and monitoring generates concerns surrounding heightened environmental pollution. The authors' analysis supports the need for global leaders to regulate the spraying of disinfectants. The authors note, "The overuse of disinfectants may contaminate the habitats of urban wildlife.…Therefore, it is important that disinfectants used to control COVID-19 in urban environments are selected and applied in ways that avoid unnecessary environmental pollution."

At least 135 animals of 17 different species (including wild boars, weasels, common blackbirds [*Turdus merula*], and other bird species) died after disinfectant exposure from spraying, according to the report. Chemical disinfectants can irritate and destroy the mucous membranes in animal and human respiratory and digestive tracts upon ingestion or inhalation.

Science Supporting Urgent Action to Eliminate Toxics in Land Management

From Environmental Degradation to the Climate Crisis

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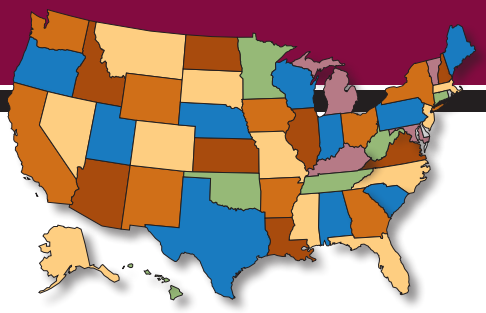
As Beyond Pesticides continues to advance land management practices, both cultural methods and products compatible with ecosystem health, the scientific literature informs our understanding of the urgency of the climate crisis and the importance of eliminating hazards that contribute to it. With this in mind, the articles cited here offer critical support to informing sound public policy and practices at the local, state, and federal level that embrace strong organic standards.

Eliminating Pesticides and Fertilizers Critical to Confronting Climate Crisis

Eliminating nitrogen fertilizers is a keystone element to mitigating the impending climate catastrophe, as research shows that agriculture is driving global nitrous oxide (N_2O) emissions higher than any projected scenario. According to the latest research, "A comprehensive quantification of global nitrous oxide sources and sinks," published by an international team of scientists in the journal *Nature,* failure to adequately address nitrous oxide emissions has the potential to impede the ability for the world to keep warming below the 2°C target established under the Paris Climate Agreement, necessitating further cuts in other greenhouse gasses. The paper is a clarion call for greater attention to agriculture's role in generating and mitigating the climate crisis.

Nitrous oxide both damages ozone and warms the atmosphere, as it is roughly 300x better at capturing heat than carbon dioxide. To account for global nitrous oxide emissions, the research team synthesized emission data from a wide range of both anthropogenic and natural sources, including consideration of the biogeochemical processes that influence N_2O release



into the atmosphere. In sum, it covers 21 natural and human related sectors between the years 1980 and 2016.

Growth in nitrous oxide emissions over these last four decades has been considerable, with human-caused release, mostly from fertilizer use on cropland, increasing by 30%.

Synthetic nitrogen applied to cropland can also be emitted from agricultural soil in the form of harmful nitrogen oxides (NO_x, NO, NO_2). In this form, nitrogen compounds not only damage the ozone layer and contribute to climate change, but also lead to the creation of smog and acid rain, increasing public health risks for asthma and other respiratory illnesses. A 2018 study, "Agriculture is a major source of NO_x pollution in California" (*Science Advances*), determined that the state of California is woefully underestimating nitrogen oxide emissions from agricultural sources.

In addition to reducing the influx of dangerous nitrogen compounds into the atmosphere, organic land management systems, on both farms and nonagricultural landscapes, sequester significant amounts of carbon from the atmosphere into on-site soil carbon. A report from the Rodale Institute, *Regenerative Organic Agriculture and Climate Change: A Down-to-Earth Solution to Global Warming*, expounds on these benefits. It reads, "Simply put, recent data from farming systems and pasture trials around the globe show that we could sequester more than 100% of current annual CO_2 emissions with a switch to widely available and inexpensive organic management practices, which we term 'regenerative organic agriculture.' These practices work to maximize carbon fixation while minimizing the loss of that carbon once returned to the soil, reversing the greenhouse effect."

Sulfur Emissions from Pesticides and Fertilizers Damage Ecosystems

Synthetic pesticides and fertilizers supersede fossil fuels as the greatest contributor of sulfur emissions in the environment, according to a study published in August, "A shift in sulfur-cycle manipulation from atmospheric emissions to agricultural additions," a National Science Foundation (NSF)-funded study, published in *Nature Geoscience*. Particularly, atmospheric sulfur dioxide and reactive sulfur emissions contribute to sulfur deposition through acidic rain and snow, causing a multitude of human and animal of health problems and environmental degradation. Although some U.S. policy regulations curb sulfur emissions from atmospheric sources, alternative sulfur inputs from agricultural sources can cause similar issues as atmospheric sulfur emissions, including acid rain.

With peak sulfur concentrations from agricultural outputs up to ten-fold higher than previous 20th-century sulfur levels, studies like these are significant in understanding how underrepresented pollution sources may contribute to overall environmental pollution. Philip C. Bennett, PhD, program director in NSF's Division of Earth Sciences, research results "…illustrate the intertwined nature of natural and human-driven biogeochemical cycles, and reveals new implications of sulfur in

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our environment, including effects on nutrient availability and runoff, food production and toxic metals."

Climate Crisis Brings the Release of Toxic Pesticides from Glacier Melt

Persistent organic pollutants (POPs), including banned and current-use pesticides are present in snow and ice on top of Arctic glaciers, according to the study, "Atmospheric Deposition of Organochlorine Pesticides and Industrial Compounds to Seasonal Surface Snow at Four Glacier Sites on Svalbard, 2013–2014," published in *Environmental Science & Technology*.

Past research finds that air contaminated with these environmentally bioaccumulative, toxic chemicals drift toward the poles, becoming entrapped in ice under the accumulating snowfall. As the global climate continues to rise and the climate crisis worsens, studies like this become significant, as glaciers encapsulating these toxic chemicals are melting. Upon melting, some chemicals can volatize back into the atmosphere releasing toxicants into air and aquatic systems, with the ensuing consequences.

As global warming progresses and the melting glaciers release more POPs into waterways, exposure concerns will increase significantly, especially for children who are more vulnerable to toxic effects of chemical exposure. To mitigate the risks associated with chemical exposure from toxic pesticides, advocates say that the manufacturing and use of pesticides must be addressed first and foremost. If pesticide use and manufacturing are amplifying the impacts of the climate crisis, advocates argue that it is essential to incite change at the point source through statutes and regulation that eliminate use.

This study quantifies POPs accumulation deposited on Arctic snow over one winter using four glaciers of various altitudes (Holtedahlfonna, Kongsvegen, Lomonosovfonna, and Austfonna) across Svalbard (a Norwegian archipelago). While the presence of POPs in Arctic air is well-known, much less is understood about atmospheric deposition. To identify what chemicals are present, researchers collected and analyzed 12 snow samples from each glacier site, surveying for 36 pesticides and seven industrial chemicals with Gas Chromatography-Mass Spectrometry (GC–high-resolution MS).

All seven industrial chemicals and 13 pesticides are detectable at all glacier sampling sites, with the total fluctuation of pesticide concentrations greater than industrial chemicals at all sites, according to the study. The seven industrial chemicals include hexachlorobutadiene, 1,2,3,4-tetrachlorobenzene, 1,2,4,5-T4CB, pentachlorobenzene, pentachloroanisole, 3,4,5,6-tetrachlorodimethoxybenene, and hexachlorobenzene. The 13 pesticides include heptachlor, heptachlor epoxide B, aldrin, α-and γ-hexachlorocyclo-hexane (HCH), chlorpyrifos, *trans*- and *cis*-chlordane, 4,4'-DDE, dieldrin, dacthal (DCPA), *trans*-nonachlor, and α-endosulfan Chlorpyrifos, dieldrin, and *trans*-chlordane dominate most Arctic areas, accounting for at least 50% of the total pesticide concentrations at each sample site.

Rising Water Temperature and Pesticide Exposure Harm Coral Reef Fish

Climate change and pesticide pollution are known to put coral reef fish at significant risk, but research, "Anthropogenic stressors impact fish sensory development and survival via thyroid disruption," published in *Nature Communications* in July, shows how these risks can be both overlapping and synergistic. "Fish face a variety of human-induced stressors including increasing water temperatures and pollution from agricultural pesticides," says study coauthor William Feeney, PhD at Griffith University (AUS). According to researchers, both of these stressors alone harm the endocrine (hormone) system and are subsequently

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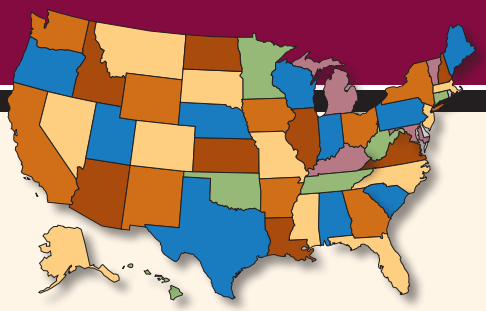
exacerbated in combination with each other. To study the impact of climate change and pesticide pollution, researchers exposed confined surgeonfish (*Acanthurus triostegus*) to varying levels of water temperature increases, as well as varying levels of the insecticide chlorpyrifos. The scientists then observed how these changes affected the level of hormones the fish were expressing, and how they acted in the presence of predators.

"Both a three-degree temperature increase and exposure to pesticide led to a decrease in the amount of thyroid hormones in exposed fish," said Marc Besson, PhD, lead author, from PSL Research University, Paris. "These hormones control the development of sensory structures such as the retina, the nostrils and the lateral line, which enables fish to detect nearby water movement."

When exposed to stressors during metamorphosis from an egg into a juvenile fish, this can significantly impact a fish's success in the wild. "This matters because animals use their sensory systems to inform ecologically important behaviours, such as their ability to identify and respond to predators," said Dr. Feeney. By failing to consider the environment holistically, we create large blind spots that limit our ability to enact comprehensive change that truly improves ecosystem health.



Local and State Action Leads the Nation

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Local and state action is critical to change and typically leads the way on critical issues of environmental and public health protection. Local decision-makers, elected officials, and community residents express a keen awareness of the urgent need to protect community health, the local ecosystem, and the global environment. With consideration of the science, local municipalities across the country are adopting organic management on farms, playing fields, and rights-of-way, and in parks, schoolyards, and backyards. In so doing, local communities are leading the nation in protecting public health, and playing an instrumental role in addressing the devastating decline in biodiversity, while confronting the climate crisis by eliminating petroleum-based pesticides and synthetic fertilizers and nurturing soil systems that sequester atmospheric carbon.

South Portland, ME Bans Synthetic Fertilizers in Its Jurisdiction

In expanding its land management ordinance in November, the South Portland, ME City Council amended its pesticide ban ordinance with a provision that eliminates synthetic fertilizers. The language draws on allowed materials under USDA's organic program's *National List of Allowed and Prohibited Substances*, limiting fertility to organic compatible soil amendments, except in the case of waivers. If the managers of "performance turf" (grounds used for athletic fields or golf courses) or new developments (municipal authority to restrict pesticides in Maine is not preempted by state law) would like to seek a waiver from a community panel (Land Management Advisory Committee), they must show that it has carried out an organic systems management plan which identifies the soil testing results, cultural practices schedule (aeration, overseeding, mowing height, etc.), fertility practices and, schedule, and other inputs (e.g. pesticides, soil supplements) and schedule of application.

Philadelphia, PA Passes Herbicide Ban that Encourages Transition to Organic

The Philadelphia City Council in December passed Bill #200425, known as *Healthy Outdoor Public Spaces* (HOPS), a sweeping ban of herbicides (weed killers) on its public property that stops short of banning all toxic pesticides, while encouraging the adoption of organic land management. With wide support for broad pesticide restrictions from public health and labor groups, scientists, and land managers, the bill was adopted by a unanimous vote. The effort was spearheaded by Toxic Free Philly, a group of local residents deeply concerned about the impacts of pesticides on health and the environment. While the hearing record and the bill's language indicates a clear spirit and intent to move Philadelphia's public spaces to organic practices, advocates cite the importance of public involvement and oversight to ensure their goals are achieved.

California Legislature Votes to Ban Highly Hazardous Rodenticides

The California legislature in August voted to ban, with limited exceptions, the use of highly toxic rat poisons. The *California Ecosystems Protection Act of 2020,* AB 1788, was passed after over a year of advocacy by groups and individuals concerned about the impact of second-generation anticoagulant rodenticides (SGAR) on state and local wildlife. Proponents of the legislation are advocating that lawmakers in other states follow California's lead by passing similar legislation. Governor Gavin Newsom signed the bill into law on September 29, 2020.

Science Comments Submitted to Keep Toxic Herbicides Out of Lake Tahoe

Beyond Pesticides joined with the Toiyabe Chapter of the Sierra Club to urge that

alternatives to herbicides be the chosen approach for managing Lake Tahoe, urging that no herbicides be used to manage vegetation in this treasured and sacred ecosystem. The Tahoe Regional Planning Agency and Lahontan Regional Water Quality Control Board (TRPA/LRWQCB) accepted comments on a draft environmental impact report/environmental impact statement (EIR/EIS) analyzing environmental impacts of a proposed Tahoe Keys Lagoons Aquatic Weed Control Methods Test. The groups urged the authorities to adopt Action Alternative 1: Testing of Non-Herbicidal Methods Only is the environmentally best choice and should be selected for the proposed weed control test program. The comments are being reviewed.

Massachusetts Enacts New Measures for Mosquito Management with Pros and Cons

Massachusetts lawmakers finalized in July, and the Governor subsequently signed, emergency legislation, aimed at revamping the state's approach to mosquito management. The final version of this mosquito reform bill continues to include certain problematic provisions, but nonetheless represents a significant shift from an initial proposal, proposed by Governor Charlie Baker (R), that would have allowed the blanket spraying of mosquito adulticides throughout the Commonwealth with little oversight, notification, or transparency. "Though many cooks had a hand in the process, the resulting final bill was strengthened by advocates," said state Senator Jo Comerford, chair of the state's Joint Committee on Public Health, in an emailed statement to supporters. "I'm pleased that we were able to build in strong protections for both the environment and human health."

The Massachusetts Department of Public Health (DPH) had indicated that the state faced higher risks of mosquito-borne disease, particularly Eastern Equine Encephalitis (EEE), for which outbreaks generally last two or three years. The state saw 12 human cases of EEE and four deaths from the disease in 2019; EEE was also confirmed in nine livestock animals. In 2020, sporadic reports of EEE have been found, but the state considers the current risk level "low."

A coalition of advocacy groups urged that lawmakers improve safeguards within the legislation. The updated legislation ultimately passed by lawmakers improves transparency around making public health determinations, requires 48 hours prior notice to the public before mosquito spraying, sets a process to allow people and communities to opt-out of spraying, and sunsets all new powers within the bill after two years. Most importantly, over the course of the next two years, the legislation establishes a Mosquito Control for the Twenty-First Century Task Force, which will be overseen by a range of stakeholders. As Senator Comerford, who pushed for the task force, wrote, "Our current mosquito management system is a relic from the 1950s, and I am hopeful that the Task Force recommendations will lead to a more modern system that recognizes the latest evidence about effective mosquito management and environmental protection."

In the meantime, the bill will provide outsized powers to state officials to conduct mosquito spray campaigns throughout the state. Public Employees for Environmental Responsibility (PEER) has filed a complaint with the state Inspector General, challenging the efficacy of the state's adulticide-focused spray program. Responsibility (PEER), regarding the post efficacy

New York Bans Glyphosate (Roundup) on State Land

The New York State Legislature passed in July (and was signed by the Governor in December) a bill that bans the use of all glyphosate-based herbicides on state properties by December 31, 2021. Nevertheless, such piecemeal, state-by-state, town-by-town initiatives represent mere "drops" of protection in an ocean of toxic chemical pesticides to which the U.S. public is exposed.

The bill represents a piecemeal approach to regulating hazardous pesticides, as many communities across the country transition from chemical-intensive land management to organic systems that do not use toxic pesticides.

The bill—titled "An Act to amend the environmental conservation law, in relation to prohibiting the use of glyphosate on state property"—was introduced in 2019 and sponsored by New York State Assembly Member Linda B. Rosenthal (D/WF) and State Senator José Serrano (D,WF) adds a new subdivision to section 12 of the state's environmental conservation law, prohibiting "any state department, agency, public benefit corporation or any pesticide applicator employed thereby as a contractor or subcontractor to apply glyphosate on state property." More than 50,000 gallons of glyphosate-based herbicides were applied in public spaces across the entirety of the state, as reported in 2019 by Bronx.com.

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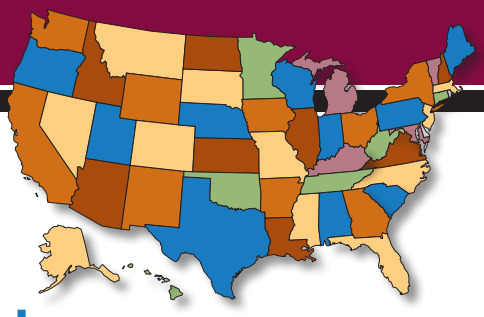
Bayer-Monsanto Chalks Up Court Victory that Takes Cancer Warning Off Roundup™—Glyphosate

A court decision in California, challenging a cancer warning on products containing the weed killer glyphosate, highlights the distinct ways in which scientific findings are applied under regulatory standards, in toxic tort cases evaluated by juries, and by consumers in the marketplace. These differences came into focus as a U.S. court quashed California's decision to require cancer warning labels on glyphosate products on June 22. The ruling, by Judge William Shubb of the U.S. District Court for the Eastern District of California, bars the state from requiring labeling that warns of potential carcinogenicity on such herbicides.

The 2015 cancer finding by the International Agency for Research on Cancer spurred the California Office of Environmental Health Hazard Assessment, in the same year, to announce that glyphosate would be listed as a probable cancer-causing chemical under *California's Safe Drinking Water and Toxic Enforcement Act of 1986* (Proposition 65 or Prop 65). With that announcement came another: the state would mandate that cancer warning labels be applied to glyphosate-based products in the state when any of four legal requirements were met.

Prop 65 requires businesses to "provide warnings to Californians about significant exposures to chemicals that cause cancer, birth defects, or other reproductive harm. Monsanto's campaign against glyphosate restrictions had been mostly unsuccessful, except that EPA declared in 2017 that glyphosate is likely not carcinogenic. Following California's Prop 65 listing in 2017, Monsanto sued the state to challenge that listing in Fresno County Superior Court and lost. The company then brought suit (along with a variety of industry stakeholders) against California in federal court in late 2017, claiming that the state's plan to require manufacturer labeling constitutes "unconstitutional forced speech." The court agreed and found that "California has [other] options available to inform consumers" of its listing.



PFAS "Forever Chemicals" Found in Mosquito Pesticide

Raises Concerns Over Widespread Contamination

Shutterstock/Steve Skjold

PFAS (per and polyfluorinated alykyl substances) "forever chemicals" are being detected in a commonly used mosquito pesticide known as Anvil 10+10, according to reporting in the *Boston Globe,* based on independent testing from a watchdog group and state regulators. PFAS are a large family of nearly 5,000 chemicals that may never break down in the environment and have been linked to cancer, liver damage, birth and developmental problems, reduced fertility, and asthma. The chemicals already disproportionately contaminate people of color communities, and there is evidence they reduce the efficacy of vaccines. While many may be familiar with PFAS for its use in nonstick cookware, electrical wire insulation, personal care products, food packaging, textiles, and other consumer goods, its presence within an already toxic pesticide is alarming. Perhaps most concerning, neither the manufacturer nor regulators have a good understanding of how exactly PFAS chemicals made their way into pesticide products.

"This is an issue that cuts to the core of what's wrong with our federal system for regulating pesticides," said Drew Toher, community resource and policy director at Beyond Pesticides. "The finding makes it imperative that EPA review and disclose full pesticide formulations before allowing the public to be exposed to unknown hazards."

Watchdog group Public Employees for Environmental Responsibility (PEER) conducted a preliminary test on Anvil 10+10 this fall, detecting presence of PFAS in a 2.5 gallon jug. "Our tests revealed that Anvil 10+10 contains roughly 250 parts per trillion (ppt) of perfluorooctanoic acid (PFOA), and 260–500 ppt of hexafluoropropylene oxide dimer acid (HFPO-DA), a GenX replacement for PFOA," the group wrote in a letter to EPA and state regulators. Concerned by the results, the Massachusetts Department of Environmental Protection initiated its own testing directly from 55 gallon drums of the product. Not only was PFAS found, some of the detections exceeded safety limits recently enacted by the state for drinking water. Although EPA does not currently regulate PFAS, it established a 70 ppt Lifetime Health Advisory for PFOA and PFOS in drinking water.

Because of the pervasiveness and persistence of PFAS, the chemical is showing up on farms and contaminating food. In Maine, according to the *Portland Press Herald*, "Milk from a Central Maine dairy farm contained levels of a harmful "forever chemical" that were 60 to 150 times higher than health standards, triggering a state investigation and raising new concerns about PFAS contamination on farms."

Living in Sync with Ecosystems Yields Farm Productivity and Health Benefits

Biological Control for Slugs Shows Promise

Researchers at Oregon State University recently made a promising discovery that could significantly improve the ability for North American farmers and gardeners to manage invasive, crop damaging slugs. It is not a "pesticide," but a nematode (*Phasmarhabditis* spp.), a microscopic animal whose phylum (closely related) contains potentially millions of different species. Oregon State researchers think they have found the specific type of nematode that will parasitize and kill *Deroceras reticulatum*, also known as the grey garden slug. The study underscores the critical importance of funding and supporting research on biological controls and other nontoxic pest management approaches.

Researchers were keyed into the potential to use nematodes for slug biocontrol by a product that has been successfully used in Europe for over 25 years, known as Nemaslug. However, the product is not registered by EPA. Study coauthor Rory Mc Donnell, PhD, said. "If we can provide evidence it's native, that makes a strong case for developing it as a bio-control. But we want to make sure there are no effects on native slugs or snails. We don't want bio-control gone awry. That's very, very important."

To determine whether slug-predator nematodes are present in the U.S., scientists took nematode samples from Oregon fields and compared them to the Nemaslug strain, as well as other nematodes found throughout the world. Through a series of tests and DNA sequencing, it was determined that the strain found in Oregon is nearly identical to those in Nemaslug. The only difference is the absence of one bacterial species usually found around the specific nematode, and in the Nemaslug product. Subsequent testing found that several nematode species found in North America have the potential to kill garden slugs.

Eating Organic Reduces Risk of Type 2 Diabetes

Reinforcing a body of scientific evidence, research finds that eating organic food lowers one's risk of developing type 2 diabetes. One in 10 (34 million) Americans are afflicted with type 2 diabetes, and one in three (88 million) with prediabetes.

The results of the study, "Prospective association between organic food consumption and the risk of type 2 diabetes: findings from the NutriNet-Santé cohort study," published by a team of French and American researchers in the *International Journal of Behavioral Nutrition and Physical Activity*, reinforce the triple bottom line benefits of organic food for public health, the environment, and the wider economy.

Scientists used data from NutriNet-Santé, a massive study including over 170,000 participants (averaging 52 years old) who regularly respond to questions concerning lifestyle, dietary intake, body type, physical activity, and health status. Roughly 33,000 NutriNet-Santé participants completed a food frequency questionnaire regarding how often they consume organic food. After four years, 293 surveyed individuals had been diagnosed with type 2 diabetes. Researchers then looked at how organic food consumption affected the risk of developing the disease, adjusting for body mass index, gender, family history of diabetes, physical activity, education, economic status, occupation, smoking, and alcohol consumption.

Higher organic food consumption was found to be inversely associated with the risk of developing type 2 diabetes. In fact, for every 5% increase in

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Ohio State University Extension

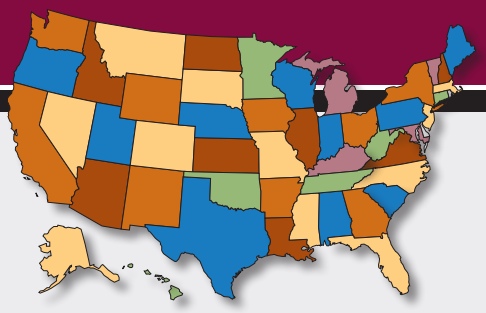
the proportion of organic foods in one's diet, risk of type 2 diabetes decreased by 3%. When comparing the group with the highest proportion of organic food in their diet to those with the lowest, individuals in the high consumption group were 35% less likely to develop the disease.

Crop Diversity Yields Benefits

A study by researchers at the University of California, Santa Barbara (UCSB), "The ecology of crop pests," published in *Science Daily* in November, finds that crop diversity in commercial agriculture is just as essential to supporting a stable biological system as plant diversity on noncommercial landscapes. Furthermore, less diverse crop areas lead to higher, more intensive pesticide use, indicating a threat to environmental and human health, as well as food security. Researchers note, "While [crop] complexity increases stability and reduces high deviations in insecticide use, accounting for crop and farmer-specific characteristics is crucial for statistical inference and sound scientific understanding."

Researchers evaluated how crop and landscape diversity affect pest populations, using insecticide use data as a surrogate for pest pressures from the Kern County Agricultural Commissioner (CAC), California, over the period 2005 to 2017. Crop data includes crop type, acceptable field size, field and farmer permit number, and active dates for the field. The research finds that more complex/diverse croplands and landscapes boast lower pest populations and lower levels of insecticide use. Furthermore, larger, less diverse croplands have higher concentrations of insecticide use with more variation in the type of pesticides used when compared to smaller, more diverse crop areas. The study's authors mention, "We find increasing cropland in the landscape and larger fields generally increase the level and variability of pesticides, while crop diversity has the opposite effect."

Since the 1940s, ecological theory maintains that greater diversity promotes the stability of an ecosystem. However, U.S. commercial agriculture and noncommercial landscapes have become more chemically dependent and less diverse. This study adds to the growing body of scientific research supporting the same conclusion that larger, monoculture croplands contain higher concentrations of pests, thus higher pesticide use. Pesticides, to control many wild plant species on noncommercial landscapes—mainly for aesthetic purposes—not only limits pollinator foraging habitat, but also causes harm to pollinators and other animals upon exposure.



Study Shows Organic Food Diet Reduces Glyphosate Residues in Body

Levels of the notorious herbicide compound glyphosate in the human body are reduced by 71% through a one-week switch to an organic diet, according to "Organic diet intervention significantly reduces urinary glyphosate levels in U.S. children and adults," published in *Environmental Research* in October.

The researchers write, "Recent research indicates that the increase in use of glyphosate has been paralleled by an increase in exposure of the human population, at least in the U.S. It was reported that urine glyphosate levels increased more than five-fold from the mid-1970s to 2014, and that the percent of the population with detectable urine glyphosate levels increased nearly 600%, representing more than 70% of the population."

Plant Diversity Enhances Productivity, Reduces Pesticide Use

Higher rates of plant diversity can limit pest pressure and reduce the need for pesticide use, finds a study published in "Biodiversity enhances the multitrophic control of arthropod herbivory" (*Science Advances*) in November.

With rampant declines in insect biodiversity from the ongoing insect apocalypse, it is critical that farmers and ecologists better understand the natural interplay between plants and insects, and the important ecosystem services that flow from these interactions. "Our experiments show that conserving plant diversity provides multiple benefits for controlling herbivore pests, which could play a key role in reducing inputs of agrochemicals and enhancing plant

productivity," said study coauthor Andrew Barnes, PhD.

Scientists investigated the importance of plant biodiversity by studying 487 arthropod food webs in two ongoing biodiversity experiments—one known as The Jena Experiment, based in Central Europe, and another, Cedar Creek Biodiversity Experiment, in the state of Minnesota. Both sites established blocks of plant diversity gradients, flowing from monoculture plots to those with 16 species or more. Researchers aimed to investigate how insect food webs and feeding behavior, plant biomass, and pest predator response changes as a function of plant biodiversity. Results show that higher plant diversity resulted in an insect (herbivore pest) feeding rate that is 44% lower than that found in areas containing a monoculture of only one plant species. Thus, greater rates of plant diversity may be expected to produce higher yields, on balance, than monoculture fields when pest pressure is taken into account. "That ultimately means that where multiple species are planted together, this will yield more plant biomass per square meter, and each individual plant in diverse mixtures will receive lower damage from herbivores," Dr. Barnes indicates.

Natural Areas Surrounding Farmland Critical to Reducing Pesticide Use

Natural areas around farmlands play an important role in managing pest outbreaks and therefore reducing insecticide use, according to "Landscape simplification increases vineyard pest outbreaks and insecticide use," published in the *Ecology Letters* in October. While industrial agriculture puts pressure on farmers to grow single crops on ever larger farms to achieve economies of scale, these monoculture landscapes have significant downsides for public health and the environment. "Overall, our results suggest that simplified landscapes increase vineyard pest outbreaks and escalate insecticide spray frequencies," said lead author Daniel Paredes, PhD, to the *Daily Democrat* (California). "In contrast, vineyards surrounded by more productive habitats and more shrubland area are less likely to apply insecticides."

To investigate the effect of nearby landscapes on farm pest pressure, the team of University of California, Davis scientists used a database created by the government of Spain. For 13 years, the government monitored 400 Spanish vineyards for the presence of the European Grapevine Moth. The moth is a notorious vineyard pest (discovered in California vineyards in 2009), laying three generations of eggs on grapes. In the first generation, the moth larvae will web and feed on flowers. In the second and third, they feed on berries, damaging harvests.

Results show that pest outbreaks above levels that cause significant economic damage are much more likely when farms are surrounded by other vineyards. The effect was particularly pronounced with the second and third generation of moths, which cause the most widespread damage. "At harvest, we found pest outbreaks increased fourfold in simplified, vineyard-dominated landscapes compared to complex landscapes in which vineyards are surrounded by semi-natural habitats," said Dr. Paredes.

Biological Management Has Added Billions in Benefits to Agricultural Economies

While the Green Revolution is often heralded in conventional agriculture circles as the key agricultural innovation of the last century, new research finds that biological controls has had the greatest beneficial impact on world crop production. The study, "Ecological Pest Control Fortifies Agricultural Growth in Asia–Pacific Economies," published in *Nature Ecology* and Evolution in August, finds that the introduction of predators to manage non-native pest species is just as important as the introduction of new cereal grain varieties.

"Our work constitutes an empirical demonstration of how insect biological control helped solidify the agrarian foundation of several Asia-Pacific economies and, in doing so, places biological control on an equal footing with other biological innovations such as Green Revolution germplasm," said study coauthor Michael Furlong, PhD, of the University of Queensland, Australia.

"Biological control delivered durable pest control in myriad Asia-Pacific agriculture sectors, permitting yield-loss recoveries up to 73%, 81% and 100% in cassava, banana and coconut crops respectively," said Dr. Furlong. "The ensuing economic dividends are substantial, as pest-induced losses up to US $6.8, $4.3 and $8.2 billion annually for the above crops were offset (at respective values of $5.4–6.8 billion, $1.4–2.2 billion and $3.8-5.5 billion/year, for a conservative to high impact scenario range). As many of the underlying programs were run on a shoestring, the rate of return on biological control science is extraordinary." Overall, the authors indicate that biological controls have brought approximately $20 billion to the Asia-Pacific farm economy on an annual basis.

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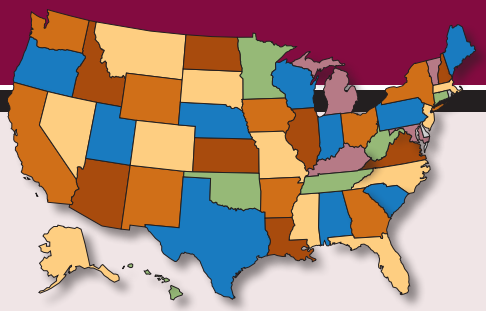

Managing Mosquitoes

Human Environment Increases the Prevalence of Disease Carrying Mosquitoes

Disease carrying mosquitoes are more likely to flourish in areas being altered by human activities, according to "Human practices promote presence and abundance of disease-transmitting mosquito species," published by scientists at Oregon State University in *Scientific Reports* in August. As climate change facilitates the spread of mosquitoes into new regions throughout the world, managers are struggling with the drivers of mosquito-borne disease in order to establish effective mitigation measures. "People care a lot about what environment a lion needs to succeed in; we've researched that extensively. But people don't do that with mosquitoes. We don't understand them as a group of species and how their ecology differs between species," said study coauthor Brianna Beechler, PhD, a disease ecologist and assistant professor of research in Oregon State University's Carlson College of Veterinary Medicine.

Authors of the study note that most mosquito collection occurs opportunistically, with samples taken at known mosquito breeding sites. To better understand mosquito spatial ecology, scientists conducted paired sampling at locations inside and outside South Africa's Kruger National Park, the largest nature preserve in the country. Each sample location inside the park was paired with another sample from a similar location (in terms of landscape and climatic conditions) in developing areas outside of the park. Human disturbance was measured by five factors, including (i) pesticide use, (ii) nutrient loading, (iii) human population density, (iv) biomass of grazing animals, and (v) loss of vegetation.

The research looks at the impact of these hazards on disease vector

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mosquitoes, which are not widely evaluated in this comprehensive context. Each of these impacts are significantly higher, by orders of magnitude, outside the park than inside. The findings show that mosquito abundance outside the part is determined to be an average 2.9 times (ranging between 1.5 and 10 times) greater than paired sites of similar layout inside the national park.

Mosquito Resistance to Pesticides Leads to 400,000 Malaria Deaths Worldwide

Efforts to control the transmission of malaria are encountering a big, though predictable, problem: the mosquitoes that transmit malaria are developing resistance to at least five of the insecticides that have been central to limiting transmission of the disease. A study released in June, "Mapping trends in insecticide resistance phenotypes in African malaria vectors," in PLOS Biology reveals a dramatic increase in resistance to pyrethroid insecticides and DDT across sub-Saharan Africa. This signals the failure of a mainstay chemical approach to the spread of malarial mosquitoes; this same problem—resistance—is happening with chemical management of agricultural insects and weeds, and with antibiotics to treat human bacterial infections. This study underscores a point Beyond Pesticides has made repeatedly: resistance to pesticides (whether insecticides, herbicides, biocides, fungicides, or medical antibiotics) is nearly inevitable. The solution to containing the spread of malaria lies not in the use of more and different chemicals, but in nontoxic approaches that respect nature and ecological balance.

Malaria can be a deadly disease caused by female *Anopheles* mosquitoes infected with any of four varieties of the *Plasmodium* parasite. The disease kills roughly 400,000 people annually, with half that mortality in sub-Saharan Africa. The U.S. sees approximately 2,000 cases of malaria annually, primarily in people returning from countries in south Asia and sub-Saharan Africa that deal with consistent malaria threats.

In such regions, primary control strategies for these mosquito vectors during the past couple of decades have been the insecticidal treatment of bed nets (known as ITNs), and indoor residual spraying (IRS) of insecticides on walls, floors, ceilings, and eaves prior to the intensive malaria transmission season. The development of mosquito resistance to these insecticides means that existing control programs, which promote ITNs and/or IRS, are becoming far less effective. Over the course of the last two decades, deltamethrin and λ-cyhalothrin (synthetic pyrethroids), and DDT have been used for IRS, but the authors note that other classes of insecticides, such as carbamates and organophosphates, are increasingly being used for IRS.

Consumer Reports Focuses on Reducing Pesticide Residues in Diet Not Use

Consumer Reports magazine (*CR*) issued a report, "Stop Eating Pesticides," in August, which offers consumers a rating system *CR* developed and employed to help identify "the health benefits from fruits and vegetables while minimizing [the] risk from toxic chemicals." In addition to providing its analysis and ratings of the pesticide risk of a variety of produce items, *CR* recommends eating organically grown and raised foods whenever possible. It also makes a host of recommendations on federal pesticide policies and emphasizes the importance of maintaining the integrity of the National Organic Standards (of the USDA-housed National Organic Program).

Advocates say it is important that this mainstream publication has arrived at many shared, science-based assessments of the risks of pesticides. While public disclosure of the risks of pesticides, and the limits of full knowledge of the complexities of pesticide hazards is important, a wholesale transition to organic and regenerative agriculture—rather than making the public figure out which fruits and vegetables are "safer" or "less safe"—is the real answer to the health risks of pesticides in the food supply, according to Beyond Pesticides. In addition, the *CR* system does not consider the effect of food choices on workers who handle and are exposed to pesticides, impacts on the communities where pesticides are used and produced, as well as the interrelationship of pesticide use with the climate crisis and biodiversity decline.

The *CR* analysis used data from the U.S. Department of Agriculture's (USDA) Pesticide Data Program for 2014–2018. Those pesticide residue data were compiled from tests of approximately 450 pesticides across 24,000 samples of 35 different fruits and vegetables. The analysis evaluated both conventionally grown, meaning produce that is typically treated with pesticides and synthetic fertilizers, and organically grown produce; it also reviewed both U.S. produced and imported items. *CR* based its ratings on four criteria: the number of pesticides found on each item, the average amount of residue of each pesticide found on the items, the frequency with which pesticides were found on samples, and the toxicity of the pesticides detected.

The *CR* report says that consumers "can minimize the risk by choosing fruits and vegetables grown with fewer and safer pesticides." To that end, the analysis proposes to "help consumers identify which produce poses the biggest risk from pesticides," and asserts that the "good news" is that nearly "half of the nonorganic fruits and vegetables pose little risk. But about 20 percent, such as fresh green beans, peaches, and potatoes, received our worst scores; those are the ones it's most important to try to buy organic. . . . For the lowest-scoring items, eating a half of a serving or less per day poses long-term health risks to a young child."

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Beyond Pesticides emphasizes that consumption of conventionally grown produce with chemical-intensive practices—even those items that score well in *CR*'s analysis—takes both environmental and social justice tolls at the sites of food production and processing. Farmworkers, ecosystems, and biodiversity are notoriously negatively affected by the use of pesticides. Beyond Pesticides executive director Jay Feldman notes: "We contribute to environmental racism when we eat conventionally grown food because the regulations and risk assessments that support our chemical-intensive food system institutionalize disproportionate risk for black and brown people." *CR* senior policy analyst Charlotte Vallaeys, PhD is quoted in the article: "The effects of pesticides on the people who grow and harvest our food is a big part of the reason *CR* recommends buying organic when you can."

Fashion Killer: Report Finds Apparel Industry Is a Major Contributor to Biodiversity Loss

The apparel industry becomes the latest focus of industries contributing to global biodiversity loss, directly linking soil degradation, natural ecosystems destruction, and environmental pollution with apparel supply chains, in the report *Biodiversity: The next frontier in sustainable fashion* by McKinsey & Company. Although there are many studies on the fashion industry's impact on climate change, much less research discusses the impact the industry has on biodiversity.

The globe is currently going through the Holocene Extinction, Earth's 6th mass extinction, with one million species of plants and animals at risk of extinction. With the increasing rate of biodiversity loss, advocates say it is essential for government agencies to hold the fashion industry accountable for the direct (i.e., excessive agrochemical use, water consumption) and indirect (i.e., water pollution from runoff) impacts on the environment, not only to protect the well-being of animals, but humans, as well. Study researchers note, "We expect biodiversity to become an even greater concern for consumers and investors in the coming years. Covid-19, instead of slowing the trend, has accelerated it—perhaps because people now understand more deeply that human and animal ecosystems are interdependent. It's time for the apparel industry, which to date has contributed heavily to biodiversity loss, to now make bold moves in the opposite direction."