



# POISONED FOOD, POISONED BRAINS

## Mapping dangerous pesticides in the foods we eat

### BACKGROUND

Since the mid-1960s, staple fruits and vegetables in the U.S. have been sprayed with chlorpyrifos, one of many dangerous organophosphate pesticides on the market. Multiple studies have linked chlorpyrifos to [permanent harms to the developing brains of children](#), including reduced IQ, loss of working memory, and attention deficit disorders. Chlorpyrifos is sprayed on apples, all major citrus crops, table grapes, strawberries, and cherries. It is also used on corn, the country's largest crop.

The dire health consequences of organophosphates like chlorpyrifos are not accidental. In the 1940s, the [Nazis weaponized organophosphates](#) as a form of chemical warfare. After World War II, German chemical companies repurposed this class of nerve agents for agricultural use. And now, more than half a century later, millions of pounds of chlorpyrifos are [manufactured and sold every year by agrochemical conglomerates](#) like Dow Chemical (now Corteva Agriscience)<sup>1</sup>, ADAMA Agricultural Solutions Ltd., Cheminova (owned by FMC Corporation), Gharda Chemicals, Ltd., and Platte Chemical Company, Inc. (part of Loveland Products, Inc.).

Chlorpyrifos is one of dozens of organophosphates that the Environmental Protection Agency (EPA) reauthorized for use in agricultural fields in 2006. In the early 2000s, [EPA agreed with Dow AgroSciences](#), then the largest manufacturer of chlorpyrifos, to end most residential uses but not most food uses. In April 2021, after years of litigation led by Earthjustice and its clients, the 9th Circuit Court of Appeals ordered EPA to ban all food uses of chlorpyrifos or retain only those it can find safe for workers and children.

EPA must unveil its rule by August 20, 2021. While the only sensible and lawful action would be to ban

chlorpyrifos from food, it is unclear EPA will do so. [Recent reporting from The Intercept](#) shows that for years, chemical companies like Dow have strong-armed, tricked, or persuaded EPA into relying on flawed science and keeping harmful pesticides – including chlorpyrifos – on the market. These lobbying maneuvers are most likely ongoing as the August deadline looms.

To keep the record straight, Earthjustice reviewed and extracted data from EPA human health risk assessments, as well as agricultural pesticide usage data from the United States Geological Survey (USGS). The data Earthjustice compiled, categorized, and analyzed, which also includes information on 16 other organophosphates, is available to download and explore in a [searchable database at earthjustice.org/organophosphates](#). The database shows which crops are sprayed, the foods that contain high levels of organophosphates, links to health risks evaluations, and a brief regulatory history. This is the first time that risk findings and USGS mapping data on organophosphates as a whole, and chlorpyrifos in particular, have been collated.

#### Manufacturers with chlorpyrifos registrations in the US:

Nufarm Americas, Inc., FMC Corporation, BASF Corporation, Southern Agricultural Insecticides, Inc., Adama Makhteshim LTD, Drexel Chemical Company, Control Solutions, Inc., Makhteshim Agan of North America, Inc., Tide International, USA, Inc, Liberty Crop Protection LLC, Central Garden and Pest Company, Gharda Chemicals International.<sup>2</sup>

1. Corteva, the largest manufacturer of chlorpyrifos, said it would stop manufacturing in 2021. [Lorsban, the product name of chlorpyrifos, is still promoted on Corteva's website.](#)  
2. <http://npirspublic.ceris.purdue.edu/ppis/product.aspx>

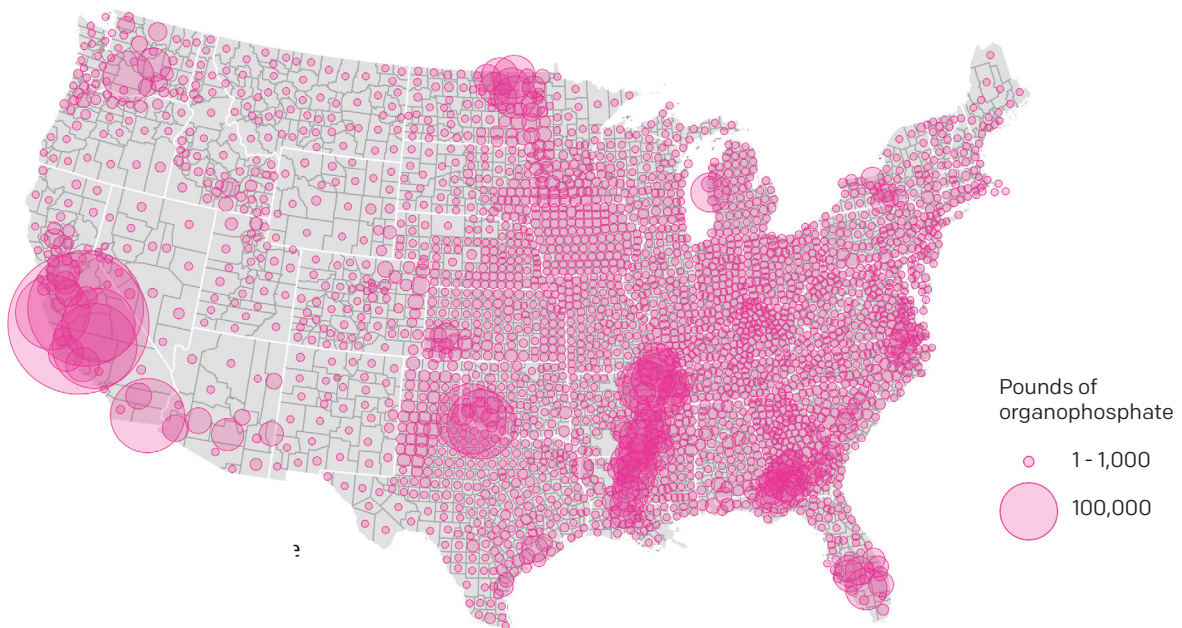
**PRESS CONTACT:**  
Alejandro Dávila Fragoso,  
National Media Strategist  
[adavila@earthjustice.org](mailto:adavila@earthjustice.org)

## KEY TAKEAWAYS

- The most recent government data says the United States used over 5.6 million pounds of chlorpyrifos on agricultural land in 2017.
- California, Minnesota, North Dakota, and Kansas used the most chlorpyrifos. Of the top 10 counties that used the most, four are in California and five are in North Dakota.
- Chlorpyrifos is allowed on 48 food commodities, including fruits, vegetables, meats, and their offshoot products. The commodities that have the highest allowable levels of chlorpyrifos are sugar beets, corn, and citrus. Cilantro, basil, and raisins have residue levels that exceed allowable limits, according to the most recent government data.
- Anyone living near where chlorpyrifos is used can be exposed to unsafe levels through air (drift) or drinking water, according to government studies, which note that food is a method of exposure too. Government reports show that farmworkers and people who live, work, or go to school near agricultural fields where chlorpyrifos is used experience dangerously high levels of exposure and are at elevated risk of harm.
- Children between one and two years old are most at risk of harm from chlorpyrifos, as they face dietary exposures of more than 140 times EPA’s so-called level of concern.
- In its 2016 Refined Drinking Water Assessment, which is the only such assessment that attempted to find a chlorpyrifos exposure level that would be safe for children, EPA said drinking water across the nation is likely contaminated with unsafe levels of chlorpyrifos. EPA’s high end estimates indicate that in the most contaminated areas, chlorpyrifos contamination may be 12,000 higher than levels of concern.

## REPORT FINDINGS

### Chlorpyrifos Hot Spots Across the United States



USGS low estimates for chlorpyrifos use in pounds across US harvested croplands, or Crop Reporting Districts (“CDR”). The USGS E-pest low model more accurately reflects state use as it assumes no chlorpyrifos on crops for which data is not reported in a CDR. High estimates account for chlorpyrifos use that may happen but may not be reported and cannot be verified. The map reflects only agricultural crop usage in 2017, and does not reflect other uses like golf courses, or plant nurseries. Chlorpyrifos use data pertaining to non-contiguous states and U.S. territories, including Hawai’i, Alaska, and Puerto Rico were not made available by the USGS and are not reflected on this map.

**PRESS CONTACT:**  
**Alejandro Dávila Fragoso,**  
 National Media Strategist  
 adavila@earthjustice.org

Chlorpyrifos is used in nearly every major agricultural state and all over the country. The most recent available government data shows a downward trend of use, but nonetheless the U.S. sprayed 5.6 million pounds of chlorpyrifos on fields in one year. According to the same 2017 data, California, Minnesota, North Dakota, Kansas, Florida, and Washington state used the most. And while California approved a chlorpyrifos ban in 2019, which would phase out most, but not all, agricultural uses of the pesticide by December 2020, this does not mean the state will be chlorpyrifos free. In fact, states that have adopted bans cannot prevent foods with chlorpyrifos residues from being sold or consumed in the state.<sup>3</sup> Only EPA can do that with a federal ban.

Of the top 10 counties that use the most chlorpyrifos by volume, four are in California and five are in North Dakota. In California, those counties are Kern, Fresno, Tulare, and Kings, which all border each other and are in the San Joaquin Valley. In North Dakota, the counties with the

highest chlorpyrifos use are Grand Forks, Pembina, Cavalier, Walsh, and Ramsey. The adjacent counties of Towner and Nelson in North Dakota, along with Marshall and Polk counties in Minnesota, all fall in the top 20 counties with highest chlorpyrifos use by volume, creating a sizeable agricultural hot spot. The combined use of chlorpyrifos across these two states account for almost 27% of the annual usage in the United States from 2017.

Studies have shown that psychosocial stress from factors like poverty and racial injustice can make communities like those in Yakima and Grant counties in Washington state, which have higher percentages of poverty than the national average, more vulnerable to harm from chlorpyrifos exposure.<sup>4</sup> Hispanic or Latinx communities are also twice as likely to live in these two counties with heavy chlorpyrifos use compared to the rest of Washington state, according to 2010 US Census data. EPA does not take these factors into account when assessing risks.

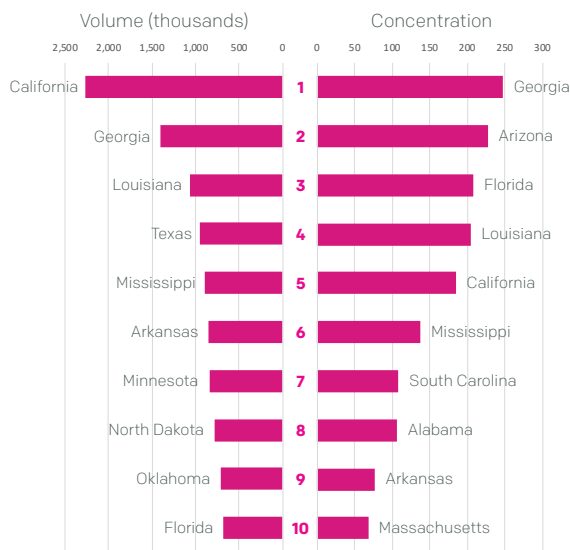


Figure 1: Ranking of states (top 10) based on aggregate pesticide volume and concentration

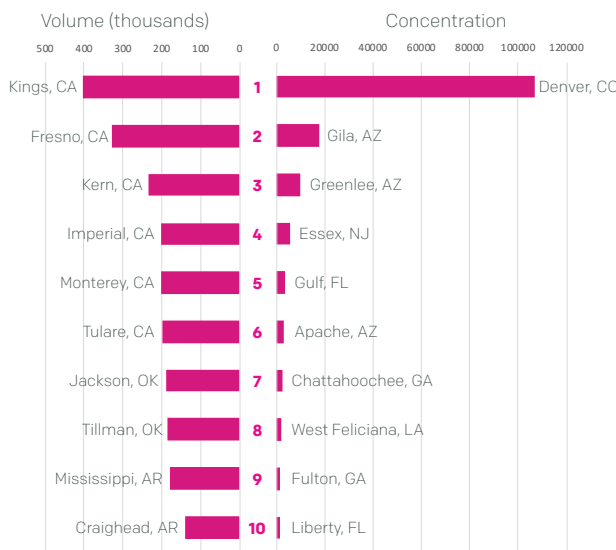


Figure 2: Ranking of counties (top 10) based on aggregate pesticide volume and concentration

3. New York, Oregon and Hawai'i also banned chlorpyrifos.  
 4. Rachel Morello-Frosch et al., *Understanding the Cumulative Impacts of Inequalities in Environmental Health: Implications for Policy*, 30 *Health Affairs* 879-887 (May 2011), <https://www.healthaffairs.org/doi/pdf/10.1377/hlthaff.2011.0153>; Devon C. Payne-Sturges et al., *Methods for Evaluating the Combined Effects of Chemical and Nonchemical Exposures for Cumulative Environmental Health Risk Assessment*, 15 *Int'l. J. Env'tl. Research & Pub. Health* 2797 (2018), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6313653/>; Cliona M. McHale et al., *Assessing Health Risks from Multiple Environmental Stressors: Moving from G×E to I×E*, 775 *Mutational Research* 11-20 (Jan. 2018), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5863617/>.

**PRESS CONTACT:**  
**Alejandro Dávila Fragoso,**  
 National Media Strategist  
[adavila@earthjustice.org](mailto:adavila@earthjustice.org)

## Chlorpyrifos in Water and Food

Federal agency assessments show that chlorpyrifos is pervasive in our environment, from the air we breathe to the food we eat. Although farmworkers who directly handle chlorpyrifos are at most immediate risk of exposure, government reports show that communities can be exposed to this pesticide through water, food, and the toxic drift that reaches schools and homes. Independent scientists from universities from across the country agree that exposure is ongoing.

In its 2016 [Refined Drinking Water Assessment](#), EPA found that drinking water across the nation is likely contaminated with unsafe levels of chlorpyrifos. EPA'S high end estimates indicate that in the most contaminated areas, chlorpyrifos contamination may be 12,000 higher than levels of concern. Reports do not specify locations.

According to food residue monitoring data obtained by the USDA Pesticide Data Program (PDP), **chlorpyrifos is widespread on food products sold in the U.S.**

EPA allows residues of chlorpyrifos on 48 food commodities, including fruits, vegetables, grains, meats, and various offshoot products like milk, eggs, and vegetable oil, to name a few. But the allowable levels are based on acute poisoning risks, not on risks of neurodevelopmental harm in children. This means that even residues below EPA'S allowable levels could harm children'S brains.

Chlorpyrifos is allowed on foods that children and families eat often, including apples, oranges and other citrus, strawberries, soybeans, cucumbers and corn. The commodities that have the highest allowable levels of chlorpyrifos are sugar beets, corn, and oils like citrus oil, peppermint, and spearmint, the latter can end up in a variety of processed foods and even toothpaste.

The most recent PDP data from 2015 – 2019 shows that chlorpyrifos residues were detected on 37 different foods at times above allowable levels. Chlorpyrifos was frequently detected on asparagus,

peppers, frozen strawberries<sup>5</sup> and peaches, foods that EPA continues to allow it to be used on. Peaches, cilantro, basil, and raisins had residue levels that exceeded allowable levels.

In its 2016 Human Health Risk Assessment for chlorpyrifos, the only version to date that attempted to examine risk at exposure levels associated with neurodevelopmental harm in children, EPA found that exposure to chlorpyrifos through food occurs at unsafe levels across the general population. But in children aged 1-2 years, the subgroup with the highest risk, dietary exposures are over 140 times higher than EPA'S level of concern, the threshold the agency used to try to protect children from neurodevelopmental harm. This happens because children eat, drink and breathe more in proportion to their body size than adults.

And chlorpyrifos is just the tip of the iceberg in terms of exposures to organophosphate pesticides, which all act in the same way and cause the same type of harm. In 2017, over 10.5 million pounds of 13 other organophosphate pesticides were used across U.S. fields. Most of these pesticides are also found in food and drinking water at unsafe levels. Earthjustice reviewed government studies showing that 16 commonly used organophosphates besides chlorpyrifos are also linked to neurodevelopmental harm in children. Under the law, their combined effect must be considered.



In 2017, 5.6 million pounds of chlorpyrifos was sprayed on crop in the United States. Chlorpyrifos is used on fruits and vegetables, like oranges, strawberries, apple, and greens, we eat and feed our families every day. Dave Getzschman / Earthjustice

5. Although in the case of strawberries, most of the nation'S crop will not be sprayed with chlorpyrifos thanks to state bans in California and Oregon. There are some strawberry-producing states, however, like North Carolina, that can use chlorpyrifos on this crop.

**PRESS CONTACT:**  
Alejandro Dávila Fragoso,  
National Media Strategist  
adavila@earthjustice.org



	Human Health Effects					Crops							
	Neurodevelopmental Harm	Reproductive Toxicity	Cancer	Immunotoxicity	Endocrine Disruption (Tier 2)	Alfalfa	Corn	Cotton	Fruit and Vegetables	Orchards and Grapes	Other Crops	Soybeans	Wheat
Chlorpyrifos	●	●				○	○	○	○	○	○	○	○
Diazinon	●	●							○	○			
Acephate	●		●					○	○	○	○		
Bensulide	●	●							○				
Dicrotophos	●	●	●	●				○					
Dimethoate	●	●	●		●	○	○	○	○	○	○		○
Ethoprop	●		●						○				
Malathion	●	●	●			○			○	○			
Phosmet	●	●	●			○			○	○			
Terbufos	●						○					○	
Tribufos	●		●					○					
Chlorpyrifos-methyl	●												
Chlorethoxyfos	●						○		○				
Coumaphos	●												
Phorate	●						○	○				○	
Dichlorvos	●		●										
Naled	●	●				○		○	○	○	○		

Figure 4: Table of Health Effects Side by Side with Crops, by pesticide

### Risks and Health Effects of Chlorpyrifos

Chlorpyrifos, like all organophosphates, is acutely neurotoxic, meaning that people who are exposed at high doses over a short period of time – generally workers – can experience severe neurological symptoms like headaches, dizziness, difficulty breathing, seizures, and even death. Beginning in 2014, EPA found that chlorpyrifos exposure during pregnancy is linked to long-term harm to children’s developing brains, causing lower IQs, loss of working memory, developmental delays, attention deficit disorders, and structural changes in the brain. These findings align with decades of scientific research. [Harms to children’s brains occur at even low levels of exposure](#), according to [studies that tracked mothers and children](#).

EPA reports also show that people who live near fields where chlorpyrifos is used, referred to as “residential bystanders,” can experience dangerous levels of exposures to this pesticide. These exposures occur primarily from aerosolized chlorpyrifos, which drifts from agricultural fields to nearby homes, schools, and other establishments following spray application. Bystanders can experience high levels of exposure to chlorpyrifos by breathing in, touching, or ingesting pesticide residues inside or near their homes, according to EPA.

**PRESS CONTACT:**  
**Alejandro Dávila Fragoso,**  
 National Media Strategist  
 adavila@earthjustice.org

## CONCLUSION

Chlorpyrifos, an organophosphate that was banned from home use two decades ago because it was too toxic, continues to be used on fruits and vegetables. This exposes millions of people living in the United States to the dangers of this pesticide, including irreparable harm to children's brains that has been documented for decades. Despite the resounding scientific consensus on the ability of chlorpyrifos to impair critical brain development, to this day EPA has refused to ban the pesticide.

In 2020, the Trump administration released a revised human health risk assessment for chlorpyrifos that abandoned any attempt to protect children from neurodevelopmental harm and reverted to previous risk assessment approaches that defied the law and the best available science. Based on the findings of its flawed assessment, the Trump administration then proposed to allow continued chlorpyrifos use on 11 crops at levels that far exceed the levels at which harm to children's brains occurs. This proposal is still before EPA.

In April 2021, the 9th Circuit Court of Appeals ordered the EPA to ban all food uses of chlorpyrifos unless the agency can prove that the pesticide is safe for children. The agency has until August 20, 2021, to finalize regulations banning or limiting chlorpyrifos on our food. EPA could ban all food uses of this pesticide to finally protect children, farmworkers, and rural communities from this dangerous pesticide. Or EPA could succumb to chemical industry pressure and finalize a Trump-era proposal to continue chlorpyrifos use on food that defies sound scientific evidence and the law.

Just as science led EPA to say chlorpyrifos is too toxic for our homes 20 years ago, so too science is telling the agency this pesticide is too toxic for our food. Indeed, following the science leads inevitably to the conclusion that the only acceptable way to keep children and workers safe from chlorpyrifos is to ban it, once and for all, and start taking a hard look at the whole class of organophosphates.



Communities of color bear a disproportionate burden of pesticide exposure in the United States. In agricultural communities, like Salinas, CA (pictured above), schools are frequently situated near fields where chlorpyrifos is sprayed. *Martin DoNascimento / Earthjustice*

**PRESS CONTACT:**  
Alejandro Dávila Fragoso,  
National Media Strategist  
[adavila@earthjustice.org](mailto:adavila@earthjustice.org)