

Improving Colorado's Pesticide Protections

Comments Submitted for Consideration of the Sunset Review of the Colorado Pesticide Applicators' Act

On Behalf of the City of Boulder, Colorado

8/19/2014

Table of Contents

Introduction	3
Background	4
Sunset Review Legal Standards.....	7
Pesticide Risks	8
Pesticide Impacts and Community Responses	9
I. Children’s Exposure to Pesticides	9
II. Pollinator Exposure to Pesticides.....	11
Analysis and Legislative Alternatives	13
I. Federal Law and Authorities	13
II. Colorado’s Pesticide Laws and Authorities.....	14
a. Colorado Municipal Authority.....	14
III. Colorado Pesticide Statutes	14
IV. Model Laws In Other States	17
Recommendations for Improvement of the PAA	20
I. Amend the Colorado PAA to Establish Baseline Protections for Children and Pollinators.....	20
II. Expressly Grant Local Governments the Authority to Pass Ordinances that Further the Public Interest and Environmental Health and Safety.	20
III. Revise and Balance the Pesticide Advisory Committee to Include Local Government Representatives, Environmental/Conservation Representatives, and a Scientific and Human Health Expert.	21
Conclusion.....	22

APPENDIX A – Pesticide Risks

APPENDIX B – Model Pollinator Protections Act

APPENDIX C – Preemption Amendments

APPENDIX D – Advisory Committee Amendments

COMMENTS IN SUPPORT OF IMPROVING COLORADO PESTICIDE PROTECTIONS

Introduction

Communities across Colorado face unique needs and circumstances when it comes to providing public health and safety standards for residents and the environment in which residents live and work. Depending on these unique circumstances, pesticide use within these communities can present significant health risks to sensitive populations and ecosystems as well as all residents and the general environment.

It is recognized by both federal and state authorities that residents and local governments are best situated to identify the unique risks and impacts posed by pesticide use within their communities. Because of this recognition, Colorado state legislators should facilitate and empower local authorities to address pesticide use in a manner suited to each community's individual needs and risks, while also taking steps to improve upon baseline protections in an inadequate state-wide pesticide regulatory framework.

With this in mind, it is the goal of the proposed legislative models and solutions provided within this memorandum to achieve the following:

- **Establish baseline statutory protections for children and pollinators against pesticides;**
- **Expressly grant local governments the authority to pass ordinances that further the public interest through environmental health and safety protections; and**
- **Revise and balance the Pesticide Advisory Committee to include local government representatives, environmental/conservation representatives, and a scientific and human health expert.**

These proposed amendments to the Colorado Pesticide Applicators' Act (PAA) are necessary to improve agency operations and to further enhance the public interest. The proposed amendments are not intended to infringe on the broad authority of the state to regulate pesticides in important areas such as registration, licensing and application standards for commercial and private applicators, and labeling. By supporting and implementing these recommendations and improvements, Colorado will take important steps towards protecting the public and environment in a manner that imposes minimal burdens on the state and Colorado citizens.

Background

Colorado's PAA,¹ which regulates the use and application of pesticides, is scheduled to sunset on July 1, 2015.² The state's Department of Regulatory Affairs (DORA) is currently reviewing and evaluating the PAA, pursuant to standards set forth in section 24-34-104 of the Colorado Revised Statute.³ Under this provision of law, all regulatory frameworks and agencies are to be reviewed for reauthorization every ten years or face sunset. Sunset review must be concluded by October 15th of the year preceding the date of termination.⁴ In the present case, DORA must complete its sunset review and recommendations for reauthorization by October 15, 2014. After DORA releases its recommendations, reauthorization of the law and any incorporated amendments will then be subject to the usual legislative process.

Presently, the Colorado Department of Agriculture (CDA) is charged with the implementation of Colorado's pesticides laws. CDA exercises the exclusive authority over not only pesticide registration, review, licensing, and enforcement, but also pesticide use and application by all persons—commercial applicator,⁵ private applicator,⁶ and individuals. The CDA is also responsible for the appointment of the pesticide applicators' advisory committee, an eleven-member committee charged with assisting the commissioner in promulgating rules and regulations to carry out the provisions of the PAA.⁷ Presently, no municipal, citizen-oriented, or environmental or human health representatives sit on the committee.

While some of the exclusive authority vested in the CDA concerning commercial applicators and the general implementation of the registration and labeling framework existed since the enactment of the PAA, legislators had been careful to provide for local government authority in matters not involving commercial applicators and pertaining to individual use of pesticides on agricultural, personal, and public property. Changes made to the PAA during the 2005 sunset review, however, expanded state authority over all persons and pesticide uses. This expansion of authority occurred despite findings from the previous 1995 DORA review that public and state officials found no significant burdens on applicators or the state by allowing for local government authority.⁸

¹ Colo. Rev. Stat. § 35-10-101 *et seq.*

² Colo. Rev. Stat. § 35-10-128.

³ See Colo. Rev. Stat. § 24-34-104(8(a)(I)).

⁴ Colo. Rev. Stat. § 24-34-104(8(a)(I)-(II)).

⁵ Colo. Rev. Stat. § 35-10-103(2) (2013) ("Commercial applicator" means any person, other than a private applicator, who engages in the business of applying pesticides for hire or operating a device for hire that is designated by the commissioner as requiring licensure for use under this article.").

⁶ Colo. Rev. Stat. § 35-10-103(2013) ("Private applicator" means any person who uses or supervises the use of a pesticide for purposes of producing any agricultural commodity on property owned or leased by the applicator or the applicator's employer or, if the pesticide is applied without compensation other than trading of personal services between producers of agricultural commodities, on the property of another person.").

⁷ Colo. Rev. Stat. § 35-10-125 (2013).

⁸ See Colo. Dept. of Reg. Agencies, *Colorado Commercial Pesticide Applicators, Qualified Supervisors and Certified Operators: 1995 Sunset Review* at 31.

Yet, the 2005 preemption amendments to the PAA stripped important and long-standing local government authority to regulate non-commercial pesticide use and application.⁹ According to the 2005 Sunset Review Report, these changes were necessary to establish, under U.S. Environmental Protection Agency (EPA) standards, state-wide primary enforcement authority over pesticide application and impose stronger certification standards and compliance efforts.¹⁰

Data, however, obtained from the CDA concerning enforcement actions and penalties during the last three fiscal years (2011-2013) show that the improvements in oversight and enforcement have not been accomplished and, in fact, have been stagnant or reduced:

Comparison of Complaints, Resolved/Final Enforcement Actions, and Dismissals

Fiscal Year	Pesticide Use Complaints	Resolved Formal Use Investigations/Final Agency Actions	Cases Dismissed Out of Resolved Formal Use Investigations	% Dismissed
FFY 2013	61	46	21	45%
FFY 2012	76	59	21	36%
FFY 2011	45	46	14	30%
FFY 2004	38	114	18	16%
FFY 2003	42	129	15	12%
FFY 2002	38	92	23	25%

Comparison of Fines

Fiscal Year	No. of Cases Resulting in Fines	Total Fines Collected by Dept.	Avg. Fine*
FFY 2013	22	\$9,050	\$411
FFY 2012	16	\$22,800	\$1,425
FFY 2011	16	\$39,925**	\$2,495
FFY 2004	16/20***	\$20,550	\$1,284
FFY 2003	17/18	\$21,950	\$1,291
FFY 2002	16/22	\$43,400	\$2,716
*The average fine is shown for comparative purposes only and it should be recognized that amount of fines varies widely depending on circumstances of each case. Thus, many fines			

⁹ Colo. Rev. Stat. § 35-10-104 (2013)(“Any person who uses or supervises the use of any pesticide or device in the state of Colorado shall be subject to this article and to any rules adopted pursuant thereto.”).

¹⁰ Dept. of Regulatory Agencies, Office of Policy, Research and Regulatory Reform, *2005 Sunset Review, Colorado Pesticide Applicators’ Act*, Oct. 14, 2005.

are significantly less than the average provided, while a few may be substantially greater and occupy the majority of the figure collected.

**Data does not indicate as with other fiscal year figures that this is “collected,” so could be value of fines assessed, which is usually higher in value.

***Differing figures provided in Tables 11 and 12 of the 2005 Sunset Review Report. Lowest number used to calculate averages.

While these data do not reflect external and internal factors affecting enforcement decisions, such as resource constraints, staffing, and technical constraints, it demonstrates lagging agency efforts to ensure that existing pesticide laws and regulations are adequately being used to protect the public as intended.

Further concerns arise when taking into consideration the experiences of local governments in dealing with the CDA and its willingness to address local pesticide issues. As one city-representative described:

Some particularly problematic pesticides, such as the neonicotinoid insecticide, imidacloprid, have limits for the amount of active ingredient that can be applied annually per acre. The EPA put these protections in place for a number of reasons, including the persistence of imidacloprid in soil, where it kills earthworms and other soil invertebrates. Imidacloprid is also systemic and is taken up from the soil by plants and then distributed throughout all plant parts, including leaves, pollen, nectar and seeds. It is extremely toxic to bees and other pollinators. It is a common tree insecticide and one to two tree treatments in an acre can exceed the annual limits. This product is also used by homeowners on grass, flower beds, and shrubs. Yet CDA has no mechanism to enforce the annual limits for this pesticide and only responds on a complaint basis, when most people are unaware of the limits and there is no mechanism for commercial applicators to know if other treatments have occurred by other commercial applicators or homeowners. Under current preemption, local communities are not allowed to ensure that EPA protective standards are followed, resulting in widespread environmental harm from misuse of this pesticide.

The result is that public health and the environment have suffered. CDA’s implementation of the PAA provides few options for the public to address health, safety, and environmental concerns surrounding pesticide use, even in instances of sensitive populations like children and pollinators.¹¹ And communities that continue to show an increased interest in addressing

¹¹ See, e.g., 6 Colo. Code Regs. § 1010-6:3 (“All pesticides shall be used in accordance with registered label directions and stored in a safe manner in an area accessible only to authorized personnel. Application of “restricted use pesticides” shall be performed only by a certified pesticide applicator.”)

concerns surrounding sensitive populations and unique environmental impacts find that they are prohibited from implementing meaningful restrictions on pesticide use in accordance with local conditions and concerns. For the public interest to be supported by the PAA and its implementation, the law must change.

Sunset Review Legal Standards

When evaluating an existing regulatory framework, Colorado law requires that DORA hold public hearings to determine “whether an agency has demonstrated a public need for continued existence of the agency or function and for the degree of regulation it practices” This determination must be based on, but not limited to, the following factors:

- (I) Whether regulation by the agency is necessary to protect the public health, safety, and welfare; whether the conditions which led to the initial regulation have changed; and whether other conditions have arisen which would warrant more, less, or the same degree of regulation;
- (II) If regulation is necessary, whether the existing statutes and regulations establish the least restrictive form of regulation consistent with the public interest, considering other available regulatory mechanisms, and whether agency rules enhance the public interest and are within the scope of legislative intent;
- (III) Whether the agency operates in the public interest and whether its operation is impeded or enhanced by existing statutes, rules, procedures, and practices and any other circumstances, including budgetary, resource, and personnel matters;
- (IV) Whether an analysis of agency operations indicates that the agency performs its statutory duties efficiently and effectively;
- (V) Whether the composition of the agency's board or commission adequately represents the public interest and whether the agency encourages public participation in its decisions rather than participation only by the people it regulates;
- (VI) The economic impact of regulation and, if national economic information is not available, whether the agency stimulates or restricts competition;
- (VII) Whether complaint, investigation, and disciplinary procedures adequately protect the public and whether final dispositions of complaints are in the public interest or self-serving to the profession;
- (VIII) Whether the scope of practice of the regulated occupation contributes to the optimum utilization of personnel and whether entry requirements encourage affirmative action;
- . . .
- (IX) Whether administrative and statutory changes are necessary to improve agency operations to enhance the public interest.¹²

These standards provide the lens through which the existing PAA should be viewed and critiqued. As demonstrated by the information and analysis provided in this memorandum, the

¹² Colo. Rev. Stat. § 24-34-104 (2013).

current PAA does not meet the above standards, particularly with regard to enhancing and operating in the public interest, and must be revised to better align its standards and practices at the state-level, while also restore the right of local governments to address the individualized risks that pesticides pose in their communities in the least burdensome manner to the state.

Pesticide Risks

Colorado is no different than most state pesticide regulatory frameworks, which rely almost entirely on the U.S. Environmental Protection Agency (EPA) for chemical risk assessment and pesticide labeling standards. Risk assessments justify use patterns for widely-used pesticides based on assumptions about toxicity and exposure. Yet these traditional risk assessments are primarily skewed in favor of the continued use of hazardous chemicals because they fail to capture the most recent data on non-generic, individualized, and localized risks and effects. Because of these failures, other flaws in the system, and the slow pace in which it moves and adapts, the problems with this risk assessment and regulatory framework structure are numerous, beginning with antiquated and inadequate general risk assessment protocols and endpoints and ending with a failure to protect sensitive populations and individualized environments and ecosystems.

One of the most glaring present-day examples of the system failure is the use of a class of pesticide known as neonicotinoids and their connection to the significant pollinator declines being faced around the world, threatening food supplies and ecosystems everywhere. As noted in the recent policy announcement from the U.S. Department of the Interior, Fish and Wildlife Service, concerning its decision to ban neonicotinoids applications on National Wildlife Refuges by January 2016, “[The] prophylactic use, such as a seed treatment, of the neonicotinoid pesticides that can distribute systemically in a plant and can potentially affect a broad spectrum of non-target species is not consistent with Service policy. [FWS] make[s] this decision based on a precautionary approach to our wildlife management practices”¹³

In other words, broad EPA determinations on allowable risks of pesticides often do not account for the need for additional precautions or increased protection from the hazards to a particular environment, population, or community. Nor do the registration reviews and enforcement tools within the existing federal and state frameworks adapt efficiently enough to accommodate emerging science and concerns.

While these problems apply to nearly all of the pesticides registered and in use today, this memorandum provides in **APPENDIX A** five sample active ingredients or classes of pesticides where independent research has revealed significant risks, yet use and application standards for these pesticides remain unchanged and the risks unaccounted for. Also included in **APPENDIX A** is a discussion of the unknown and unaccounted for risks posed by pesticides.

¹³ James W. Kurth, *Use of Agricultural Practices in Wildlife Management in the National Wildlife Refuge System*, U.S. Dept. of the Interior, Fish and Wildlife Service, July 17, 2014, http://www.centerforfoodsafety.org/files/agricultural-practices-in-wildlife-management_20849.pdf.

Even more disturbing, the identified issues in this “unknowns” section reveal that little is known concerning risks like inert ingredients, endocrine disruption, and drift and volatilization for the majority of pesticides in use today.

Whether ignored, unaccounted for, or severely delayed under current federal and state safety standards, the identified areas of concern demonstrate the lapses within the regulatory system that necessitate redress through both more protective state standards and through the ability of local governments to impose individualized controls.

Pesticide Impacts and Community Responses

In Colorado, health and environmental impacts resulting from pesticide use are widespread., however, two primary issues have surfaced both in Colorado and across the nation that warrant immediate action on all levels:

I. Children’s Exposure to Pesticides

In 2012, the American Academy of Pediatrics (AAP) released a report, *Pesticide Exposure in Children*,¹⁴ acknowledging the existing regulatory inadequacies surrounding pesticide safety and risk standards as applied to children and identifying areas of significant concern surrounding pesticides exposure and children. For example, EPA tolerances developed under the Food Quality Protection Act (FQPA) were not formulated with the consideration of additional exposure to pesticide drift. Under the FQPA, EPA is required to protect children from pesticides by assessing their aggregate exposures, which includes pesticide drift. Despite this obligation, EPA has left children vulnerable to pesticide exposure through delayed completion of aggregate and cumulative risk assessments, lax application of the standards, and inadequate consideration of emerging adverse impacts like endocrine disruption and epigenetics.¹⁵ The California Department of Public Health finds that 36 percent of public schools in the state have pesticides of public health concern applied within a quarter mile of the school.¹⁶ Chlorpyrifos, methyl bromide, and malathion, chemicals known to be both toxic and persistent in the environment, are among the pesticides found to be applied near schools.¹⁷

With children, labeling, use standards, and enforcement are often not enough from a prevention perspective, especially in cases of applicator negligence where one misuse can have disastrous impacts. Such was the case in Bountiful, Utah, when two children died after

¹⁴ Council on Environmental Health, *Pesticide Exposure in Children*, Pediatrics, Vol. 130 No. 6, Nov. 26, 2012, DOI: 10.1542/peds.2012-2757 at <http://pediatrics.aappublications.org/content/130/6/e1757.full.pdf+html>.

¹⁵ M.K. Skinner et al., Pesticide Methoxychlor Promotes the Epigenetic Transgenerational Inheritance of Adult-Onset Disease through the Female Germline, PLOS One, July 24, 2014, DOI: 10.1371/journal.pone.0102091 at <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0102091>.

¹⁶ Ca. Dept. Public Health, *Agricultural Pesticide Use Near Public Schools in California*, April 2014 at <http://bloximages.newyork1.vip.townnews.com/montereycountyweekly.com/content/tncms/assets/v3/editorial/5/ea/5eae8f76-ccd6-11e3-8e1d-0017a43b2370/535af85bbc029.pdf.pdf>.

¹⁷ *Id.*

improper application on a children's residence. The Utah Department of Agriculture and Food's (UDAF) Division of Plant Industry filed multiple civil charges against Bugman Pest and Lawn, Inc. and employee Cole Nocks in connection with a February 5, 2010, application of the pesticide Fumitoxin (active ingredient: [aluminum phosphide](#)) at the residence of Nathan and Brenda Toone of Layton, Utah. The application led to the death of the Toones' two daughters ages 15-months and 4 years. Investigators discovered additional violations of the Utah Pesticide Control Act by the company and other employees, and it was determined that on February 5, 2010 applicator Cole Nocks operated in a faulty, careless, or negligent manner by misapplying the highly toxic and restricted use pesticide, Fumitoxin. Mr. Nocks's improper application allowed the pesticide to runoff or drift from the target area causing human harm, as high levels of phosphine gas were detected in the Toone residence. He failed to follow label directions and federal law by applying large amounts of Fumitoxin pellets in several locations that were within a required 15-foot buffer zone of the residence. He did not have a Fumigation Management Plan which would have required him to provide the Toones with label information, an MSDS (materials safety data sheet), and require him to return in one or two days to re-inspect the fumigated area. At the time of the application, Fumitoxin was restricted from use within 15 feet of any residence. The Utah Medical Examiner's Office determined that two children who died at the Toone residence had elevated levels of phosphorous and lung damage associated with inhaling a harmful substance which appears consistent with the above information.

Spurred by these concerns and others, many communities across the country have instituted stronger protections for children against pesticides. The following are some examples, and while many demonstrate voluntary successes in abating individual applications of pesticides or pesticides practices, these examples also highlight the struggles to implement meaningful and mandatory standards and prevent dangerous impacts:

- [Durango, Colorado](#) - Concerned parents in Durango, Colorado voiced serious concerns when they discovered a synthetic weed killer containing at least two possible carcinogens would be applied to the athletic fields before Saturday games. Though the city enacted the [Organically Managed Lands Program](#), the season's contracts with pest control companies had not yet been canceled and the ordinance only applied to city lands. The efforts of local organizers and the city council left an impression on parents, however, and the city decided to postpone all youth soccer games that were scheduled after the spray.
- [Ball State University, Indiana](#) - Plans to spray herbicides on the lawns around its K-12 school were cancelled after objections from parents who were worried that it would expose their children to toxic chemicals. The university planned to use Trimec 992, a 2,4-D product, but a petition started by parents helped to put a stop to the weedkiller.
- [New York](#) - New restrictions that ban the outdoor use of pesticides on playgrounds or playing fields in New York went into effect in November, 2010. In preparation for these new requirements at the time, the New York State Department of Environmental Conservation (DEC) released a [draft guidance](#). This guidance was intended to instruct schools and day care centers on compliance with the new law by providing information on its requirements and on allowable alternatives to pesticides for grounds maintenance. The [Child Safe Playing Field Act](#), which was enacted in [May 2010](#), requires that all schools, preschools, and day

care centers both public and private to stop using pesticides on any playgrounds or playing fields. The law allows for emergency application of pesticides for infestations if the County Health Department, the Commissioner of Health, the Commissioner of Environmental Conservation, or the school board deems it an emergency.

- [Illinois](#) – In late November of 2013, the Illinois Department of Public Health announced that it was ramping up its efforts to educate day care centers and schools about the rules aimed at reducing and managing pests in light of widespread non-compliance with pest management regulations in public schools and day care centers. State law requires public schools and licensed day care centers to file an Integrated Pest Management (IPM) form with the department to document how school officials plan to implement IPM. The state’s [Structural Pest Control Act](#) requires public schools and licensed day care centers to, when economically feasible, develop and implement an IPM program and resubmit their plans every 5 years. Additionally, all parents, guardians, and employees must be notified at least once each school year that requirements have been met.
- [Kauai and Maui, Hawaii](#) – Despite facing litigation from the chemical industry, two counties in Hawaii, Kauai and Maui, have passed legislation placing restrictions on the use of pesticides around schools, hospitals, residential areas, public roadways, and sensitive ecological sites.

II. Pollinator Exposure to Pesticides

Bees, butterflies, and other pollinators are declining at unprecedented rates, an issue threatening agricultural production and ecosystems on a global level, as well as in Colorado. The science has become increasingly clear that pesticides, either acting individually or synergistically, play a critical role in the ongoing decline.¹⁸ While studies reveal wide-ranging adverse impacts from a multitude of agents, including poor nutrition, stress, fungicides, and pathogens, the neonicotinoid class of insecticides continues to receive the greatest attention from scientists, beekeepers, and advocacy groups. Indeed, in a recent study conducted by the U.S. Geological Survey (USGS), federal researchers found that the threat posed by neonicotinoids is persistent and increasing across ecosystems.¹⁹

As evidence mounts linking the disappearance of bees to neonicotinoid use, communities have started to eliminate the use of these chemicals in face of EPA and U.S. Congress inaction. In June of last year, in Wilsonville, Oregon, an estimated 50,000 bumblebees, likely representing over 300 colonies, were found dead or dying in a shopping mall parking lot. The massive bee die-off was caused by the use of a neonicotinoid pesticide, dinotefuran, on nearby trees. Just days later, it was reported that approximately hundreds of bees were found dead after similar pesticide use in the neighboring town of Hillsboro. Elsewhere in Oregon, the city of Eugene became the first community in the nation to specifically ban from city property the use of

¹⁸ See Beyond Pesticides, *What the Science Shows*, at <http://www.beyondpesticides.org/pollinators/research.php>, an informational website with summaries and links to the most recent scientific studies on this subject.

¹⁹ U.S. Geological Survey, *Insecticides Similar to Nicotine Widespread in Midwest*, July 24, 2014, <http://www.usgs.gov/newsroom/article.asp?ID=3941#.U9f3uPldVig>.

neonicotinoid pesticides. The passage of the resolution came just one week after the Oregon State Legislature passed a pollinator protection bill that removed language requiring the restriction of neonicotinoid pesticides and, instead, includes a weaker requirement to set up a task force that will examine the possibility of future restrictions. More recently, Spokane, Washington became one of a handful of cities that have restricted the use of neonicotinoids. The Spokane City Council voted to ban city purchase and use of neonicotinoids in late June of this year. The ban does not apply to private use, but covers about 30 percent of the land in Spokane, including streets, parks, and right of way.²⁰

Communities in Colorado are also taking steps to reduce neonicotinoid use in whatever ways they can. The Melody-Catalpa neighborhood of Boulder has become the first “bee-safe” locality in Colorado that has voluntarily pledged to not use neonicotinoids and other systemic pesticides in the community. The effort aims to protect bees and other pollinators while providing safe forage and habitat. Commendable as this neighborhood effort is, citizens of Colorado lack lasting and enforceable recourse to establish community standards. Other examples of communities, as well as the federal government, taking steps to protect pollinator health include:

- [Prince Edward County, Ontario](#) - This year, Prince Edward County in southern Ontario became the first Canadian municipality, according to reports, to pass a motion prohibiting the use of neonicotinoid pesticides on municipal lands. The rural county, nestled in the heart of Ontario’s agricultural heartland, also wants the federal and provincial government to “declare a moratorium surrounding the use of neonicotinoid crop treatments, as soon as possible, pending further study.” The motion requires letters to be sent to several federal and provincial ministers—including the Prime Minister Stephen Harper, Agriculture Minister Gerry Ritz, and Health Minister Rona Ambrose—outlining the county’s position.
- [Washington, DC](#) - the White House issued a Presidential Memorandum in June on pollinator health to the heads of federal agencies requiring action to “reverse pollinator losses and help restore populations to healthy levels.” The Presidential Memorandum recognizes the severe losses in the populations of the nation’s pollinators, including honey bees, wild bees, monarch butterflies, and others. In accordance with these losses and acknowledging the importance pollinators have to the agricultural economy, the Memorandum directs federal agencies to establish a Pollinator Health Task Force, to be chaired by U.S. Department of Agriculture (USDA); develop a pollinator health strategy within 180 days; and support and create pollinator habitat. This federal strategy will include a pollinator research action plan with a focus on preventing and recovering from pollinator losses, including studying how various stressors, like pesticides, pathogens, and management practices contribute to pollinator losses. The task force will also engage in a public education initiative and develop public-private partnerships with various stakeholders.
- [U.S. Fish and Wildlife Service](#) - The U.S. Fish and Wildlife Service (FWS) issued an internal memorandum in July with an announcement that the “Pacific Region will begin a phased

²⁰ Nicholas K. Geranios, *Spokane bans chemical that may kill bees*, The Seattle Times, July 4, 2014, at http://seattletimes.com/html/localnews/2023996148_spokanebeesxml.html.

approach to eliminate the use of neonicotinoid insecticides (by any method) to grow agricultural crops for wildlife on National Wildlife Refuge System lands, effectively immediately. By January 2016, Region 1 will no longer use neonicotinoid pesticides in any agricultural activity.” The transition period will go through 2016; during that time, refuge managers must exhaust all remedies before application or use of neonicotinoids, including the use of neonicotinoid-treated seeds. Additionally, starting in 2015 all refuge managers must prepare and submit a Pesticide Use Proposal (PUP) in order to apply any neonicotinoids during the transition to the ban. This ban has also been extended to the national level.

Analysis and Legislative Alternatives

Current regulations at the federal level, and the risk assessments that inform them, often fail to take sensitive populations like children and pollinators into account, as well as the individual settings and activities of towns and communities. Yet, as demonstrated by the information provided above, scientific evidence linking the particularly detrimental effects of pesticide use around infants and children, pollinators, and other sensitive populations have stimulated both local and state-level action in jurisdictions across the country to improve protections and address sensitive population needs. These protective measures can take the form of increased restrictions on uses, all-out elimination of the use of certain classes of pesticides, increased buffer zones, and better systems management practices. Colorado residents, however, are faced with inadequate safety and environmental frameworks on which to carry out these protections.

I. Federal Law and Authorities

As noted throughout this memorandum, the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)²¹ controls pesticide labeling and registration at the federal level. When a property owner was denied a permit for aerial spraying because of a town’s pesticide application ordinance, the property owner challenged the ordinance as being preempted by FIFRA. The United States Supreme Court eventually weighed in on the issue of whether FIFRA preempted local authority and came to a clear conclusion:

FIFRA nowhere seeks to establish an affirmative permit scheme for the actual use of pesticides. It certainly does not equate registration and labeling requirements with a general approval to apply pesticides throughout the Nation without regard to regional and local factors like climate, population, geography, and water supply. Whatever else FIFRA may supplant, it does not occupy the field of pesticide regulation in general or the area of local use permitting in particular.²²

²¹ 7 U.S.C. § 136 *et seq.*

²² *Wisconsin Pub. Intervenor v. Mortier*, 501 U.S. 597, 613-14, 111 S. Ct. 2476, 2486, 115 L. Ed. 2d 532 (1991).

II. Colorado's Pesticide Laws and Authorities

a. Colorado Municipal Authority

In most jurisdictions across America, it is a recognized authority of local and municipal governments to exercise police power through the establishment of ordinances aimed at protecting the public safety and health of local citizens, so long as the state legislature has not specifically preempted the regulation. Colorado is no different.²³

Making of Ordinances § 31-15-103

*Municipalities shall have power to make and publish ordinances not inconsistent with the laws of this state, from time to time, for carrying into effect or discharging the powers and duties conferred by this title which are necessary and proper to provide for the safety, preserve the health, promote the prosperity, and improve the morals, order, comfort, and convenience of such municipality and the inhabitants thereof not inconsistent with the laws of this state.*²⁴

When instances of specific preemption do occur, as is the present case with the PAA, courts will interpret preemptive legislative scope with a presumption in favor of maintaining local authority unless expressly denied or an operational conflict exists.²⁵

III. Colorado Pesticide Statutes

Colorado's PAA and Pesticide Act²⁶ establish a detailed framework under which most pesticide registration, labeling, storage, distribution, licensing, and use is regulated. In advocating for amendments to the PAA for the reasons set forth within this memorandum, it is not the intent of the proponents of these amendments to infringe on the majority of these state-held authorities or to assert that the law is not necessary for the public interest. Pesticide regulation is absolutely necessary to protect the health and safety of Colorado citizens and thus in most areas should remain unaltered. Because of the fundamental purpose of preventing adverse effects on individuals and the environment, however, the law must be amended to account for new understandings of these adverse effects—not just on the general public and environment, but for sensitive populations as well—and to allow those best suited to identify these often localized adverse effects.

²³ See *Town of Dillon v. Yacht Club Condominiums Home Owners Association*, 325 P.3d 1032, 1038-1039 (Colo. 2014) ("Police power is an inherent attribute of sovereignty with which the state is endowed for the protection and general welfare of its citizens. Like the state, municipalities have broad police powers, including the power to establish laws that promote the health, safety, and welfare of citizens.") (internal quotations and citations omitted). This home rule authority does not extend to counties. See *Bd. Of County Com'rs, La Plata County v. Bowen/Edwards Assoc., Inc.*, 830 P.2d 1045,

²⁴ Colo. Rev. Stat. § 31-15-103 (2014).

²⁵ See *Town of Frederick v. North American Resources Co.*, 60 P.3d 758 (Colo. Ct. App. 2002)(holding that an operational conflict partially invalidated a town ordinance banning fracking...).

²⁶ See Color. Rev. Stat. § 35-9-101 et seq.

Before proposing changes to the law that will better align it with protection of the public interest and address some of the specific concerns surrounding pesticide use in local communities, however, it is helpful to review the relevant sections of the law that will inform the proposed modifications and potentially warrant amendment:

Legislative Declaration § 35-10-102

The general assembly hereby finds and declares that pesticides perform a valuable function in controlling insects, rodents, weeds, and other forms of life which may be injurious to crops, livestock, and other desirable forms of plant and animal life, to structures, and to individuals. The general assembly further finds and declares that pesticides contain toxic substances which may pose a serious risk to the public health and safety and that regulation of pesticide use is necessary to prevent adverse effects on individuals and the environment.²⁷

Scope of Article § 35-10-104

(1) Any person who uses or supervises the use of any pesticide or device in the state of Colorado shall be subject to this article and to any rules adopted pursuant thereto.²⁸

Statewide Uniformity of Pesticide Control and Regulation – Exceptions § 35-10-112.5

(1) The general assembly hereby determines that the citizens of this state benefit from a system of safe, effective, and scientifically sound pesticide regulation. The general assembly further finds that a system of pesticide regulation that is consistent and coordinated, that creates statewide uniform standards, and that conforms with both state and federal technical standards and requirements is essential to the public health, safety, and welfare, and finds that local regulation of pesticides that is inconsistent with and adopts different standards from federal and state requirements does not assist in achieving these benefits. The general assembly also finds and declares that, through statute and regulation, the state has created a system of pesticide regulation based upon scientific standards that protects the citizens of this state. The general assembly expressly finds and declares that pesticide regulation is a matter of statewide concern.

(2) No local government shall adopt or continue in effect any ordinance, rule, resolution, charter provision, or statute regarding the use of any pesticide by persons regulated by this article or federal law and pertaining to:

(a) Any labeling or registration requirements for pesticides, including requirements regarding the name of the product, the name and address of the manufacturer, and any applicable registration numbers;

²⁷ Colo. Rev. Stat. § 35-10-102 (2013).

²⁸ Colo. Rev. Stat. § 35-10-104 (2013).

(b) Use and application of pesticides by persons regulated by this article or federal law, including, but not limited to, directions for use, classification of pesticides as general or restricted use, mixing and loading, site of application, target pest, dosage rate, method of application, application equipment, frequency and timing of applications, application rate, reentry intervals, worker specifications, container storage and disposal, required intervals between application and harvest of food or feed crops, rotational crop restrictions, and warnings against use on certain crops, animals, or objects or against use in or adjacent to certain areas;

(c) Except as specifically provided in this article, any warnings and precautionary statements, notifications, or statements of practical treatment; or

(d) Licensure, training, or certification requirements for persons regulated under this article, including any insurance and record-keeping requirements.

(3) (a) Nothing in this article may be construed to limit the authority of a local government as defined by state law to:

(I) Zone for the sale or storage of any pesticide, provide or designate sites for disposal of any pesticide or pesticide container, adopt or enforce building and fire code requirements, regulate the transportation of pesticides consistently with and in no more strict of a manner than state and federal law, adopt regulations pursuant to a storm water management program that is consistent with federal or state law, or adopt regulations to protect surface or groundwater drinking water supplies consistent with state or federal law concerning the protection of drinking water supplies;

(II) Take any action specifically authorized or required by any federal or state law or regulation with respect to pesticides, or to take any action otherwise prohibited by this article in order to comply with any specific federal or state requirement or in order to avoid a fine or other penalty under federal or state law;

(III) Regulate the use of pesticides on property owned or leased by the local government;

(IV) Issue local general occupational licenses to persons regulated by this article.

(b) This subsection (3) may not be construed to authorize a local government to utilize the authority to zone, to provide or designate disposal sites, to adopt and enforce building and fire codes, or to regulate the transportation of pesticides as described in paragraph (a) of this subsection (3) to directly or indirectly regulate or prohibit the application of pesticides by persons regulated by this article or by federal law.

(c) Nothing in this article shall be construed to be an implicit grant of authority to a local government that is not otherwise granted by state law.

(4) Any local government that promulgates an ordinance that concerns pesticides, that is promulgated pursuant to section 31-15-707(1)(b), C.R.S., or that is promulgated pursuant to any authority described in paragraph (a) of subsection (3) of this section concerning pesticides shall file the following with the department of agriculture:

(a) A certified copy of the ordinance; and

*(b) A map or legal description of the geographic area that the local government intends to regulate under the ordinance.*²⁹

IV. Model Laws In Other States

There are 20 states across the United States that uphold local government regulation of pesticide use. Most of these states have adopted state pesticide laws that do little more than reiterate the labeling, licensing, and registration requirements of FIFRA. More importantly, many of these states do not have specific language that expressly provides for local authority to regulate pesticides, but rather the statutes do not speak to the matter. And because the Supreme Court in *Mortier* recognized that FIFRA does not infringe on the right of local governments to pass ordinances concerning pesticide use, the door remains open for municipalities to address individual circumstances and community needs.

The following is an example of a state law that expressly permits local regulations:

Maine

HEALTH AND WELFARE

Subtitle 2: HEALTH; Part 3: PUBLIC HEALTH HEADING: PL 1989, C. 487, §11 (RPR)

Chapter 258-A: BOARD OF PESTICIDES CONTROL

§1471-U. Municipal ordinances

- 1. Centralized listing. The Board of Pesticides Control shall maintain for informational purposes, for the entire State, a centralized listing of municipal ordinances that specifically apply to pesticide storage, distribution or use.*
- 2. Existing ordinances. The clerk of any municipality which, on the effective date of this section, has an ordinance to be listed under subsection 1 shall file a copy of that ordinance with the board by December 31, 1988.*
- 3. New ordinances. The clerk of the municipality shall provide the board with notice and a copy of any ordinance to be listed under subsection 1 at least 7 days prior to the meeting of the legislative body or the public hearing at which adoption of the ordinance will be considered. The clerk shall notify the board within 30 days after adoption of the ordinance.*

²⁹ Colo. Rev. Stat. Ann. § 35-10-112.5 (West). *But see* § 31-15-707(1)(b) of the Colorado Revised Statute, which instills authority within municipal governments to acquire utilities and protect local watersheds. *See also* Town of Carbondale v. GSS Properties, LLC, 140 P.3d 54 (Colo. Ct. App. 2005)(holding that town ordinance prohibiting pollution of town's water systems and sources was not beyond the authority conferred by Colo Rev. Stat. §31-15-707(1)(b))(reversed on separate grounds concerning waivability of affirmative defense in Town of Carbondale v. GSS Properties, LLC, 169 P.3 675 (Colo. 2007).

4. *Intent.* It is the intent of this section to provide information on municipal ordinances. This section shall not affect municipal authority to enact ordinances.

5. *Failure to file.* For any ordinance which is not filed with the board, with notice given to the board in accordance with this section, which is otherwise valid under the laws of this State, any provision that specifically applies to storage, distribution or use of pesticides shall be considered void and of no effect after the deadline for filing and until the board is given proper notice and the ordinance is filed with the board.

Alternatively, some states allow for local laws under specific circumstances, while also establishing a default position of preemption:

Michigan

Natural Resources and Environmental Protection ACT 451 of 1994

Part 83 Pesticide Control

324.8328 Local governments; powers.

Sec. 8328.

(1) Except as otherwise provided in this section, it is the express legislative intent that this part preempt any local ordinance, regulation, or resolution that purports to duplicate, extend, or revise in any manner the provisions of this part. Except as otherwise provided for in this section, a local unit of government shall not enact, maintain, or enforce an ordinance, regulation, or resolution that contradicts or conflicts in any manner with this part.

(2) If a local unit of government is under contract with the department to act as its agent or the local unit of government has received prior written authorization from the department, then that local unit of government may pass an ordinance that is identical to this part and rules promulgated under this part, except as prohibited in subsection (7). The local unit of government's enforcement response for a violation of the ordinance that involves the use of a pesticide is limited to issuing a cease and desist order as prescribed in section 8327.

(3) A local unit of government may enact an ordinance identical to this part and rules promulgated under this part regarding the posting and notification of the application of a pesticide. Subject to subsection (8), enforcement of such an ordinance may occur without prior authorization from the department and without a contract with the department for the enforcement of this part and rules promulgated under this part. The local unit of government shall immediately notify the department upon enactment of such an ordinance and shall immediately notify the department of any citations for a violation of that ordinance. A person who violates an ordinance enacted under this subsection is responsible for a municipal civil infraction and may be ordered to pay a civil fine of not more than \$500.00.

(4) A local unit of government may enact an ordinance prescribing standards different from those contained in this part and rules promulgated under this part and which regulates the distribution, sale, storage, handling, use, application, transportation, or disposal of pesticides under either or both of the following circumstances:

(a) Unreasonable adverse effects on the environment or public health will exist within the local unit of government. The determination that unreasonable adverse effects on the environment or public health will exist shall take into consideration specific populations whose health may be adversely affected within that local unit of government.

(b) The local unit of government has determined that the use of a pesticide within that unit of government has resulted or will result in the violation of other existing state laws or federal laws.

(5) An ordinance enacted pursuant to subsections (2), (3), and (4) shall not conflict with existing state laws or federal laws. An ordinance enacted pursuant to subsection (4) shall not be enforced by a local unit of government until approved by the commission of agriculture. If the commission of agriculture denies an ordinance enacted pursuant to subsection (4), the commission of agriculture shall provide a detailed explanation of the basis of the denial within 60 days.

(6) Upon identification of unreasonable adverse effects on the environment or public health by a local unit of government as evidenced by a resolution submitted to the department, the department shall hold a local public meeting within 60 days after the submission of the resolution to determine the nature and extent of unreasonable adverse effects on the environment or public health due to the use of pesticides. Within 30 days after the local public meeting, the department shall issue a detailed opinion regarding the existence of unreasonable adverse effects on the environment or public health as identified by the resolution of the local unit of government.

(7) The director may contract with a local unit of government to act as its agent for the purpose of enforcing this part and the rules promulgated pursuant to this part. The department shall have sole authority to assess fees, register and certify pesticide applicators, license commercial applicators and restricted use pesticide dealer firms, register pesticide products, cancel or suspend pesticide registrations, and regulate and enforce all provisions of this part pertaining to the application and use of a pesticide to an agricultural commodity or for the purpose of producing an agricultural commodity.

(8) For any ordinance enacted pursuant to this section, the local unit of government shall provide that persons enforcing the ordinance comply with the training and enforcement requirements as determined by the director. A local unit of government shall reimburse the department for actual costs incurred in training local government personnel.

These examples are provided to demonstrate the two ways in which other states have accomplished a recognition of both state and municipal authority concerning pesticide regulations, the latter being more burdensome on the state-level officials and thus less desirable.

Recommendations for Improvement of the PAA

Children and pollinators continue to face significant threats and municipal governments are unable to respond to community needs that best serve the public interest and promote health and safety. For these reasons and more, the PAA fails to meet sunset review standards in its existing form and must be changed. The following provides recommendations for improvement to the PAA so that it better meets sunset review standards and establishes better protections for the public:

I. Amend the Colorado PAA to Establish Baseline Protections for Children and Pollinators.

Children and pollinators across the state deserve increased baseline protections against pesticide use. Adopting provisions aimed at protecting these sensitive populations is necessary to improve agency operations to enhance the public interest. To accomplish this in a comprehensive manner we propose the language found in **APPENDIX B** concerning pollinator protections be added to the PAA. The proposed language for pollinator protections is drawn from the Save America’s Pollinators Act.³⁰ Regarding school protections, we refer you to the school IPM laws of Maryland and Massachusetts, as well as stalled federal legislation—the School Environment Protection Act (SEPA).³¹ Adopting these provisions within the PAA would ensure that the law and regulatory framework achieves its aim of protecting health and the environment, based on overwhelming scientific evidence that these sensitive populations face significant threats from currently unregulated pesticide use.

II. Expressly Grant Local Governments the Authority to Pass Ordinances that Further the Public Interest and Environmental Health and Safety.

Restoring local government authority must be achieved in order to enhance the public interest and adequately protect communities and the environment against the hazards of pesticides. CDA and the Pesticide Advisory Committee have not operated in the public interest and existing laws impede efforts of local governments in addressing unique health, safety, and environmental concerns impacting their communities.

The simplest way to restore local government authority, however, by reverting to the language of the PAA prior to the 2005 sunset review amendments, is not the best solution. While this

³⁰ See Save American Pollinators Act at any other members of the nitro group of neonicotinoid insecticides to the extent such insecticide is registered.

³¹ See School Environmental Protection Act (SEPA) at <https://www.govtrack.us/congress/bills/112/hr4225/text>.

change would implicitly grant municipalities the authority to employ their ordinance-making authority under section 31-15-103 of the Colorado Revised Statute individual use, it would perpetuate the complexities of the regulatory and enforcement structure identified in the 2005 Sunset Review Report concerning EPA occupation of enforcement authority where state legislation fails to assert such authority. This “fix” would also revoke licensing standards for private applicators, an important authority of the state.

Instead, Colorado should maintain its general use and application authority, while also providing for local government authority when needed to address the health, safety, and environmental concerns of a particular community. Proposed amendments and model language to achieve this goal can be found at **APPENDIX C**.

III. Revise and Balance the Pesticide Advisory Committee to Include Local Government Representatives, Environmental/Conservation Representatives, and a Scientific and Human Health Expert.

As it presently stands, the composition of the advisory committee, a critical component of the CDA’s pesticide regulatory framework, does not adequately represent the public interest. Membership of the committee is heavily weighted toward industry interests, and its members are predominantly the community regulated under the statute, with no representative from municipal governments, non-governmental environmental/conservation groups, or scientific and human health experts. Failure to include these important voices and perspectives on advisory committee tasked with assisting “the commissioner in promulgating rules and regulations to carry out the provisions of this article,”³² rules and regulations that must address the overarching purpose of preventing “adverse effects on individuals and the environment,”³³ does not enhance the public interest, nor does it protect the interest of the regulated community, the population with the most frequent exposure to pesticides and whom make decisions and provide advice to their clients about pesticide use. The addition to the Pesticide Advisory Committee of health and environmental experts and other members outside the regulated industry, will provide valuable input and information, which could result in a decrease in unnecessary pesticide exposure to the community, including vulnerable populations such as children and pollinators. With the current makeup of the Pesticide Advisory Committee, pesticide efficacy takes precedence over the body of physicians’ and professional health experts’ guidance and independent scientific studies, which are rarely if ever considered.

To bring a more diverse and balanced advisory voice within the CDA, the board must expand to incorporate new voices and members. Proposed amendments to § 35-10-125 that accomplish this balance can be found at **APPENDIX D**.

³² Colo. Rev. Stat. § 35-10-125.

³³ Colo. Rev. Stat. § 35-10-10.

Conclusion

The more that society learns about pesticides, the more it has become necessary to modify state-level regulatory frameworks that establish better overall, baseline protections where the federal regulatory system and laws fail to keep up. But inherent to establishing better protections is also enabling citizens to adequately protect against unique risks posed by pesticide use in the communities and environment in which they live. The PAA and the CDA's implementation of the statute do not adequately protect the public from known pesticides hazards, let alone unknown and sensitive population risks. The recommendations for improving the PAA to enable these needed standards and protections would not only help to align the PAA with the sunset review standards as required by law, but would empower the citizens of Colorado to preserve the health, safety, and environment they cherish.

APPENDIX A

Pesticide Risks

I. Known Yet Unaccounted for Risks

a. Glyphosate

Glyphosate is a registered pesticide with EPA that first received its approval in 1974. Found in numerous products, the most famous being Monsanto's Roundup®, products employing glyphosate act as a non-selective herbicide for broadleaf weed and grass control. It is used on food and non-food field crop sites. Since its registration, its popularity has increased dramatically due to claims that it is of low toxicity. However, a growing body of research demonstrates concern about the toxicity of glyphosate, particularly formulated products.

A study published in 1999 found that people exposed to glyphosate are 2.7 times more likely to contract non-Hodgkin Lymphoma (NHL).¹ In 2002, a study of Swedish men showed that glyphosate exposure was *significantly* associated with an increased risk of NHL, and hairy cell leukemia- a rare subtype of NHL.² Further, a 2003 review of studies conducted on farmers by researchers at the National Cancer Institute shows that exposure to glyphosate is associated with an increased incidence of NHL.³ The American Cancer Society states that non-Hodgkin lymphoma is a cancer that starts in cells called lymphocytes, which are part of the body's immune system.⁴

Breast cancer,⁵ ADD/ADHD,⁶ increased risks of late abortion,⁷ and endocrine disruption⁸ have all been linked to glyphosate exposure. Glyphosate has also been *suggestively* associated with an increased risk of multiple myeloma, according to an Agricultural Health Study published in 2005.⁹ Multiple myeloma is another type of cancer that starts in plasma cells- a type of white blood cell.¹⁰

¹ L. Hardell & M. Eriksson, *A Case-Control Study of Non-Hodgkin Lymphoma and Exposure to Pesticides*, *Cancer*, 85(6), 1999, 1353–1360.

² Hardell L, Eriksson M, & Nordstrom M. 2002. Exposure to pesticides as risk factor for non-Hodgkin's lymphoma and hairy cell leukemia: pooled analysis of two Swedish case-control studies. *Leuk Lymphoma*, 43(5), 1043-1049.

³ De Roos, *et al.*, *Integrative assessment of multiple pesticides as risk factors for non-Hodgkin's lymphoma among men*, *Occup Environ Med*, 60(9) (2003).

⁴ American Cancer Society. *Detailed Guide: Lymphoma, Non-Hodgkin Type: What Is Non-Hodgkin Lymphoma?* *Cancer Reference Information*. Available at

http://www.cancer.org/docroot/CRI/content/CRI_2_4_1X_What_Is_Non_Hodgkins_Lymphoma_32.asp.

⁵ Siriporn Thongprakaisang, *et al.*, *Glyphosate induces human breast cancer cells growth via estrogen Receptors*, *Food and Chemical Toxicology* 59 (2013), 129–136.

⁶ V.F. Garry, *et al.*, *Birth defects, season of conception, and sex of children born to pesticide applicators living in the Red River Valley of Minnesota, USA*, *Environ Health Perspect*, 110(Suppl 3): 441–449 (2002).

⁷ Arbuckle, T.E., Z. Lin, and L.S. Mery. 2001. An Exploratory Analysis of the Effect of Pesticide Exposure on the Risk of Spontaneous Abortion in an Ontario Farm Population. *Environmental Health Perspectives* 109:851-857.

⁸ Walsh, L. P., McCormick, C., Martin, C., & Stocco, D. M. 2000. Roundup Inhibits Steroidogenesis by Disrupting Steroidogenic Acute Regulatory (StAR) Protein Expression. *Environ Health Perspect*, 108, 769–776.

⁹ A.J.D. De Roos, *et al.*, *Cancer Incidence among Glyphosate-Exposed Pesticide Applicators in the Agricultural Health Study*. *Environmental Health Perspectives*, 113(1), 49-54 (2005).

¹⁰ National Cancer Institute, *What You Need to Know About: Multiple Myeloma* (2008), available at

Health effects are not limited to humans. A 2011 study found that glyphosate changed the toxicological parameters in certain fish.¹¹ Another study from 2010 found that sublethal residues of glyphosate induced immunological responses in fish and alters their natural immune response to bacterial and possibly to other aquatic microorganism.¹² Chronic exposure has been associated with histopathological damage in the gills and liver of freshwater fish species, some of which was irreversible.¹³ A study found that Roundup, the most commonly used glyphosate product, alone is “extremely lethal” to amphibians in concentrations found in the environment.¹⁴

Beyond health hazards, the environmental impacts of glyphosate to surface waters and surrounding areas are becoming an increasing concern. Originally predicted to decrease pesticide use, the agricultural use of glyphosate has increased dramatically over the years (mostly caused by the expansion of genetically-engineered (GE) crops and resulting glyphosate resistant-weeds), thus increasing exposure to vulnerable populations and habitats. According to EPA’s most recent estimates from 2007, as well as from 2005, 2003, and 2001, glyphosate ranked first in a list of most commonly used conventional pesticide active ingredients in the agricultural market sector for all four years. In 2007, 180 - 185 million pounds of the active ingredient were used, putting it far ahead of the second most commonly used pesticide, atrazine, at 73 – 78 million pounds.¹⁵ Looking further back to the past two decades, data from the U.S. Geological Survey (USGS) point to a history of estimated increases in glyphosate use within the same sector.¹⁶

Because of this heavy use, glyphosate is routinely detected in surface and groundwater samples. A separate USGS survey detected glyphosate in 36% of samples, and aminomethylphosphonic acid or AMPA (a degradation product of glyphosate) in 69 percent of the samples.¹⁷ While some of these data originates from agricultural areas where glyphosate

<http://www.cancer.gov/cancertopics/wyntk/myeloma/page2>.

¹¹ L. Gluszcak L, *et al.*, *Acute Exposure to Glyphosate Herbicide Affects Oxidative Parameters in Piava (Leporinus obtusidens)*, Arch Environ Contam Toxicol, 61(4):624-30 (2011).

¹² LC Kreutz, *et al.*, *Exposure to sublethal concentration of glyphosate or atrazine-based herbicides alters the phagocytic function and increases the susceptibility of silver catfish fingerlings (Rhamdia quelen) to Aeromonas hydrophila challenge*, Fish Shellfish Immunol, 29(4):694-7 (2010).

¹³ E. Ortiz-Ordoñez, *et al.*, *Effect of Yerbimat Herbicide on Lipid Peroxidation, Catalase Activity, and Histological Damage in Gills and Liver of the Freshwater Fish Goodea Atripinnis*, Arch Environ Contam Toxicol, 61(3):443-52 (2011).

¹⁴ R. Relyea, *The lethal impact of Roundup on aquatic and terrestrial amphibians*, Ecological Applications, 15(4): 1118–1124 (2005).

¹⁵ Environmental Protection Agency (EPA). 2011. 2006-2007 Pesticide Market Estimates. http://www.epa.gov/opp00001/pestsales/07pestsales/market_estimates2007.pdf

¹⁶ U.S. Geological Survey (USGS). 2013. Pesticide Use Maps: Estimated Agricultural Use for Glyphosate, 1992-2011. Accessed July 29, 2014. Available at:

http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2011&map=GLYPHOSATE&hilo=L

¹⁷ Scribner, E. A., Battaglin, W. A., Dietze, J. E., & Thurman, E. M. 2003. Reconnaissance Data for Glyphosate, Other Selected Herbicides, Their Degradation Products, and Antibiotics in 51 Streams in Nine Midwestern States, 2002 *U.S. Geological Survey, Open-File Report 03–217(101 p)*.

use is in the largest quantities, the fact remains that EPA acknowledges glyphosate's potential to contaminate surface water on a national level because it does not readily break down in water or sunlight. Due to glyphosate's potential for water contamination, EPA set its maximum contaminant level (MCL) at 0.7 parts per million (ppm).¹⁸ Unfortunately, many of the above-noted health effects and environmental impacts have been observed at levels below this MCL.

b. Neonicotinoids

Other systemic pesticides aside from glyphosate include neonicotinoids, a class of synthetic insecticides that are chemically similar to nicotine. This relatively new class includes imidacloprid, acetamiprid, clothianidin, dinotefuran, nithiazine, thiacloprid, and thiamethoxam. As systemic pesticides, neonicotinoids confer insecticidal activity to the entire plant system, where residues can accumulate in the pollen and nectar of treated plants and thus present a prolonged and continuing risk to pollinators.

Although neonicotinoid insecticides are considered by many in the industry to be a chemical of relatively low toxicity, it has also been found to be highly toxic to pollinators, beneficial insects, and larger fauna, and because of this neonicotinoids have been one of the major contributors linked to the decline of bee populations around the world. Colony-level effects have been observed for bumblebees, with exposed colonies growing at slower rates and producing significantly fewer queens.¹⁹ Effects on bees are also present at extremely low, near infinitesimal doses of neonicotinoids.²⁰ Recent evidence points to a 57 percent reduction in the amount of pollen bumblebees are able to collect for their colony, and researchers found that the effects of neonicotinoid exposure can persist for a month or more.²¹ Other ecological effects that have been documented include declines in bird populations²² and aquatic life.²³

Neonicotinoid use has grown significantly over the recent decade with data from 2008 showing they account for 24 percent of the total pesticide market.²⁴ Due to their widespread use, neonicotinoids and have been found to be both persistent and pervasive in the environment. A recent USGS study found clothianidin to be the most commonly detected chemical in the Midwestern United States in 75 percent of sites sampled and at the highest concentration,

¹⁸ USEPA. Basic Information about Glyphosate in Drinking Water. Available at <http://water.epa.gov/drink/contaminants/basicinformation/glyphosate.cfm>.

¹⁹ Gibbons D., Morrissey C., Mineau P. 2014. A review of the direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife. *Environ Sci Pollut Res*.

²⁰ C. Lu *et al.*, 2014, Sub-lethal exposure to neonicotinoids impaired honey bees winterization before proceeding to colony collapse disorder, *Bulletin of Insectology* 67 (1): 125-130.

²¹ Feltham H, Park K, and Goulson D. Field realistic doses of pesticide imidacloprid reduce bumblebee pollen foraging efficiency. 2014. *Ecotoxicology*. 23(3):317-323.

²² Hallmann CA, *et al.* 2014. Declines in insectivorous birds are associated with high neonicotinoids concentrations. *Nature*. 511:341-343.

²³ Van Dijk TC, *et al.* 2013. Macro-Invertebrate Decline in Surface Water Pollution with Imidacloprid. *PLoS ONE*. 8(5).

²⁴ Jeschke P, *et al.* 2001. Overview of the Status and Global Strategy for Neonicotinoids. *Journal of Agricultural and Food Chemistry*. 59:2897-2908.

thiamethoxam at 47 percent, and imidacloprid at 23 percent. The study examined nine rivers and streams, including the Mississippi and Missouri Rivers and found neonicotinoids in all of them.²⁵

c. Organophosphates

Typically used as insecticides, organophosphates are some of the most common and most toxic pesticides used today. The mode of action shared by this class of chemicals is characterized by the disruption of the enzyme that regulates acetylcholine, a neurotransmitter. While they were developed during the early 19th century, their effects on insects, which are similar to their effects on humans, were not discovered until 1932.

Although organophosphates are not usually persistent in the environment, some of them have proven to be extremely poisonous. For example, methamidophos is highly toxic via oral, dermal, and inhalation exposure routes. Symptoms of acute poisoning include respiratory dysfunction, weakness, shakiness, paralysis, and peripheral neuropathy.²⁶ Long-term exposure is associated with reduced sperm count and sperm viability and neuropsychiatric symptoms.²⁷ One study finds that accidental ingestion of methamidophos and profenofos, another organophosphate, on contaminated food led to depressed blood cholinesterase levels in hospitalized patients.²⁸

The authors of another study find that children are also susceptible to organophosphate exposure. In this study, prenatal organophosphate metabolites were associated with mental development and “pervasive developmental problems” at 24 months of age.²⁹ The proximity of pregnant women living less than one mile from fields treated with organophosphates was found to be associated with a 60% increase in their child being diagnosed with autism.³⁰ Other commonly used organophosphates include parathion, malathion, methyl parathion, and chlorpyrifos, all with similarly documented risks and adverse health effects.

d. Atrazine

²⁵ Hladik ML, Kolpin DW, and Kuivila KM. Widespread occurrence of neonicotinoid insecticides in streams in a high corn and soybean producing region, USA. 2014. *Environmental Pollution*. 193:189-196.

²⁶ Extonet. Methamidophos. 1996. <http://pmep.cce.cornell.edu/profiles/extoxnet/haloxypop-methylparathion/methamidophos-ext.html>

²⁷ Salvi RM, Lara DR, Ghisolfi ES, et al. Neuropsychiatric Evaluation in Subjects Chronically Exposed to Organophosphate Pesticides. *Toxicol Sci*. 2003. 72(2):267-271.

²⁸ Goh KT, Yew FS, Ong KH, et al. Acute organophosphorus food poisoning caused by contaminated green leafy vegetables. *Arch Environ Health*. 1990. 45(3):180-4.

²⁹ Eskenazi B, Marks AR, Bradman A, et al. Organophosphate Pesticide Exposure and Neurodevelopment in Young Mexican-American Children. *Environ Health Perspect*. 2007. 115(5):792-8.

³⁰ Shelton, JF. 2014. Neurodevelopmental Disorders and Prenatal Residential Proximity to Agricultural Pesticides: The CHARGE Study. *Environmental Health Perspectives*.

Atrazine is a widely used herbicide on crops, golf courses, and residential lawns. It is a part of a group of herbicides known as triazines, which include atrazine, simazine, cynazine, ametryn, prometryn, and zine.

Many studies have documented hormone disruption in amphibians and other aquatic organisms as a result of atrazine exposure. One 2013 Purdue University study reports that genetic and molecular targets are altered in response to a developmental atrazine exposure in zebrafish. Here, embryos were exposed to a range of atrazine concentrations and morphological, transcriptomic, and protein alterations were then assessed. A significant increase in head length was observed and the transcriptomic profiles revealed the alteration of genes associated with neuroendocrine and reproductive system development, function, and disease, cell cycle control, and carcinogenesis.³¹

Another study, "Atrazine induces complete feminization and chemical castration in male African clawed frogs (*Xenopus laevis*)," demonstrates the reproductive consequences of atrazine exposure in adult amphibians. Here the atrazine-exposed males were both demasculinized (chemically castrated) and completely feminized as adults. Exposed genetic males developed into functional females that copulated with unexposed males and produced viable eggs. The eggs produced were all male offspring since both parents contributed male genes.³²

Similarly, in "Demasculinization and feminization of male gonads by atrazine: Consistent effects across vertebrate classes,"³³ Hayes found evidence that the effects of atrazine on male development are consistent across all vertebrate classes examined. This study found atrazine demasculinizes male gonads producing testicular lesions associated with reduced germ cell numbers in teleost fish, amphibians, reptiles, and mammals, and induces partial and/or complete feminization in fish, amphibians, and reptiles. These effects were explained by mechanisms that lead to reductions in androgen levels and the induction of estrogen synthesis, which were demonstrated in fish, amphibians, reptiles, and mammals.

Significantly reduced survival and growth (weight, length and fat body size) in male and female tadpoles exposed to atrazine was also identified in a separate study, "Chronic exposure to high levels of atrazine alters expression of genes that regulate immune and growth-related functions in developing *Xenopus laevis* tadpoles."³⁴ Genes associated with growth and metabolism, proteolysis, fibrinogen complex formation, immune regulation and immune system function, specifically defense molecules present in the skin, were altered and downregulated, especially in female tadpoles.

³¹ Weber GJ, Sepúlveda MS, Peterson SM, et al. 2013. Transcriptome alterations following developmental atrazine exposure in zebrafish are associated with disruption of neuroendocrine and reproductive system function, cell cycle, and carcinogenesis. *Toxicol Sci.* 132(2):458-66.

³² Hayes, T., et al. 2010. Atrazine induces complete feminization and chemical castration in male African clawed frogs (*Xenopus laevis*). *PNAS*, doi: 10.1073/pnas.0909519107

³³ Hayes, T., et al. 2011. Demasculinization and feminization of male gonads by atrazine: Consistent effects across vertebrate classes. *J. Steroid Biochem and Molecular Bio.* 127(1-2):64-73.

³⁴ Langerveld, A.J., Celestine, R., Zaya, R., et al. 2009. Chronic exposure to high levels of atrazine alters expression of genes that regulate immune and growth-related functions in developing *Xenopus laevis* tadpoles. *Environmental Research*, 109(4):379-389.

Federal research has also raised concerns. A USGS study, “Atrazine Reduces Reproduction in Fathead Minnow (*Pimephales promelas*)” found that concentrations of atrazine commonly found in agricultural streams and rivers caused reduced reproduction and spawning, as well as tissue abnormalities in laboratory studies with fish. The results of this study show that normal reproductive cycling was disrupted by atrazine and exposed fish did not spawn as much or as well when exposed to atrazine. Total egg production was also lower in all atrazine-exposed fish, as compared to the non-exposed fish, within 17 to 20 days of exposure. In addition, atrazine-exposed fish spawned less and there were abnormalities in reproductive tissues of both males and females.³⁵

And a recent study by the U.S. Department of Agriculture (USDA) found that the volatilization of atrazine consistently results in herbicide movement off the target site that exceeds nontarget field runoff, varying widely depending upon weather conditions. On average, atrazine and metolachlor, the two herbicides looked at in this study, losses by volatilization was about 25 times larger than movement from surface runoff, despite low vapor pressures.³⁶ This increases the mobility of atrazine, causing off site deposition to non-target areas not accounted for by surface runoff.

EPA’s past findings for the carcinogenic potential of atrazine- ‘not likely to cause cancer in humans’- is at odds with current research which finds atrazine to impact mammary glands in the breast, increasing the risk for mammary cancer. In the publication *Environment and Breast Cancer*, the authors note that atrazine alters the developing mammary gland, makes it susceptible to tumorigenesis or hyperplasia, alters lactational ability, and decreases weight gain in second-generation litters.³⁷ Specifically, researchers find that atrazine is associated with impaired lactation observed in conjunction with altered mammary gland development in one or more generations after gestational exposure.³⁸ Another published study by researchers at the National Institute of Environmental Health Sciences and EPA shows that male rats prenatally exposed to low doses of atrazine are more likely to develop prostate inflammation and to go through puberty later than non-exposed animals.³⁹

e. Synthetic Pyrethroids

Pesticide products containing pyrethroids are often described by pest control operators and community mosquito management bureaus as “safe as chrysanthemum flowers.” While

³⁵ Tillitt DE, Papoulias DM, Whyte JJ, Richter CA. 2010. Atrazine reduces reproduction in fathead minnow (*Pimephales promelas*). *Aquat Toxicol.* 99(2):149-59.

³⁶ Gish, T., et al. 2010. Comparison of Field-scale Herbicide Runoff and Volatilization Losses: An Eight-Year Field Investigation. *J. Environ. Qual.* doi:10.2134/jeq2010.0092

³⁷ Rayner, J and Fenton, S. 2010. Atrazine- An Environmental Endocrine Disruptor That Alters Mammary Gland Development and Tumor Susceptibility. In a J. Russo (Ed.), *Environment and Breast Cancer*, (pp 167-183). New York, NY: Springer

³⁸ Rudel RA, Fenton SE, et al. 2011. Environmental Exposures and Mammary Gland Development: State of the Science, Public Health Implications, and Research Recommendations. *Environ Health Perspect.* 119:1053-1061. <http://dx.doi.org/10.1289/ehp.1002864>

³⁹ Stanko, J., et al. 2010. Effects of prenatal exposure to a low dose atrazine metabolite mixture on pubertal timing and prostate development of male Long-Evans rats. *Reproductive Tox.* 30(4): 540-549

pyrethroids are a synthetic version of an extract from the chrysanthemum, they were chemically designed to be more toxic with longer breakdown times, and are often formulated with synergists, increasing potency and compromising the human body's ability to detoxify the pesticides.

In a recent review of these pesticides, EPA reduced the safety factor applied under the FQPA, but current available data that document exposures and adverse effects in the young do not justify this reduction.

For example, a study by Shafer et al.,⁴⁰ a paper which looked at issues of mode of action and age-dependent and developmental neurotoxicity as related to risk decisions under the FQPA, notes that there is a large age dependence to the acute toxicity of pyrethroids in which juvenile laboratory rats are at least an order of magnitude more sensitive than adults to certain pyrethroids. Previous studies have found that age related sensitivity to pyrethroids occur at higher doses. For example, cypermethrin and permethrin were 17-fold and 6-fold respectively more lethal to 8-day old rats compared with adults,⁴¹ due to incomplete development of the enzymes which catalyze the metabolism of pyrethroids in the liver of young animals which is a widely accepted hypothesis. However, Shafer et al. point out that age-dependent differences in pyrethroid neurotoxicity have not been thoroughly studied at the lower end of the dose-response relationship (sublethal doses), concluding that "decisions related to the FQPA could be strengthened by additional studies comparing the relative susceptibility of differential sensitivity between young and adult animals, particularly at sublethal doses." Studies for sublethal effects on the young have been lacking in EPA risk assessments.

Fenvalerate and cypermethrin given to pregnant and nursing rats resulted in pups with significant increases in the levels of dopamine and muscarinic receptors of striatal membrane, with effects being more pronounced in lactationally exposed pups. Those prenatally exposed to fenvalerate had significant decreases in the activity of brain monoamine oxidase and Na⁺, K⁽⁺⁾-ATPase and a significant increase in acetylcholinesterase. The authors conclude that exposures to these pyrethroids disturb dopaminergic and cholinergic pathways which are more pronounced during the "growth spurt" period in the young and may lead to a functional delay in brain maturation.⁴²

Another study⁴³ suggests that neonatal exposure to permethrin or cypermethrin induces long-lasting effects after developmental exposure in juvenile rats, leading to changes in open-field behaviors, striatal monoamine levels, and increased oxidative stress. Lower dopamine and a reduction of blood glutathione peroxidase content were also observed.

⁴⁰Shafer, T., et al. 2004. Developmental Neurotoxicity of Pyrethroid Insecticides: Critical Review and Future Research Needs. *Environ Health Perspect* 113:123-136

⁴¹ Cantalamessa F. 1993. Acute toxicity of two pyrethroids, permethrin, and cypermethrin in neonatal and adult rats. *Arch Toxicol* 67:510-513.

⁴² Malaviya M, Husain R, Seth PK, Husain R. 1993. Perinatal effects of two pyrethroid insecticides on brain neurotransmitter function in the neonatal rat. *Vet Hum Toxicol*, 35:119-122.

⁴³ Nasuti C, Gabbianelli R, Falcioni ML, Di SA, Sozio P, Cantalamessa F. 2007. Dopaminergic system modulation, behavioral changes, and oxidative stress after neonatal administration of pyrethroids. *Toxicology*. 229:194-205

In a study examining the relationship between prenatal exposure to indoor pesticides and infant growth and development in urban families,⁴⁴ researchers at the Mount Sinai School of Medicine found higher than expected levels of pyrethroid metabolites in sample urine (compared with previous NHANES data) which, according to the authors, may be attributed to higher exposures resulting from West Nile mosquito spray programs in the subjects' communities. Given that the half-lives of the pyrethroids in question were short, high levels of metabolites in the urine indicate continuous exposures. In this study a high percentage of women (70 percent) reported being pregnant during times of pesticide exposures. This study underscores the prevalence of prenatal exposure to pyrethroid chemicals, especially in under-represented populations.

In a similar 2002 study, low level concentrations of pyrethroid pesticides were frequently (47-83 percent) detected in pregnant minority women in New York City, indicating widespread prenatal pesticide use among minority women.⁴⁵ In a study conducted by researchers from the Centers for Disease Control and Prevention (CDC) in a community in the Southeastern U.S., urinary pyrethroid pesticide metabolite concentrations for children, compared to those reported in the NHANES and GerES studies, were significant and substantially higher than the general populations of the U. S. and Germany.⁴⁶

In a study with 127 preschool children⁴⁷ at their homes and daycare centers found that these children were exposed to low levels of permethrin from several sources with 67percent of the children's urine samples containing permethrin metabolites. The authors note that the primary route of the children's exposure was through dietary ingestion, followed by indirect ingestion (hand to mouth action). Indirect ingestion as a method of exposure is also corroborated by EPA researchers in a 2011 study,⁴⁸ which demonstrated that surface concentration of pesticide residues were 'highly influential' on the dietary intake of children. In the Morgan study, permethrin residues were detected most often in the dust (100%) and hand wipe (>78%) samples.

Several studies have determined that dietary ingestion is a main source of children's exposure to pyrethroid pesticides.^{49,50} A 2011 EPA study⁵¹ found that pesticide residues were transferred

⁴⁴ Berkowitz GS, Obel J, Deych E, Lapinski R, Godbold J, Liu Z, et al. 2003. Exposure to indoor pesticides during pregnancy in a multiethnic, urban cohort. *Environ Health Perspect* 111:79–84.

⁴⁵ Whyatt, R et al. 2002. Residential Pesticide Use during Pregnancy among a Cohort of Urban Minority Women *Environ Health Perspect* 110:507–514

⁴⁶ Naehler LP, et al. 2010. Organophosphorus and pyrethroid insecticide urinary metabolite concentrations in young children living in a southeastern United States city. *Sci Total Environ*. 408(5):1145-53.

⁴⁷ Morgan MK., et al. 2007. An observational study of 127 preschool children at their homes and daycare centers in Ohio: environmental pathways to cis- and trans-permethrin exposure. *Environ Res*. 104(2):266-74.

⁴⁸ Melnyk LJ, Byron MZ . et al. 2011. Pesticides on household surfaces may influence dietary intake of children. *Environ Sci Technol*. 45(10):4594-601.

⁴⁹ Schettgen T, Heudorf U, Drexler H, Angerer J. 2002. Pyrethroid exposure of the general population-is this due to diet. *Toxicol Lett* 134:141–145.

⁵⁰ Heudorf U, Angerer J, Drexler H. 2004. Current internal exposure to pesticides in children and adolescents in Germany: urinary levels of metabolites of pyrethroid and organophosphorous insecticides. *Int Arch Occup Environ Health* 77:67–72.

from treated surfaces to foods, stating that, “[A]s long as pesticide levels are measureable on surfaces in children’s eating environment, it can be concluded that transfer of pesticides to foods will take place.” A Children Pesticide Exposure Study⁵² found that children are continuously exposed to pyrethroid insecticides through their diets all year long, and that chronic exposure patterns are periodically modified by episodes of relatively high exposures from residential uses. The authors concluded that the combination of the use of pyrethroid insecticides in the household, dietary intake, and seasonal differences play a significant role in predicting children’s exposure to synthetic pyrethroid insecticides.

In a 2011 study⁵³ published in *Pediatrics*, which investigated prenatal exposure to permethrin and piperonyl butoxide (PBO) -a synergist commonly formulated with pyrethroid- and 36-month neurodevelopment, found that the synergist PBO was negatively associated with 36-month cognitive and motor development in children with a history of pre natal exposure, as measured in umbilical cord and maternal plasma.

Additionally, farmworkers and farmworker children, especially those living adjacent to agricultural fields, are uniquely vulnerable to pyrethroid exposures. Pesticide drift from fields contaminate clothing and homes where residues linger,⁵⁴ resulting in exposure pathways that the agency does not give credence to. Dermal and inhalation exposures from pyrethroid drift resulting from community mosquito fogging and spraying account for significant exposure pathways that have gone unevaluated, even though mosquito spray programs for West Nile virus and other mosquito-borne disease are prevalent in several U.S. states,⁵⁵ where pyrethroids like phenothrin, permethrin and resmethrin are used annually. Symptoms from these exposures result in headache, nausea, eye irritation, muscle weakness, anxiety, and shortness of breath. The agency has failed to adequately take into account exposures occurring in these subpopulations into its assessment. The FQPA safety factor must not be reduced until pyrethroid exposures to adults and children in these vulnerable communities are adequately accounted for.

II. Unknown and Unaccounted for Risks

As noted throughout the known hazards and risks discussion above, all of these commonly-used chemicals show inadequacies in their safety and environmental assessments concerning the identified active ingredients and use restrictions relating to the products. Yet, even more concerning are the risks associated with other pesticide ingredients, known as inerts, unaccounted for endpoints, like endocrine disruption, and unaccounted for pesticide behaviors.

⁵¹ Melnyk LJ, et al. 2011. Influences on transfer of selected synthetic pyrethroids from treated Formica to foods. *J Expo Sci Environ Epidemiol.* 21(2):186-96.

⁵² Lu C., et al. 2009. The attribution of urban and suburban children’s exposure to synthetic pyrethroid insecticides: a longitudinal assessment. *J Expo Sci Environ Epidemiol.* 19(1):69-78.

⁵³ Horton MK et al. 2011. Impact of prenatal exposure to piperonyl butoxide and permethrin on 36-month neurodevelopment. *Pediatrics.* 127(3):e699-706.

⁵⁴ Harnly. M., et al. 2009. Pesticides in Dust from Homes in an Agricultural Area. *Environ Sci & Tech.* 43 (23), 8767-8774.

⁵⁵ CDC. 2010. Locally Acquired Dengue --- Key West, Florida, 2009—2010. Morbidity and Mortality Weekly Report (*MMWR*) May 21, 2010 / 59(19);577-581.

a. Inert Ingredients

For example, glyphosate is listed as the active ingredient in a number of common, formulated end-use products like Rodeo® or Roundup®. The large remaining percentage of the contents of these products, however, are composed of what is merely described as “inert ingredients.” These ingredients serve many purposes, often creating a more effective and/or longer lasting herbicide. Chemical companies argue that disclosing these inert ingredients would be revealing trade secrets.

Recent scientific inquiries, however, have demonstrated that these ingredients often have significant toxic effect themselves, and can increase the toxicity of the active ingredients. A recent 2008 study was the first to definitively confirm this fact. The researchers found that glyphosate formulated products kill human cells, particularly embryonic, placental and umbilical cord cells, even at very low concentrations.⁵⁶ These researchers found that the formulations cause total cell death within 24 hours, through an inhibition of the mitochondrial succinate dehydrogenase activity, and necrosis, by release of cytosolic adenylate kinase measuring membrane damage. This study reports that polyethoxylated tallowamine or POEA, an “inert” surfactant, was responsible for the elevated toxic effects observed.

Other studies have found that the formulated glyphosate products reduce human placental JEG3 cell viability at least 2 times more efficiently than glyphosate, disrupt aromatase activity and mRNA levels,⁵⁷ induce a dose-dependent formation of DNA adducts in the kidneys and liver of mice,⁵⁸ and induce developmental retardation of the fetal skeleton, a decrease in sperm number and increase in the percentage of abnormal sperms.⁵⁹

In light of such data demonstrating the toxic potential of glyphosate and its formulated products, especially the ingredient POEA, many would argue that the use of glyphosate products poses unreasonable human health risks to the applicators, bystanders, and other people in the vicinity exposed to the product due to pesticide drift and runoff, thus failing federal and state level pesticides standards. These findings are also only the tip of the “inert” hazards iceberg and warrant additional research and study of all inerts before continued use.

The dangers of inerts do not stop with humans. For example, glyphosate and its formulated products adversely impact aquatic organisms, contrary to industry claims. A study in 2005

⁵⁶ N. Benachour, G.-E. Seralini, *Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells*, *Chemical Research in Toxicology*, 22(1), 97-105 (2008).

⁵⁷ S. Richard S, et al., *Differential effects of glyphosate and roundup on human placental cells and aromatase*, *Environ Health Perspect*, 113(6), 716-720 (2005).

⁵⁸ Marco, P., Armelle, M., Claudia, B., & Silvio, P. 1998. 32P-postlabeling detection of DNA adducts in mice treated with the herbicide roundup. *Environmental and Molecular Mutagenesis*, 31(1), 55-59.

⁵⁹ E. Dallegrave, et al., *The teratogenic potential of the herbicide glyphosate-Roundup® in Wistar rats*, *Toxicology Letters*, 142(1-2), 45-52 (2003); E. Dallegrave, et al., *Pre- and postnatal toxicity of the commercial glyphosate formulation in Wistar rats*, *Arch Toxicol*, 81(9), 665-673 (2007).

found that Roundup as a whole is “extremely lethal” to amphibians in concentrations found in the environment.⁶⁰ Another study found that *Rana pipiens* tadpoles chronically exposed to environmentally relevant concentrations of glyphosate formulations containing POEA showed decreased snout-vent length at metamorphosis and increased time to metamorphosis, tail damage, and gonadal abnormalities. Other organisms such as the freshwater mussel, *Lampsilis siliquoidea*, were found to be the most sensitive aquatic organisms tested to date with glyphosate-based chemicals and its surfactant.⁶¹

EPA in its Reregistration Eligibility Decision (RED) document in 1993 acknowledged that an “inert” ingredient in some glyphosate end-use products was toxic to aquatic organisms and found that these products necessitated labeling: “toxic to fish” as these products are applied directly to aquatic environments.⁶² EPA is also aware that glyphosate poses a risk of water contamination since it is not only released directly into aquatic environments, but also via the transport of residues adsorbed to soil particles suspended in runoff water, leaching and drift.

While glyphosate and its inert ingredients have received the most scientific attention because of its large-scale and increasing presence in the environment, concerns over the health and environmental effects of inert ingredients are of concern in many other products.

b. Endocrine Disruptors

Yet another unknown hazard that spans the majority of pesticides arises due to the failure of traditional risk assessment protocols and standards to require testing of new endpoints and examine non-monotonic dose responses.

Chemicals that produce endocrine-disrupting effects are a prime example. Endocrine-disruption occurs when chemicals interfere with human or other species’ hormones and hormone-receptors. In some cases, endocrine-disruption has been linked to genetic impacts as well. Adverse effects from endocrine-disruption are far ranging and include reproductive abnormalities, neurological effects, and diseases such as diabetes, ADHD, and cancer.⁶³

Under traditional risk assessment protocols, “the-dose-makes-the-poison” toxicological theory rules, meaning that most chemicals are only tested to see how much of the poison can be withstood before adverse effects happen. These traditional risk assessment protocols miss adverse effects like endocrine-disruption. Science, however, has documented in the past two decades a wide range of negative health and environmental impacts occurring at low-doses or

⁶⁰ R. Relyea, *The lethal impact of Roundup on aquatic and terrestrial amphibians*, *Ecological Applications*, 15(4), 1118–1124 (2005).

⁶¹ RB Bringolf, *et al.*, *Acute and chronic toxicity of glyphosate compounds to glochidia and juveniles of Lampsilis siliquoidea (Unionidae)*, *Environ Toxicol Chem.*, 26(10), 2094-2100 (2007).

⁶² U.S. Env’tl Prot. Agency, Office of Prevention, Pesticides and Toxic Substances, *Reregistration Eligibility Decision (RED) Glyphosate* (1993).

⁶³ N Harriott and J. Feldman, *Beyond Pesticides, Pesticides That Disrupt Endocrine System Still Unregulated by EPA*, <http://www.beyondpesticides.org/gateway/health%20effects/endocrine%20cited.pdf>.

resulting in delayed effects from not only pesticides, but the many chemicals in the products that surround us.

EPA recognizes the need for including endocrine disruptor screening in its risk assessments, and in fact, was directed to do so by Congress in 1996. Since that time, the EPA has yet to finalize the process for endocrine disruptor screening and no products on the market have been evaluated by the EPA for the potentially devastating risks that many peer-reviewed studies have shown for human health and other non-target organisms.

c. Drift and Volatilization

Pesticide drift can occur when pesticides move off the application site in the air as particles or aerosols during application or when the pesticides move that are attached to dust. Volatilization occurs when pesticide surface residues change from a solid or liquid to a gas or vapor after an application of a pesticide has occurred. Once airborne, volatile pesticides can move long distances off site. Assumptions concerning which pesticides and application environments required assessment of these risks excluded the large majority of pesticides from evaluation for these risks.

Yet again, pollinators provide a prime example. An ecological assessment of pesticide volatilization and pollinators has not been conducted, yet the use of pesticides, especially those systemic in nature, has been shown to adversely impact bee populations. Pesticide residues that can emanate from volatilized pesticides can remain in the environment for long periods of time. One study found pesticide residues on dandelions – a bee-attractive plant- adjacent to a treated field where pesticide residues migrated off site.⁶⁴

Farm workers are another example. While occupational assessments address worker exposures, they do not address exposures occurring in and outside the home of these worker communities, which also house vulnerable children. Farmworker studies routinely show high exposure risks and disease from pesticide migration in these communities.^{65,66,67}

⁶⁴ Krupke CH, Hunt GJ, Eitzer BD, Andino G, Given K. 2012. Multiple Routes of Pesticide Exposure for Honey Bees Living Near Agricultural Fields. *PLoS ONE* 7(1): e29268. doi:10.1371/journal.pone.0029268.

⁶⁵ Das R, Steege A, Baron S, et al. 2001. Pesticide-related illness among migrant farm workers in the United States. *Int J Occup Environ Health*. 7(4):303-12.

⁶⁶ Reeves M, Schafer KS. 2003. Greater risks, fewer rights: U.S. farmworkers and pesticides. *Int J Occup Environ Health*. 9(1):30-9.

⁶⁷ CDC. 2006. Worker illness related to ground application of pesticide--Kern County, California, 2005. *MMWR Morb Mortal Wkly Rep*. 55(17):486-8.

APPENDIX B

Pollinator Proposed Language

POLLINATOR PROTECTIONS

1. Urgent regulatory response for honey bee and pollinator protection

(a) In general

Not later than 180 days after the date of the enactment of this Act, the Commissioner of the Colorado Department of Agriculture shall prohibit the use of imidacloprid, clothianidin, thiamethoxam, dinotafuran, and any other members of the nitro group of neonicotinoid insecticides to the extent such insecticide is registered, conditionally or otherwise, under the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.) for use in seed treatment, soil application, or foliar treatment on bee attractive plants, trees, and cereals until the Administrator has made a determination that such insecticide will not cause unreasonable adverse effects on pollinators based on—

- (1) an evaluation of the published and peer-reviewed scientific evidence on whether the use or uses of such neonicotinoids cause unreasonable adverse effects on pollinators, including native bees, honey bees, birds, bats, and other species of beneficial insects; and
- (2) a completed field study that meets the criteria required by the Administrator and evaluates residues, including residue build-up after repeated annual application, chronic low-dose exposure, cumulative effects of multiple chemical exposures, and any other protocol determined to be necessary by the Administrator to protect managed and native pollinators.

(b) Conditions on future registered products certain pesticides registrations

No uses of any other members of the nitro group of neonicotinoid insecticides that have yet to registered and receive future registration approval from the U.S. Environmental Protection Agency shall be permitted until the Commissioner has made the determination described in subsection (a), based on an evaluation described in subsection (a)(1) and a completed field study described in subsection (a)(2), with respect to such insecticide.

(c) Monitoring of native bees

The Commissioner of the Colorado Department of Agriculture shall, for purposes of protecting and ensuring the long-term viability of native bees and other pollinators of agricultural crops, horticultural plants, wild plants, and other plants—

(1) Establish a pollinator task force appointed the Commissioner of the Colorado Department of Agriculture for two year renewable terms with the following representation;

- i) Two commercial beekeepers;
- ii) Two fruit or vegetable agricultural producers;
- iii) Independent scientist with expertise in pollinator health and pesticides;
- iv) Independent scientist with expertise in native pollinator biology;
- v) A representative from the Rocky Mountain Farmer's Union; and
- vi) A representative from the Colorado Department of Agriculture Pesticide Program

(2) Regularly monitor the health and population status of native bees, including the status of native bees in agricultural and non-agricultural habitats and areas of ornamental plants, residential areas, and landscaped areas;

(3) Track and record honeybee health and annual losses of beekeepers;

- (4) Mandate notification through a transparent database for all bee-toxic pesticides prior to application, which will include product name, active ingredient, rate, application type, target pest, application site in the form of GPS coordinates, and dates of application to be published in an accessible format for the public at least 48 hours in advance of any application;
- (5) Identify the scope and likely causes of unusual native bee mortality;
- (6) Beginning not later than 180 days after the date of the enactment of this Act and each year thereafter, submit to the Colorado General Assembly, and make available to the public, a report on such health and population status.
- (7) Provide education to the public, agricultural producers and the Pesticide Advisory Committee about bee health and potential impacts from pesticide use;
- (8) Track results from independent studies concerning pollinator and non-target health from pesticide uses, the impacts of agricultural yield from alternate practices, and provide funding to researchers to provide best practices for agricultural production that protects pollinator health.

APPENDIX C

Preemption Amendments and Model Language Recommendations

Insert the following definition to § 35-10-103:

“Interest of the public health, safety, and environmental protection” means any and all interests or purposes targeting recognized health, safety, and environmental impacts. These concerns need not be dependent on the findings or positions of state or federal regulators, agencies, or policies.

Make the following amendments to § 35-10-112.5:

Statewide Uniformity of Pesticide ~~Labeling Control~~ and Regulation – Exceptions § 35-10-112.5

(1) The general assembly hereby determines that the citizens of this state benefit from a system of safe, effective, and scientifically sound pesticide regulation. The general assembly further finds that a system of pesticide regulation that is consistent, ~~and~~ coordinated, and transparent, that creates certain areas of statewide uniform standards, ~~and that that~~ conforms with both state and federal technical standards and requirements, and that enables local governments to address the needs of their citizens and individualized environments is essential to the public health, safety, and welfare, ~~and finds that local regulation of pesticides that is inconsistent with and adopts different standards from federal and state requirements does not assist in achieving these benefits. The general assembly also finds and declares that, through statute and regulation, the state has created a system of pesticide regulation based upon scientific standards that protects the citizens of this state.~~The general assembly expressly finds and declares that pesticide regulation is a matter of statewide concern.

(2) No local government shall adopt or continue in effect any ordinance, rule, resolution, charter provision, or statute regarding the use of any pesticide by persons regulated by this article or federal law and pertaining to:

(a) Any labeling or registration requirements for pesticides, including requirements regarding the name of the product, the name and address of the manufacturer, and any applicable registration numbers; or

(b) Use and application of pesticides as described on the label ~~by persons regulated by this article or federal law~~, including, but not limited to, directions for use, classification of pesticides as general or restricted use, mixing and loading, site of application, target pest, dosage rate, method of application, application equipment, frequency and timing of applications, application rate, reentry intervals, worker specifications, container storage and disposal, required intervals between application and harvest of food or feed crops, rotational crop restrictions, and warnings against use on certain crops, animals, or objects or against use in or adjacent to certain areas;

(c) Except as specifically provided in this article, any warnings and precautionary statements, notifications, or statements of practical treatment ~~represented on the label~~; or

(d) Licensure, training, or certification requirements for persons regulated under this article, including any insurance and record-keeping requirements.

(3) (a) Nothing in this article may be construed to limit the authority of a local government as defined by state law to:

(I) Adopt any ordinance, rule, resolution, charter provision, or statute, concerning the use and application of pesticides within that local unit of government and adopted in the interest of public health, safety, and environmental protection.

(II) Zone for the sale or storage of any pesticide, provide or designate sites for disposal of any pesticide or pesticide container, adopt or enforce building and fire code requirements, regulate the transportation of pesticides consistently with and in no more strict of a manner than state and federal law, adopt regulations pursuant to a storm water management program that is consistent with federal or state law, or adopt regulations to protect surface or groundwater drinking water supplies consistent with state or federal law concerning the protection of drinking water supplies;

(II) Take any action specifically authorized or required by any federal or state law or regulation with respect to pesticides, or to take any action otherwise prohibited by this article in order to comply with any specific federal or state requirement or in order to avoid a fine or other penalty under federal or state law;

~~(III) Regulate the use of pesticides on property owned or leased by the local government;~~

~~(III)~~ Issue local general occupational licenses to persons regulated by this article.

(b) This subsection (3) may not be construed to authorize a local government to utilize the authority to zone, to provide or designate disposal sites, to adopt and enforce building and fire codes, or to regulate the transportation of pesticides as described in paragraph (a) of this subsection (3) to directly or indirectly regulate or prohibit the application of pesticides by persons regulated by this article or by federal law.

(c) Nothing in this article shall be construed to be an implicit grant of authority to a local government that is not otherwise granted by state law, nor does it grant authority to local government to degrade baseline safety standards concerning pesticide application and use.

~~(4) Any local government that promulgates an ordinance that concerns pesticides, that is promulgated pursuant to section 31-15-707(1)(b), C.R.S., or that is promulgated pursuant to any authority described in paragraph (a) of subsection (3) of this section concerning pesticides shall file the following with the department of agriculture: (a) A certified copy of the ordinance; and (b) A map or legal description of the geographic area that the local government intends to regulate under the ordinance.~~

And insert the following:

Local government ordinances concerning pesticide use and application - § 35-10-112.6

(a) Centralized listing. The Colorado Department of Agriculture shall maintain for informational purposes, for the entire State, a centralized listing of local government ordinances that

specifically apply to pesticide storage, distribution or use, including those promulgated pursuant to section 31-15-707(1)(b), C.R.S.

(b) Existing ordinances. The clerk of any municipality which, on the effective date of this section, has an ordinance to be listed under subsection 1 shall file a copy of that ordinance with the board by December 31, 2015.

(c) New ordinances. The clerk of the municipality shall provide the board with notice and a copy of any ordinance to be listed under subsection 1 at least 7 days prior to the meeting of the legislative body or the public hearing at which adoption of the ordinance will be considered. The clerk shall notify the board within 30 days after adoption of the ordinance.

(d) Intent. It is the intent of this section to provide information on municipal ordinances. This section shall not affect municipal authority to enact ordinances or overturn ordinances otherwise valid under local government law and procedure.

(e) Failure to file. For any ordinance which is not filed with the board, with notice given to the board in accordance with this section, which is otherwise valid under the laws of this State, any provision that specifically applies to storage, distribution or use of pesticides shall not take effect until the board is given proper notice and the ordinance is filed with the board.

Judicial review of local government ordinances pertaining to pesticide use and applications - § 35-10-112.7

(a) Review of local ordinances shall be exclusively vested in a state court of competent jurisdiction.

APPENDIX D

Proposed Amendments to Advisory Committee

§ 35-10-125. Advisory committee--sunset review

(1) The state agricultural commission created by section 35-1-105 shall appoint an advisory committee of sixteen members to assist the commissioner in promulgating rules and regulations to carry out the provisions of this article.

(2) The committee shall consist of the following members:

(a) A formulator, or his Colorado representative, actively engaged in the sale of pesticides in Colorado;

(b) A commercial applicator, licensed under this article, who is actively engaged in the commercial application of pesticides for the control of agricultural crop pests;

(c) A commercial applicator, licensed under this article, who is actively engaged in the commercial application of pesticides for the control of turf or ornamental pests;

(d) A commercial applicator, licensed under this article, who is actively engaged in the application of pesticides for the control of structural pests;

(e) A qualified supervisor, employed by a limited commercial applicator registered under this article, who is actively engaged in the application of pesticides;

(f) Two representatives from public applicators registered under this article, each of whom shall be an elected official or a designee thereof;

(g) A representative from Colorado state university agricultural experiment station or extension service;

(h) A representative from the Colorado department of public health and environment;

(i) Two representatives from the general public, one of whom is actively engaged in agricultural production;

(j) Two local government representatives;

(k) Two environmental health or conservation specialists; and

(l) One physician or public health professional with knowledge of pesticide impacts on children's health.

(3) All members of the advisory committee, with the exception of the formulator, shall be residents of this state.

(4) The appointment of the formulator, the commercial applicator engaged in the control of agricultural crop pests, and one of the representatives from a registered public applicator shall expire on January 1, 1991; and the appointment of the commercial applicator engaged in the control of turf or ornamental pests, the representative from the general public who is actively engaged in agricultural production, the qualified supervisor employed by a registered limited commercial applicator, and the representative from the department of health shall expire on January 1, 1992. The initial appointment of all other members shall be for a term of three years. Thereafter, the appointment of each member to the committee shall be for a term of three years.

(5) Members of the advisory committee shall receive no compensation but shall be reimbursed for actual and necessary traveling and subsistence expenses incurred in the performance of their official duties as members of such committee.