Stain-Resistant, Nonstick, Waterproof, and Lethal

The Hidden Dangers of C8

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Preface

In January 2002, people living in the Mid Ohio Valley began to hear about C8, a manufacturing substance that was detected in several area water supplies as the result of emissions from the DuPont Washington Works plant near Parkersburg, West Virginia. Sixteen months later, in April 2003, the Environmental Protection Agency (EPA) announced it was launching a multiagency review of the manmade chemical, which scientists call PFOA or perfluorooctanoic acid. This raised widespread concern over the chemical's prevalence. The EPA was alarmed primarily because early tests indicated that traces of the Teflon processing chemical C8 could already be found in the blood of almost everyone in the United States.

The consequential inquiry turned out to be the largest EPA investigation of its kind. Several studies resulted from the multiagency review, providing some answers, but even more questions about the substance.

In 2005, DuPont settled a class action lawsuit with thousands of Mid Ohio Valley water consumers for more than $107 million with the promise of more than $200 million in additional compensation should the chemical prove to be a health threat. Later that year, an EPA science advisory board began to float the notion that C8 is a "likely carcinogen," in preparation for the release of its risk assessment report. As the result of an independent study, residents of certain Ohio communities—those with the greatest concentration of

contamination—were advised not to drink the water, and DuPont began to provide consumers with bottled water until filtration systems could be installed.

Between 2002 and 2005, DuPont spent more than $30 million on technology and the development of pollution control devices to reduce PFOA air and water emissions by nearly 90 percent. Still, the substance is found in the water, soil, and air of adjacent Mid Ohio Valley communities.

However, the plight of these rural communities and their residents was just the beginning of the investigation into PFOA. Over time, science would reveal that the same substance detected in the water in West Virginia and Ohio was also leaching off of thousands of consumer products and into the bloodstream of millions of people around the world. DuPont refers to these applications as "miracles of science" because their heat-, grease-, stick-, and stain-resistant properties seem to act against nature.

As of this writing, twelve states have documented C8 exposure risks: West Virginia, Ohio, Delaware, North Carolina, Pennsylvania, Virginia, Alabama, Minnesota, New Jersey, Connecticut, New York, and Mississippi. However, at least one research team says no region of the United States can yet be ruled out for potential PFOA contamination, and existing blood sampling evidence would seem to bear that theory out.

For those with contaminated water supplies, it remains to be seen whether the chemical itself or the fear and concern it has instigated will be the worse consequence of this socioindustrial phenomenon. Even after years of investigation, the EPA's assessment seems murky, and many questions are still unanswered.

In the meantime, real nightmares of cancer risks and a fabled dictionary of hypothetical illnesses and diseases plague the people of the Mid Ohio Valley—and many others whose drinking water is contaminated with C8. Scientists have yet to pinpoint any specific warning signs or symptoms from exposure, but the evidence does nothing to ease the genuine anxieties of those with elevated concentrations of PFOA in their blood.

Acknowledgments

Environmental consultant Linda Aller provided the scientific review and editing of the manuscript. In addition to checking the book for accuracy and readability, she also contributed far more in terms of interesting content by sharing her knowledge and understanding. Aller is a geologist and licensed sanitarian in Ohio. She has lectured both nationally and internationally and has contributed to numerous publications.

Environmental engineer Ming Zhang designed the maps.

Many individuals from all sides of the controversy have generously shared information with me over the past few years. They include: Robert Griffin of the Little Hocking Water Association, Don Poole of the Tuppers Plains-Chester Water District, Paul Bossert, Dawn Jackson, Chris Caldwell, and Robin Ollis of DuPont, Lauren Sucher and Dr. Kris Thayer of the Environmental Working Group, attorneys Robert Bilott and Harry Deitzler, Rick Abraham of United Steelworkers, Lisa Collins of Salter and Associates, Dr. Edward Emmett, Art Maher and Paul Brooks of Brookmar, and Dr. Kyle Steenland of the C8 Science Panel.

Thanks to Simona Vaclavikova, formerly of Ohio Citizen Action, for renewing my interest at a critical time.

Thanks to the hundreds of Mid Ohio Valley residents who have contributed by sharing their stories—both in private conversation as well as recorded interviews.

Ultimately, the project was completed only with the encouragement of many dear friends, the patience and goodwill of a long-suffering family, and the acceptance of a thought-provoking companion.

I'm so very grateful to have a wonderful employer in Johnny Wharff, who supported this endeavor to the fullest extent and gave me the freedom to pursue it. I am also thankful for my WMOA family, all of the talented people I work with and those who listen to us every day, and who have encouraged and tolerated this work every step of the way.

Thanks to my mother, my most meticulous proofreader, and my father, my computer tech, my sister, my best promoter, and my brothers.

Special thanks are also due Robert for his support, patience, and belief.

Finally, the book was written for my daughters, Kaitlynne and Elizabeth, in hopes that a truly cleaner and greener future lies ahead.

Introduction: PFOA 101

Teflon is a wonder of modern science, ensuring the convenience and ease of use of thousands of familiar household items, from pots and pans to shower scrubbers to nail polish. This incomparable chemical substance has become so widely used that its residues can be found in the environment throughout the world. The mystery lies in how the chemical by-products got there.

A research chemist accidentally stumbled onto the miracle of Teflon in 1938.[1] Dr. Roy J. Plunkett was the son of a poor farmer from New Carlisle, Ohio. Determined to have a different life, he studied hard and became a scientist. At the age of twenty-eight, Dr. Plunkett was performing experiments at a Deepwater, New Jersey, lab in an effort to develop a refrigerator coolant for DuPont when instead he concocted the first batch of the most slippery substance on earth.

Later, the white, waxy material was found to be heat-resistant and nonstick. The Teflon trademark was registered in 1944. After ten years of research, in 1949, DuPont introduced the marvelous substance to consumers. In the 1960s, the application of Teflon to cookware made it a household name. Before his death in 1994, Plunkett saw the product applied to thousands of consumer products, influencing everything from culinary arts to rocket science.[2]

PFOA, or perfluorooctanoic acid, is a manufacturing chemical used to make familiar consumer items such as Teflon kitchenware, Gore-Tex clothing, household cleaning products, and some premium health and beauty items.

Scientists often pronounce it "pa-fo-a" or "pee-fo-a." Industry calls it by the trade name "C8" because of its eight-carbon chain.

For the most part and for the purposes of this discussion, PFOA and C8 are interchangeable and used to discuss both the acid and its salts.[3] To be scientifically precise, PFOA refers to the acid version of the chemical compound, whereas APFO, or ammonium perfluorooctanoate, is the ammonium salt. The broader use of C8 to describe either PFOA or APFO is appropriate for this conversation because only their industrial uses differ.

The structural formula of C8 is C8HF15O2. Melting point is 55 degrees Celsius. Boiling point is 189 to 192 degrees Celsius. Until recently, little else was publicly known about PFOA because a large amount of the body of research was classified by industry as proprietary information.

However, it is a well-documented fact that DuPont has been using C8 to make Teflon at the Washington Works plant near Parkersburg, West Virginia, since 1951. In all that time, DuPont claims it has observed no harmful health effects for humans.

C8 or PFOA is most commonly associated with Teflon. So in order to understand PFOA, it's helpful to first take a look at Teflon and other related chemicals.

C8 is used to make Teflon, and it is also a by-product of Teflon, but Teflon does not actually contain C8.

In the broader sense of the term, PFOA is a fluorinated organic compound that can be produced synthetically or created through the breakdown or degradation of certain other manmade products. PFOA is the most common processing aid for the perfluorocarbon (PFC) family. PFOA does not occur naturally. The presence of it anywhere in the environment can only be attributed to the intervention of human beings.

PFOA is a surfactant, or processing aid used to manufacture Teflon, but it's not an ingredient. It was never intended to be part of the end product since it is simply a smoothing agent. It is added to keep the Teflon ingredients in suspension. Simply put, PFOA is a surface-acting agent that evens out Teflon, which left to its own nature would form globules or bubble up.[4]

PFOA makes Teflon possible, and so far DuPont hasn't been able to find a way to produce Teflon, or hundreds of other industrial applications, without it.

Teflon is actually polytetrafluoroethylene (PTFE), an altogether different chemical composition. It is a thermoplastic fluoropolymer.[5] It is also a member of the PFC family.

Fluoropolymers are characterized by an unusual resistance to solvents, acids, and bases. A fluoropolymer is a large organic molecule that has been formed by the joining of many smaller molecules in a pattern, and which contains atoms of fluorine. The ninth element on the periodic table, fluorine is one of the one hundred most toxic substances known to exist.

PFCs are familiar to most Americans as powerful greenhouse gases emitted as the result of industrial processes and blamed for global warming. The term also applies to the broader category of manmade chemicals composed of carbon and fluorine and widely used because of their durability and resistance to oil and water. Perfluorooctane sulfonate (PFOS), the chemical at the heart of 3M's Scotchgard phaseout, is closely related to PFOA. In 1999, the EPA began an investigation into PFOS because it was discovered that the substance was persistent, bioaccumulative, and toxic. The company stopped making PFOS and PFOA as part of a plan announced early in 2000. The move made DuPont the lone open-market manufacturer of PFOA in the United States when it took over production from 3M in 2002.

In June 2000, the EPA indicated that it was expanding its investigation of PFOS to other fluorochemicals, including PFOA.[6]

PFOA and PFOS are both sturdy end products, meaning that other chemical substances breakdown to form them, but that's where the degradation stops. They remain stable nearly indefinitely.

Plunkett's Teflon was the first form of PFC to be developed and marketed commercially. Although C8 is used to make Teflon, Teflon is not considered a significant contributor to the global presence of PFOA in the environment. That's largely because PFOA is also an unintended reaction by-product of some telomer-based products.[7] Fluorinated telomers are used in the production of firefighting foams, cleaning agents, and oil-, stain-, and grease-repellent surface treatment agents for carpets, textiles, leather, and paper—just to name a few.[8] Telomers possess many of the same properties as the perfluorochemicals we have discussed, but their composition is chemically different.

Telomers are of interest in the EPA investigation because evidence suggests that some telomers are transformed into PFOA in the environment or metabolized into PFOA in living organisms.

While it is certainly true that industrial releases have likely contributed heavily to the widespread occurrence of PFOA in the

global environment, a newer hypothesis has come to light that helps to explain this phenomenon.

In December 2005, the Environmental Science and Technology Online News explained an emerging theory about the migration of PFOA. Specifically, University of Toronto chemists Scott Mabury and Tim Wallington put forth the notion that air currents to remote regions disburse fluorotelomers, and along the way atmospheric reactions transform them into PFOA. Their model may explain why PFOA can be found in the Arctic as well as in the middle of the Atlantic Ocean.[9]

"It's toxic. It's everywhere. And, it lasts forever." That was the report from the EPA when the agency launched its review of PFOA/C8 in April 2003.[10]

In a summary of the known evidence about the manmade chemical, the EPA first referred to PFOA as a "potential carcinogen." By the summer of 2005, the EPA's Science Advisory Board determined that particular classification was not strong enough to characterize PFOA. The board termed PFOA a "likely carcinogen" based on evidence of its toxicity to more than one animal species and the observation that in the lab exposed animals developed a variety of cancers, including liver, pancreas, breast, and testicular cancers.

Also of concern to the EPA was the persistence of the chemical in the environment as well as in human beings. Not only is the substance astonishingly widespread, it also takes an extraordinarily long time to get rid of. C8 is very difficult to destroy, dispose of, or eliminate. In fact, it's nearly impossible.

"PFOA is persistent in the environment. It does not hydrolyze, photolyze, or biodegrade under environmental conditions."[11]

As a processing aid, C8 makes lumpy Teflon seamless, but it also acts as a detergent. As Robbin Banerjee, superintendent at the DuPont Washington Works Teflon plant, explained, when you try to scrub the substance out, it has a tendency to bubble up and get sudsy. In other words, it tends to expand. So the corporation had some challenges in developing technology to scrub the substance out of air and water emissions. From 2002 to 2003, the company spent millions on the development of a scrubber system only to find it ineffective in practice.

Despite the EPA's January 2006 call for the elimination of industrial releases and the use of related compounds in consumer products, so far C8 eradication is still a daunting task for which industry and science have no solid plan of action. At this point, it does not

seem probable. Even though industry has vowed to remove the substance from emissions, it will still remain in the environment for untold years.

Here's why: The half-life of PFOA in the troposphere, or the closest part of the atmosphere, is more than two thousand years.[12]

In humans the half-life is thought to be between three and eight years. That's how long it takes for one half of the pollutant to disintegrate by natural means and lose half of its concentration. In other words, that's how long it takes for half of any amount of C8 to leave the body once it enters the bloodstream.

"It doesn't break down—ever," said Dr. Tim Kropp, senior scientist for the Environmental Working Group (EWG).[13] "If we were exposed to no more of it, it would take us about two decades to get rid of 95 percent of it."

Yet the general population is being exposed nearly continually through the widespread use of related consumer products, industrial emissions, and atmospheric proliferation.

Rats get rid of the stuff in a matter of days, but it kills them. PFOA's toxicity in animals is well documented. It causes cancer, developmental problems, and reproductive problems.

There is no consensus on the implications for people. With the health risks for humans as yet undetermined, perhaps the most disturbing truth known by the EPA about PFOA or C8 is that it can already be found in the blood of more than 96 percent of the general population at a median level of 5 parts per billion. It has been detected in the umbilical cord blood of infants born in various locations around the country, and the controversy surrounding the substance has become so high profile that PFOA has been added to the list of chemicals monitored nationwide in annual National Institutes of Health testing.

Interestingly, wildlife and human blood serum data available to the EPA in 2003 indicated that while both groups displayed signs of exposure nationwide, humans were much more likely to have PFOA in their blood than animals. And PFOA was not found as frequently in animals as the 3M chemical PFOS.

The total world production of PFOA, PFOS, and related compounds, and the true amount of environmental emissions, are unknown. 3M alone produced a reported 300,000 tons of these chemicals in 2000. DuPont claims C8 production alone of around 350 tons (or 700,000 pounds) in 2005. But some experts have estimated likely total global production peaked as high as 500,000 tons a year.[14]

Although C8 is used to make Teflon, Teflon is not the most likely pathway to human exposure. It is theorized that people are more likely to be exposed to C8 through the breakdown of chemical coatings on the carpeting in their homes or by eating microwave popcorn. However, it is important to note that PFOA-related coatings can be found on the most innocent of food items, ranging from donut, candy, and gum wrappers to pizza boxes and French fry pockets. Even fresh produce, including such wholesome selections as milk, apples, and green beans, has been found to be carrying significant levels of PFOA in grocery stores nationwide. Researchers from the U.S. Food and Drug Administration (FDA) have also found household dust to be laden with C8.

For residents of the Mid Ohio Valley and others living near industrial facilities, who have been drinking it in their water, breathing it in the air, consuming it with their homegrown produce, and inevitably being exposed in a number of additional ways, Teflon is actually way down on the list of probable means of contamination.

Despite all of the attention and study, the people of Little Hocking, Ohio, and others remain "adrift in a sea of controversy" over C8. No one knows a "safe level" for human exposure and there's no consensus on the potential harms. For all of the very real fears these people experience about the origin of cancers, reproductive changes, liver problems, and childhood and developmental diseases, so far the evidence is inconclusive. In worker populations, the substance has been linked to face and eye birth defects and elevated cholesterol levels. In time the chemical might prove to be a detriment, but scientists have not yet determined how much is hazardous or how to define initial symptoms.

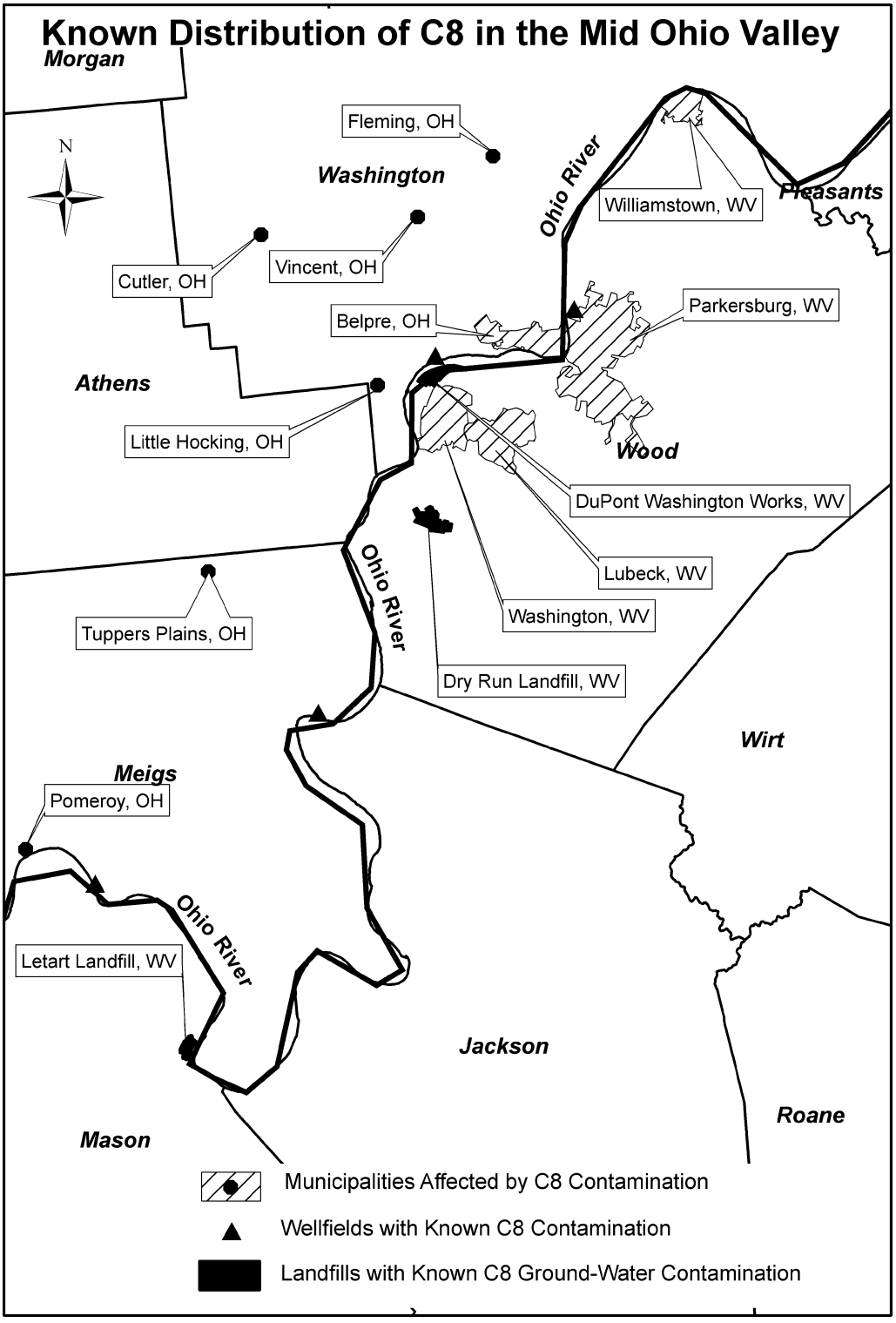

Figure 1. Known Distribution of C8 in the Mid Ohio Valley

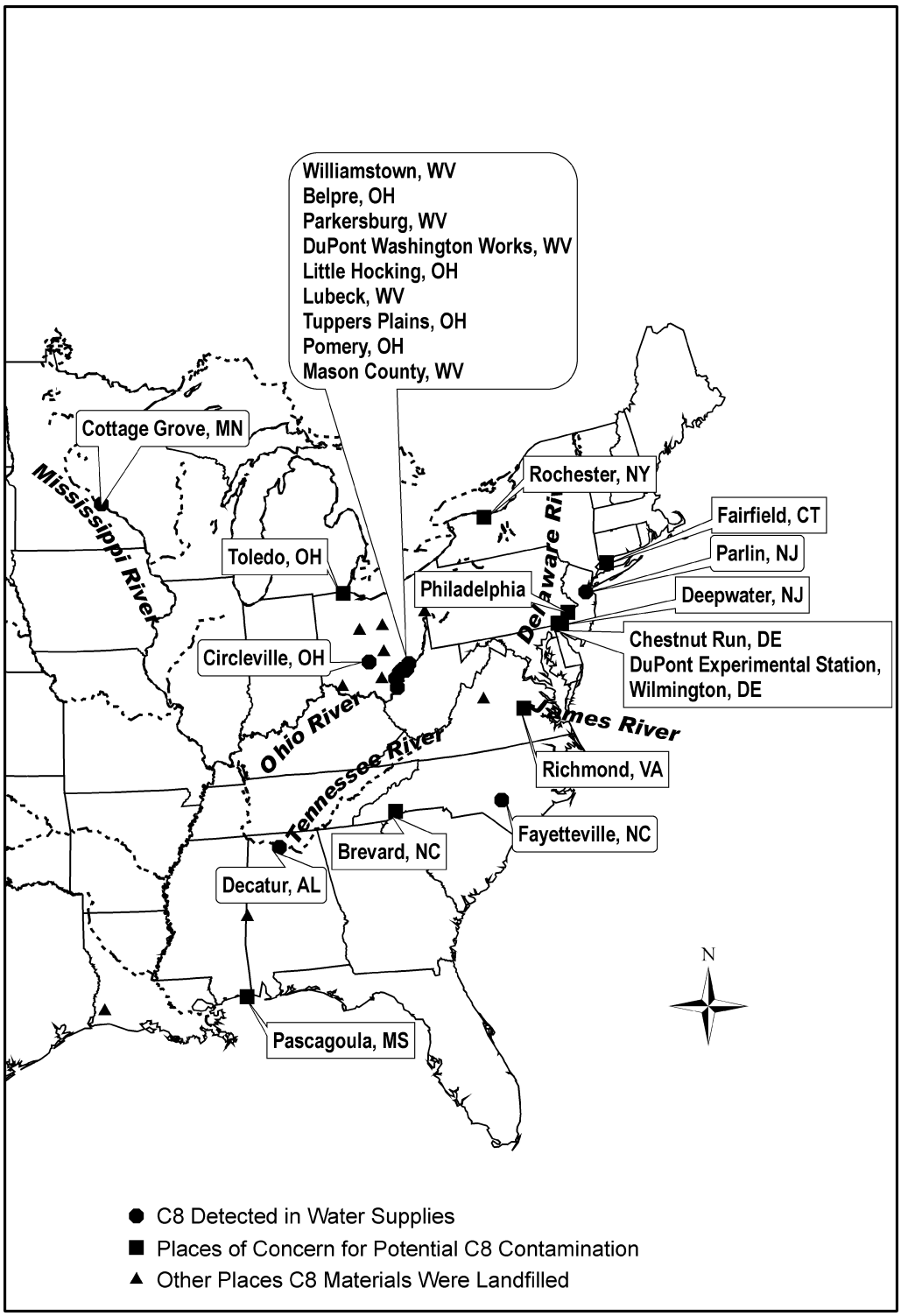

Figure 2. Known and Suspected Distribution of C8 in the United States.

CHAPTER 1

The Tennant Farm, Washington, West Virginia

The revelation that a man-made chemical had seeped into several public water supplies in West Virginia and southeastern Ohio came to light through a series of strange incidents at the Tennant farm, located deep in God's country, about eight miles south of Parkersburg, West Virginia, just off State Route 68.

It began with grisly discoveries of perished wildlife. Then domesticated animals inexplicably suffered and died under similar circumstances. Claims of human illness crept up as well. But it all came from the most simple and wholesome of beginnings.

In 1968, the Tennant clan settled on hundreds of gorgeous acres of property nestled in the scenic hills of the Ohio Valley. Little did they know, the land they loved to call home held a secret that would lead to concerns for tens of thousands of people living along the Ohio River in the Mid Ohio Valley—and then influence the whole world.

"We were three-quarters of a mile off the hard road," Jim Tennant remembers. "It was paradise."[1]

Three brothers—Earl, Jack, and Jim Tennant—and their wives lived on the land and reared their children. Together the extended family worked hard, raised cattle, and enjoyed some prosperous and happy years.

However, in the 1980s something went terribly wrong.

The Tennant family sold DuPont a portion of their land; more specifically, they sold a tract adjacent to the pasture where their cattle grazed and in close proximity to a wandering creek where the cattle drank.

Within a relatively short period of time—somewhere around a year—the family of seasoned cattle ranchers began to notice that something was not right.

"Shortly after, there were no minnows in the stream. There were deer carcasses lying around, and things were dying," Jim Tennant explained. "There were problems."

They had been raising cattle on the same land for decades, so the irregularities were obvious and worrisome. The frequent excursions they used to enjoy with family members became littered with gruesome discoveries of dead animals.

"We used to go for long walks and take picnic lunches, go fish and play in the creeks," Della Tennant recounted.

They began to notice a difference in the color and odor of a creek that meandered through the grazing hillside and wondered if it had anything to do with the animals' demise. At times, the once quietly babbling creek appeared dark and foamy and bubbly. Though the landscape remained lush and green, the wildlife went away. Within a year, the Tennant's cattle began to exhibit the symptoms of a mysterious wasting disease. By the late 1980s, the cattle were dying off. After forty years of successful breeding, 280 cattle died in ten years.

But those weren't the only problems the family observed. There were signs the cattle were fading as early as the late 1980s, but by the late 1990s the herd was obliterated. After their herd died off, family members who worked with the cattle and lived near the farm also became seriously ill with respiratory problems and various cancers.

Initially, the Tennants complained to the West Virginia Department of Environmental Protection (WVDEP), the state's equivalent of the EPA. They requested investigations and invited state personnel onto their property for exploration. They eventually also directed comments to the EPA, but grew weary of bureaucratic delays.

Unsatisfied with the progress of the regulatory agencies as their cattle continued to perish, the family sought help in different forms. Through a friend of a friend, they were introduced to a young environmental attorney with roots in the area. In 1998, they hired Robert A. Bilott to initiate legal action and guide them to the truth behind the mysterious plague. In 2000, while pursuing action against DuPont, Bilott stumbled upon C8.

Bilott's mother grew up in Parkersburg, and he had fond childhood memories of spending time with his grandparents there.

In fact, his grandmother recommended him to the Tennant family, and thus he was onto a case that would launch him into national visibility.

His past clients included both corporate and municipal interests, but the work he did on behalf of the residents of Mid Ohio Valley has been held up as a prime example of how to best represent the people.[2]

Although DuPont's internal testing proved that the company knew that C8 had been present in the area water supplies for decades, the people who lived near the plant were not made aware that it was being released into their air and water until the Tennants and their ambitious young attorney started looking for answers.

Bilott, who practiced law at the Cincinnati, Ohio, firm of Taft, Stettinius, and Hollister, represented the Tennant family in their claim against DuPont over the cattle's wasting disease. Recognizing the implications of the discovery of C8 in public water supplies, Bilott also pursued the class action against DuPont—a separate action driven by twelve original plaintiffs including one named participant—E. Jack Leach, a Lubeck, West Virginia, resident and water consumer—and about fifty-five thousand other plant neighbors whose water had become contaminated with detectable levels of C8.

Thousands of internal DuPont documents that came to light as a result of the court battle over the failed herd became ammunition in the broader suit against the corporation. In one news report, Bilott said he received 185,000 related documents from 2000 to 2002. But the Tennant family—the people ultimately responsible for the discovery of the Teflon-related contamination in public water supplies—would be precluded from participation in the class action suit by virtue of their cattle settlement.

When the Tennant family entered into the land deal with DuPont, Jim and Della Tennant relocated their household to a nearby subdivision, while other members continued to live in homes near the family's grazing pastures. Little is known of the original arrangement, or what initially began to fail in the family's relationship with DuPont, because the details are sealed under the terms of private settlements, and the parties involved will only hint at the outcomes. But it wasn't long after the property transfer that the Tennants found themselves in the midst of a feud with one of the largest, most powerful corporations in the world.

Five members of the Tennant clan are named in a March 20, 2001, document from the Parkersburg Division of the U.S. District

Court for the Southern District of West Virginia.[3] Those named include Earl, Jack, Jim, Della, and Sandra Tennant (the three brothers and Jim's wife, Della, and Earl's wife, Sandra). The motion spells out the terms of an injunction requested by DuPont on the exhibits and memos presented in the Tennants' suit. In short, the court refused the request to seal all the evidence—but the participants, the three brothers and two wives, are forbidden to discuss it forever.

What is certain is that it was the Tennants' discovery of PFOA/C8 on their land that eventually led to the testing of nearby water supplies. That testing showed DuPont's chemical had made its way into no less than six public water supplies in the surrounding area, serving more than eighty thousand unknowing customers.

The detection of PFOA in the water led to a class action lawsuit against DuPont by customers of the six water districts that were affected. It also contributed to the launch of the largest EPA chemical investigation of its kind.

Permits from the WVDEP indicate that DuPont began operating a chemical landfill at the Dry Run Landfill in 1986.[4] The Dry Run Landfill is located just west of Lubeck, a suburb of Parkersburg, West Virginia, on the land that was formerly owned by the Tennant clan. Dry Run is located on a fragmented plateau consisting of several steep valleys. Dry Run Creek drains the series of valleys as it funnels into the North Fork of Lee Creek, and eventually into the Ohio River.

About fifty million pounds of waste were dumped into the seventeen-acre Dry Run Landfill per year. Among the laundry list of chemicals and other industrial waste that were disposed of in the landfill was the unregulated chemical C8/PFOA. Because Dry Run was a captive landfill, only waste from DuPont was discarded there.

Della Tennant says the brothers didn't sell the land to the corporation with the knowledge that it would become a hazardous waste dump, but they have come to believe that's exactly what happened. Early documents from DuPont that were provided to the family indicated that the site would be used for industrial, nonhazardous waste only and mentions scrap metal, wood pallets, and miscellaneous trash.

However, the company was using the property to dispose of much more than typical industrial trash. The plant began sending some of its PFOA-related waste to the site. In at least one instance, DuPont used the Dry Run Landfill to get rid of what it believed to be a primary source of C8 pollution. In 1988, the company dumped the

contents of anaerobic digestion ponds from Washington Works at Dry Run. Sludge placed into the landfill from the ponds was assumed to be full of C8.[5]

In retrospect, DuPont officials estimate that the tons of materials dumped into the Dry Run site contained more than 4,500 pounds of C8.[6]

Dupont has taken surface water samples at Dry Run to detect C8 since 1996, and the results appear to be diminishing over time from a reported 62 parts per billion down to 27.4 parts per billion. Groundwater sampling also began in 1996, but readings have been somewhat erratic, not reflecting a similar steady decrease in C8 levels over time.

Further, state documents show that in 1996 the WVDEP fined DuPont $250,000 for leaking chemicals into a tributary from the unlined landfill. The penalty was for the pollution of Dry Run Creek, which wandered through the Tennant's grazing pastures and into the Ohio River.

Despite the fine and the controversy over the Tennant herd, for a long time the landfill remained operational. It was finally closed to receipt of wastes on March 31, 2006.

The WVDEP approved the most recent permit for the continued operation of the landfill as late as March 2005, following a brief public comment period. The renewal did include eighteen new provisions, but did not prohibit the discharge of C8/PFOA into local streams.

The seemingly innocuous couple, Jim and Della Tennant, have been far more outspoken about the C8 issue and its toll on their family than the other three individuals who are also bound by the confidentiality agreement.

However, Earl Wilbur Tennant is often quoted in newspaper stories making a singular, gruff statement: "With neighbors like DuPont, you don't need no enemies."

Long before the controversy resulted in court action, in 1995, Earl appeared on Parkersburg WTAP television news displaying a significant weight loss in his livestock and claiming to have suffered a related $140,000 to $150,000 loss of income. In the news report, he played a homemade videotape of a black calf and a white calf born weeks apart with startlingly different weights.

Court documents describe Earl's health as being poor and mention frequent hospital stays for respiratory problems, chemical

burns, and other exposure-related problems, which may also be a factor in his relative silence. Almost nothing is heard publicly of the other brother, Jack.

The failure of the Tennant herd is well documented. However, there are two different views on the cause of the elusive illness that struck the cattle.

Dr. Kristina Thayer, a noted toxicologist, formerly of the EWG and presently National Toxicology Program liaison with the National Institutes of Health, believes PFOA contamination is to blame for the cattle's wasting disease. Thayer says the mysterious syndrome that struck the cattle is consistent with what has been observed in laboratory animals exposed to C8.

"Because when you look at metabolic problems, that's what animals do in laboratory studies," Thayer explained. "Animals waste away and lose weight. All told, these cattle lost a lot of weight, and that's one of the clearest signs."[7]

However, near the end of the herd's failure, DuPont and the EPA commissioned a study performed by six veterinarians. The 120-page document is called "The Tennant Farm Health Herd Investigation" and was released in December 1999.

In 2003, DuPont Washington Works spokesperson Dawn Jackson offered the "cattle team report" as the company's only response to questions about the Tennant case.

Despite an exhaustive review of historical and contemporary herd data, the study concluded there was no evidence of toxicity associated with chemical contamination of the environment.

Based on an EPA draft report entitled "Dry Run Creek, 1997," which is cited in the cattle team report, carnivorous, piscivorous, omnivorous, insectivorous, and herbivorous mammals in the Dry Run Creek study area were at increased health risk due to exposure to metals, fluoride, and trichlorofluoromethane. Simply put, this means that all warm-blooded life forms, whether they are meat-eaters, fish-eaters, bug-eaters, plant-eaters, or those who would eat anything, were expected to see some ill effect from exposure to certain waste materials, including the chlorofluorocarbon (CFC) known as freon—a widely used refrigerant. (Remember, Teflon was invented during a failed refrigerant experiment!)[8]

Despite this evidence, the veterinary team concluded that the Tennants' herd suffered from four major disease entities: endophyte toxicity, pinkeye, malnutrition, and copper deficiency. Endophyte toxicity has infected species of grasses throughout the world,

plaguing sheep and cattle for decades. Symptoms include animals seeking shade or getting into water for no apparent reason. The heat stress, or the illusion thereof, causes the animals to refuse food, languish, and die of underfeeding. Pinkeye is a nonfatal eye irritation in cattle. Copper deficiency results in poor weight gain and can be caused either by diet with very low copper content or interference with copper absorption caused by sulfates in feed.[9]

In the end, the Tennant Farm Health Herd Investigation commissioned by DuPont and the WVDEP blamed deficiencies in herd management for the cattle deaths, citing poor nutrition, inadequate veterinary care, and lack of fly control.

To this day, Della Tennant argues vigorously against the investigation's conclusion. She finds the notion that the family was underfeeding or not properly caring for the herd embarrassing and outrageous. She claims the family did everything they could to save the herd—using veterinary treatment and special food and supplements to get the cattle to thrive—but without success.

Dr. Thayer says there is a fundamental problem with the study that undermines its conclusions.

"The veterinary team did not know at all that the chemical was implicated or present," Thayer said. "They didn't try to see if it fit with PFOA toxicity."[10]

There is no evidence to indicate that the veterinary scientists involved in the report were aware of the presence of C8 in the local environment.

After forty years in the cattle business, the Tennant brothers did not sit idly by and watch and wait for their cattle to die. Two of the rough, time-hardened hunters took matters into their own hands.

In a scene reminiscent of an *X-Files* episode, Earl and Jim performed an "autopsy" on a recently perished deer. They both say they videotaped the incident, and they both claim that the animal's organs were found to be "glowing fluorescent green."

The brothers took that to be a sign of industrial poisoning.

The gritty Appalachian characters also examined a deceased cow in search of answers. It was, after all, the 1990s and conspiracy theories were running amuck. It's an outlandish tale to be retold in urban legends.

Their attorney provided a video of both a deer and cow autopsy to the EPA along with other taped evidence of the strange happenings on their farm.[11]

Another muddy part of the story involves the beginning of the strife between the Tennant family and DuPont. It's uncertain exactly what started it and when.

Jim Tennant says he worked for DuPont for twenty years before the trouble began. Beyond that, he won't or can't elaborate about his employment. Then there was the 1984 land deal, which resulted in Jim and Della relocating their children to a house in DuPont Manor, a subdivision near Washington Works where they live to this day. It happened about seven months after DuPont purchased the property for the landfill.

The early strife seems uncharacteristic in light of the well-documented fact that the Tennant family maintained a neighborly existence with DuPont for at least a short time after the corporation purchased the landfill property. Court documents filed by Bilott say that the Tennants leased a portion of the DuPont acquisition for grazing. The company failed to renew the lease when the family began to complain to the EPA.

It seems that a portion of the land sold to DuPont was formerly the physical site of Jim and Della's house. The Tennants say they attempted to move the old house by dragging it to nearby family property, but eventually relocated anyway.

Their new place is a roomy, comfortable, ranch-style house filled with Della's dolls, knickknacks, and collections—a reflection of the quirkiness of its owners. The overstuffed furniture is neat and clean, despite the obvious signs of beloved grandchildren.

Yet Della speaks of her home with disdain. It's not the house of her dreams or her memories. The two keep all of their important papers, pictures, and newspaper clippings in a worn photo album under the coffee table. It's a living journal of their all-too-public battles. On certain occasions they take it out and privately retell parts of the story.

In front of company Jim and Della allude to the earlier court action, but only in vague of terms—and always as something secret they "aren't supposed to be talking about." DuPont officials certainly aren't willing to add anything to the conversation. So it may not be possible to know for sure what provoked the initial friction.

Despite the presumably large settlement from the cattle suit, Della says it wasn't easy for the family to take on the huge corporation. The Tennants are known in their rural hometown and the many surrounding villages as "those people who sued DuPont." It hasn't been a light burden to bear. After years of faithful attendance

and worship with one local congregation, Jim and Della have changed churches twice since the suit became public in an attempt to escape the painful stares and gossip.

Not only would people talk about them behind their backs in the voices that were meant-to-be overheard, but also open conversations could turn confrontational. Finding their best company in each other, Jim and Della rarely venture out without each other.

Della once described the situation by saying people thought the family was "only in it for the money" and an opportunity to "get DuPont," when in fact she perceived it as a most difficult battle with a dubious payoff.

For thousands of Mid Ohio Valley residents and area plant workers, DuPont is known purely as one of the economically depressed region's largest employers. The Tennants are branded as a force that tried to diminish that systemic viability.

It wasn't as though the locals in the Mid Ohio Valley were naïve about the potential dangers of the chemical plants near their homes. Many of the residents of nearby Belpre, Ohio, had witnessed a horrific worst-case scenario in May 1994.

The catastrophic event took place at Shell Chemical, located on the edge of the Belpre city limits—a stone's throw from a church parking lot and across the Ohio River from DuPont. An industrial explosion killed three workers when a blast ignited a storage tank containing hazardous chemicals that quickly spread.

The city became a staging ground in a state of emergency for nine hours as firefighters and hazardous materials workers labored feverishly to beat back the raging chemical fire before it could swell out of control. In all, four huge chemical storage tanks caught fire. Hundreds of people were evacuated from their homes. Dozens went to the hospital complaining of breathing problems and skin irritation.

The EPA described it this way: "A major explosion and fire at a chemical plant owned by Shell Chemical caused four one-million gallon styrene tanks and their secondary containment systems to fail. The explosion released numerous hazardous substances and killed over 1,500 fish in the Ohio River."[12]

Erupting more than a mile into the air, the ferocious fire was visible for miles. It could easily be seen across the Ohio River in Parkersburg and Lubeck, West Virginia. As it burned in threatening proximity to even more hazardous substances, the incident provoked

widespread fear and the rumor that if one plant were to blow, it could cause a chain reaction that would claim the whole valley of chemical giants along the river.

Chemical leaks from the explosion ended up in the Ohio River, polluting the public water supplies downstream with a twenty-two-mile torrent of ethylene dibromide. Shell received a hefty $3 million fine from the Occupational Safety and Health Administration (OSHA) for federal safety violations.[13]

Despite the fright, days after the nerve-wracking event, local residents rallied in support of Shell,[14] proudly displaying posters of support on their homes and businesses and on their vehicles. The alarm over the incident had quickly dissolved into panic over a potential plant closing and fear of the loss of Shell jobs. In the end, only twelve people signed up to participate in a class action suit over the ordeal, and it was quickly dismissed. The company settled with the families of the slain workers for about $2 million each.

Such was the culture of intractable support for the chemical companies that the Tennants encountered.

Since the discovery of C8 in local water supplies, there is a new round of dueling signs in the valley. Some area residents have been sporting cars with a bumper sticker reading "C8 Love Canal." Others boldly state "We Support DuPont Washington Works."

DuPont officials deny the Tennants' herd failed because of C8 pollution, but only offer the Tennant Farm Health Herd Investigation as their means of explanation—tied as they are to the settlement and its secrecy clause. No fault was determined as a condition of the arrangement, which included the payment of a large, undisclosed amount of money to the Tennants. After extensive studies, reports, and unofficial autopsies, it still isn't clear what caused the herd of 280 cattle to die.

Whatever caused the livestock's demise, the consequences of the Tennants' discovery and their contribution to the public's awareness of PFOA/C8 were enormous. To put it plainly, without the Tennants' suit there is every chance that the residents of southeastern Ohio, whose household water supplies have been tainted with C8 for as many as fifty years, would still be consuming the contaminated water unaware of the chemical's presence.

Even with the Tennants' contribution, which was globally significant, it still took some time for families living in rural Ohio and West Virginia to find out about the contamination.

Forty-five miles to the south of the Tennant farm, downstream along the Ohio River in Mason County, West Virginia, neighbors wouldn't learn until mid-2005 that DuPont had been polluting their water supplies, too, and dumping large amounts of Teflon-related waste into the Letart Landfill, a practice that began in the early 1960s and continued until 1995.

In 2006, communities from several other states around the nation began to learn that the manufacturing facilities near their municipal water supplies were polluting their drinking water with the same substance.

Even then, the information only came to light as a domino effect, resulting from the Tennant suit and the class action that followed.

CHAPTER 2

DuPont Washington Works and the History of C8

Tall stacks and chemical smells are familiar signs of commerce to those who live and work in the Mid Ohio Valley. The Ohio River, once scouted by a prepresidential George Washington and later targeted as an ideal business location for its proximity to cheap labor and boat transportation, is marked for miles with industrial manufacturing and power plants. Conscientious visitors to the area frequently express surprise that scenic riverboat excursions along the Ohio can't help but include the disturbing sights of dozens of enormous pipes spilling untold hundreds of gallons of dark sludgy waste into the river.

On the West Virginia side of the river, the conglomeration of plastics manufacturing sites is celebrated with a state-sponsored initiative called the Polymer Alliance Zone. Bright green road signs proudly designate the three-county area—Jackson County, Mason County, and Wood County. The zone has the largest concentration of production facilities for high-tech, specialty, and engineering polymers in the world, including more than a dozen nationally known corporations. Through a public/private initiative, the state endeavors to make it easier for these corporations to do business in West Virginia. The operations that comprise the Polymer Alliance Zone are held up as the financial salvation of the rural communities along the river.

The sentiment on the Ohio side of the river is quite similar, with perhaps one exception, designated by zip code 45620. There lies one small village in the southern part of the valley, just across the river from the Polymer Alliance Zone, where industry and people have realized they can no longer coexist safely.

In 2002, Cheshire, Ohio (population 221), was purchased by American Electric Power (AEP) for $20 million after the corporation admitted to uncontrollable toxic pollution—the result of emissions from a coal-fueled power plant that lies in Gallia County, just opposite Mason County, West Virginia.[1] The small town was estimated to be worth approximately $6 million. In exchange for the money, the residents, many of whom complained of sore throats, blisters, and breathing problems, had to abandon their homes and promise not to sue AEP for health problems.

The buyout was not a surprise to anyone who lives in the Mid Ohio Valley. Similar to the attitudes exhibited in coal-mining communities, the culture of industry and the economic development strategy of the region often mean looking the other way on environmental issues in exchange for the promise of good jobs.

DuPont Washington Works is the largest operation in the Polymer Alliance Zone. It is DuPont's largest manufacturing site and the biggest engineering plastics production facility in the world. In 2001, it was estimated that the plant represented a $400 million investment for DuPont.[2] The plant opened in 1948 and soon after became the production site for Teflon. Even so, the Teflon division is just one of eight major manufacturing divisions at the two-thousand-acre site. The others, taking up a total of about two hundred acres, are Acrylics, Butacite, Delrin, Engineering Polymers, Filaments, Specialty Compounding, and Zytel. With three facilities in West Virginia, DuPont is the state's seventh-largest private employer. In 2003, the company employed 3,170 people—about two-thirds of them at Washington Works.[3]

As one of the area's largest employers, DuPont Washington Works perpetually employs around two thousand people on a full-time basis; hundreds more are contract labor. Not only is the population of the plant comparable to a small town or village, but that's also what that plant itself looks like. With its own roads, water tower, and other infrastructure, it is an amazing and elaborate collection of pipes, buildings, stacks, and structures.

To give it some additional perspective, Belpre, Ohio, located just across the river from Washington Works, has a population of around 6,660 people. The population of Parkersburg, West Virginia, the largest city in the area, is about 33,100. Therefore, two thousand jobs are a crucial part of the local market. And these jobs offer

higher-than-average wages, so they provide for even more regional service employment opportunities.

In 2003, DuPont Washington Works' annual payroll reached $200 million. Regionally, the plant's economic impact is magnified by its worker population, which supports and enhances every imaginable industry. In addition to entertainment, restaurant, and retail sales, the plant and its workers also have a profound effect on the local automobile and housing markets.

Community loyalty for DuPont has flourished because of the company's enormous positive financial influence. As "Partners in Education," the corporation provides annual funding for events and programs at Parkersburg High School. It provides financial support to local sports clubs, recreation programs, and charities.

Area residents are so anxious to go to work for DuPont and obtain those high-paying jobs and excellent corporate benefits that in 2003—even as news of the C8 lawsuit was making daily headlines—Dupont's Dawn Jackson estimated the number of applications on hand for entry-level work at twenty thousand.

At an estimated 2,400 full-time jobs (2,000 full-time workers and approximately 400 contract workers), DuPont wages directly support 2,400 households annually or 6,792 individual men, women, and children based on the area's estimated average family size of 2.83 members.[4] That's equivalent to the whole town of Belpre, Ohio, or more than one-sixth of the city of Parkersburg, West Virginia.

They call themselves "DuPonters," the thousands of men and women who work there, and they are often heard to say they "owe their livelihoods" to the company that has employed their family members and provided them with a higher standard of living for generations.

Out of a legacy borne from revolution, DuPont has grown over two centuries to offer consumers thousands of life-enhancing products—the "miracles of science." Enticing consumers with the promise of carefree living and easy cleaning, many of its most popular items have been considered "miracles" by the housewives who love them. But that sentiment is not exactly in keeping with the original, more explosive, entrepreneurial spirit of the company.

On July 19, 1802, a French immigrant, thirty-one-year-old Éleuthère Irènèe du Pont started E. I. du Pont de Nemours and Company for the purpose of manufacturing gunpowder.[5] By the age

of fourteen, young E. I. was an explosives genius. So when he fled to the United States to escape the revolution in 1800, he already possessed expert training obtained alongside a famous chemist named Antoine Lavoisier.[6] Lavoisier was not just an ordinary chemist—he would become known as the "father of modern chemistry."[7] Armed with such respected credentials and plenty of capital from French investors, du Pont was ready to build his empire.[8]

Lavoisier met his end at the guillotine in the French Revolution. By escaping to America, du Pont kept his head and embarked on a profitable career in the industry of warfare. The company's first powder mill was located near Wilmington, Delaware, on the Brandywine River close to the corporation's present-day headquarters.

The Delaware location was selected over a Virginia site recommended by Thomas Jefferson because du Pont was not comfortable with Virginia's policy on slavery.[9] The site of the original powder mill has been converted into the Hagley Museum and Library, and along with three of the du Pont family estates, is part of an elaborate chateau tour in the Brandywine Valley. The mill finally closed in 1921. The retired structures now tell the story of the du Pont black-powder fortune, a National Historic Landmark standing in honor of entrepreneurs whose progress paralleled the nation's.

Since the beginning, DuPont has been a leader in scientific and business innovation. In 1805, the corporation became one of the first to hire a physician for employees. Written safety rules were implemented and distributed to workers by 1811. In 1835, the company offered a health plan.

However, despite a progressive attitude toward health and safety, the dangerous nature of the company's business caused some devastating setbacks nearly from the beginning. For example, a huge explosion in 1818 at the powder mill prompted the du Pont family to rethink some of its safety procedures and initiate, among other policies, a ban on alcohol.

By the 1860s the company was the country's major producer of gunpowder, supplying nearly half of the powder used by the North in the Civil War. In fact, the company's powder mill was considered such an essential resource that Union troops guarded the mill to protect it from the Confederate Army.

In the 1880s operations expanded to include smokeless powder and dynamite. Henry du Pont, the family and company leader in 1880, was uninterested in the dynamite business, despite the urging of his nephew Lammot du Pont. So Lammot started up his own

company—the Repauno Chemical Company—and began successfully proving his theory that dynamite would make blasting powder obsolete in the execution of major construction projects.[10] Upon the death of Lammot du Pont from an accidental explosion in 1884, DuPont assumed control of Repauno, leaving the corporation with an enormous share of global munitions.

During World War I, the corporation supplied 40 percent of the powder and explosives used by U.S. and Allied troops.

Repauno continued to grow and acquired the Atlantic Dynamite Company and eventually a majority of shares in the Eastern Dynamite Company, giving DuPont control of 72 percent of the U.S. explosives industry.

The controversy that ensued helps to explain the complex, interdependent relationship between the federal government and the huge international conglomerate that has come to be DuPont. In 1907, an antitrust suit was filed against DuPont, alleging a monopoly and restraint of the explosives trade. Facing a ruling from a federal court under the Sherman Antitrust Act, in 1912 DuPont agreed to create two new companies and surrender sufficient resources, research, and engineering support to make sure the new companies, somewhat appropriately named Hercules and Atlas, could manufacture 50 percent of the nation's black powder and 42 percent of its dynamite.[11] Despite the divestiture, Repauno would still produce 25 percent of the world's military explosives used in World War II.

Throughout the twentieth century, the company evolved from its focus on munitions and explosives into an expansive scientific chemical company marketing such diverse products as paints, plastics, and dyes.[12]

One hundred years after the company's inception, the original E. I. du Pont's three great-grandsons took over in 1902 and formed a new corporation more in keeping with the times. The reformation of the company by the cousins marked a shift in direction. Almost immediately, the trio set forth plans for an experimental station near Wilmington, Delaware, where they could engage in scientific research as a means to industrial expansion.

As the company grew into the new century, DuPont scientists began to experiment with a more profitable peacetime endeavor in specialty fabrics. Their work with guncotton, an early form of nitroglycerine or flash paper, helped to launch the family business into the textile industry.[13]

By 1910 the company developed an artificial leather called Fabrikoid, which quickly became a staple in automobile production and paved the way for decades of automotive products.

Ever aware of the hazards of the industry, in 1911 the cousins established the Prevention of Accident commissions within each of its departments to evaluate and recommend safety devices.

In the 1920s DuPont scientists developed cellophane, movie film or the predecessor to Mylar, and Duco paint—a durable, quick finish used on automobiles and other consumer products. It was also during this decade that the company began its polymer research.

The booming age of research and development continued through the 1930s with the invention or perfection of such products as neoprene, freon, lucite, nylon, and Teflon. DuPont's medical lab, the Haskell Laboratory for Industrial Toxicology, opened in 1935. The company's work with freon, its signature refrigerator coolant, would lead to the development of advanced refrigerants and the accidental discovery of Teflon. It would also make DuPont the most significant contributor of CFCs on the planet.[14]

In 1935 DuPont began developing one of its most successful products and the very first synthetic textile—nylon. Dr. Wallace Carothers, whose work focused on polymers or very large molecules with repeating chemical structures, discovered nylon, and by 1939 it was introduced to the market in ladies' stockings. The ever-diversifying company expanded the fabric's uses so that by the start of World War II, a second nylon plant was needed for the production of parachutes and B-29 bomber tires. By the 1960s and 1970s, nylon had revolutionized the carpet industry. Although the name of the product was never trademarked, DuPont remains the leading maker of nylon in the world.

Not long after Carothers' successful experimentation with nylon polymer fibers, a serendipitous lab accident would lead another DuPont scientist to discover the slipperiest substance on earth. In 1938, while cleaning a cylinder used in a failed refrigerant experiment, Dr. Roy Plunkett discovered Teflon, or PTFE, a white, waxy material. The refrigerant had polymerized into a heat- and chemical-resistant substance unlike any other. Young Plunkett decided to experiment on the white stuff and found that it possessed incredible water-, grease-, and stain-resistant properties. The product, trademarked in 1945, was first used for military purposes—artillery shell fuses and in the production of nuclear material for the Manhattan

Project—before finding its way into electric cable insulation, cell phones, spaceships, food packaging, and cookware.

Twenty-eight-year-old Plunkett had gone to work for DuPont just after graduating from Ohio State University with a doctorate in organic chemistry. He spent the rest of his career at DuPont as a celebrated chemist. Before his death in 1994, he would see the Teflon technology he discovered and developed used in thousands of applications.

The company's approach to diversity was set early on and modeled by the handling and growth of nylon and Teflon. The approach encouraged DuPont scientists to meld their innovations in order to fully explore their applications for defense, industrial, and consumer products, and eventually medicine.

Interestingly, it was during this time that DuPont launched its first public relations campaign to change its image from a gunpowder company to a peacetime chemical manufacturer. The slogan that would stick for decades was unveiled: "Better Things for Better Living . . . Through Chemistry."

"Through Chemistry" would disappear in the 1980s. And in 1999, "Miracles of Science" would become the mantra of DuPont.

Throughout the 1950s and 1960s, the company's engineering of polymers would take nylon and related products from fabric fiber to machinery parts with the properties of stone and metal. Fabric production would expand with the development of Dacron and then Lycra. During the 1960s and 1970s, the blending of nylon and polymer technology led to amazing advances in plastics.

With the acquisition of Conoco in 1982, DuPont dabbled in the petroleum business until 1999, when present-day CEO Chad Holliday shifted the company's focus away from substances processed from petroleum to chemicals derived from living plants. Executives and scientists were looking toward greater use of renewable resources to manufacture polymers, instead of the petrochemicals traditionally used in the process.

Following the model set forth in the 1930s, DuPont excelled by scientifically integrating business and technology and boldly exploring the possibilities. Countless chapters could be devoted to the history of the vast company, from its critical role in the Apollo space program to its stunning medical advances. In DuPont's recent history, the company's interests are organized into five categories: electronic and communication technologies, performance materials, coatings and color technologies, safety and protection, and agriculture and nutrition.

Of DuPont's scientific advances in chemical applications since 1948—industrial, consumer, defense, and medical—most are the direct result of polymer engineering, and almost all have been melded with or influenced by polymer engineering.

By 2006, the company had grown to become the world's second-largest chemical manufacturing business with holdings in seventy countries. In 2004, the company reported $28 billion in global earnings. The sixty-sixth-largest corporation in the United States, DuPont employs fifty-five thousand to sixty thousand people—far more than the combined populations of Belpre, Ohio, and Parkersburg, West Virginia.

To be fair, DuPont was making Teflon and C8 long before the EPA was a glimmer in former President Richard Nixon's green eye. By the time the agency was founded in 1970,[15] DuPont's head start of more than three decades gave it time to apply its slick technology to hundreds of consumer products.

PFOA was—and remains to this day—an unregulated chemical compound.[16] So it's really no wonder given DuPont's two-hundred-year legacy, company officials would scoff at a thirty-year-old infant organization that only within the past decade has attempted to regulate the chemical by-product of a substance the company has been making for more than half a century.

Additionally, to reinforce the viewpoint that must be resounding with DuPont executives, the company put measures in place to police itself on medical and environmental issues long before the EPA was conceived, as evidenced by the safety commission established in 1911 and the laboratory founded in 1935. So it's not hard to see why the company would resist new efforts to regulate the multibillion-dollar industry.

Even though the EPA was created in 1970, Congress didn't adopt the Toxic Substances Control Act (TSCA) until 1976. The TSCA, intended to give the EPA the ability to monitor and regulate toxic substances, began by extending blanket approval to more than sixty-three thousand substances already in use by industry. Once they were approved as safe for industrial and consumer use, it became nearly impossible to remove them from the list. There have only been a handful of instances where chemicals were removed because of their extreme toxicity. That's because the law states that the EPA must provide evidence of an "unreasonable risk to human health or the

environment." The burden of research and cost to provide the evidence lies solely with the EPA. Unfortunately, that rule extends to chemicals on the list as well as to new substances seeking approval from the EPA. All in all, the process made it extremely difficult for the federal agency to refuse or remove any substance proposed by industry.

In an age when the young EPA was trying to gather enough muscle to investigate and regulate dichloro-diphenyl-trichloroethane (DTD) and polychlorinated biphenyls (PCBs) investigating the likes of PFOA and PFOS—chemicals the agency knew almost nothing about—was clearly not a high priority.

However, officials at the EPA had good reason to be concerned about PFOA. Despite the corporation's public claims about C8's harmlessness, internal documents from DuPont's own policing efforts indicate that some of its officials have had serious questions about the substance's toxicity for decades.

One such internal DuPont memo, dated May 21, 1984, spells out the history of C8 this way:[17]

- In August 1951, the company began use of C8 in dispersion polymerization. Few precautions were taken in handling the chemical.
- On June 27, 1978, the company advised workers that 3M found elevated levels in the blood of exposed workers. DuPont began an internal review and monitoring program.
- Sometime in September 1979, a provisional limit for employee exposure was established by Haskell Laboratories, DuPont's medical division.
- On March 20, 1981, 3M advised DuPont of the results of a study in which C8 caused birth defects in unborn rats. The disclosure prompted the removal of all potentially exposed female employees to other plant assignments.
- On April 10, 1981, a C8-specific blood test was developed and put in use.
- In March 1982, DuPont completed studies that found C8 not to be a teratogen.[18] Company officials concluded that C8 displays no adverse health effects.
- On May 17, 1982, a final limit for employee exposure was established.

However, more than one startling fact was left out of the timeline in the DuPont memo. Perhaps the most disturbing detail omitted is that it wasn't only 3M's revelation about rat birth defects that led to the immediate removal of female workers from exposed portions

of the plant. In 1981 DuPont discovered through medical monitoring studies that two of seven of its own workers in the Teflon division at Washington Works who were exposed to C8 had babies with eye and facial birth defects and C8 in their newborn blood. Scientific analyses compared the defects to eye and facial birth defects observed in 3M's laboratory animal studies.

Further, the 3M studies didn't simply portend that C8 caused birth defects in rats; it also provided new evidence that C8 was carcinogenic, or that it caused cancer, in rats whether it was consumed, ingested, or absorbed. Sometime that year, company officials also became aware that PFOA is biopersistent in both animals and humans—it accumulates in the bloodstream and takes a long time to dissipate by natural means.[19]

Not only did these discoveries necessitate the reassignment of female DuPont employees, it also sent company officials searching for evidence that C8 may have found its way into the local environment. Two of the first places they looked were a nearby trailer park and the neighboring water supply. Levels of C8 were detected in the air at the trailer park and in the wells that served the Lubeck Public Water District.

Another memo confirms that by 1984, DuPont officials knew with all certainty—but did not reveal publicly—that C8 was already in a few community water supplies. Further, the document makes it clear that C8 was being released into the air and river in ever-increasing quantities with no plans to end the emissions in the foreseeable future.

"Some information which we just developed May 21, 1984 is that detectible levels of C8 are in both the Lubeck, West Virginia and the Little Hocking, Ohio water systems," the internal memo stated. "We should have quantitative numbers in the next two weeks. Also with the development of our current fine powder expansion plan, which takes capacity up to 8.2 MMAP, through a combination of equipment and recipe changes, C8 air emissions will rise from the current 12,000 pounds per year to 25,200 pounds per year. The increase for the combined divisions will increase from a current 16,000 to 25,200 pounds per year or a net 9,200 pounds due to a 4,000-pound offset with the implementation of the TBSA program. This will increase further with the installation of the third dryer to about 37,000 pounds per year."[20]

At that time, officials privately estimated that plant emissions were spilling into the river at an annual rate of sixteen thousand

pounds, vaporizing into the air at a rate of sixteen thousand pounds, and dumping roughly five thousand pounds of product.

The "personal and confidential" memo, written by J. A. Schmid and dated May 23, 1984, also mentions a new dryer system designed to capture most of the C8-laden steam emissions and transfer them to the exhaust stack for release.

"The intent is to first reduce in plant exposure, and second leave a future capability for treatment of this relatively concentrated stream."

Anticipating future problems with the issue, the memo also outlines a wait-and-see strategy discussed by company officials for handling C8: "There was agreement that a departmental position needed to be developed concerning the continuation of work directed at elimination of C8 exposures off plant as well as to our customers and the communities in which they operate."

The transmission coldly describes any company liability in the C8 matter as "incremental."

"Currently, none of the options developed are, from a fine powdered business standpoint, economically attractive and would essentially put the long term viability of this business segment on the line. From a broader corporate viewpoint the costs are small."

Officials ultimately decided to increase production and report nothing of the risks. And, in an ominous statement, Schmid spelled out the inevitable future of PFOA.

"Looking ahead, legal and medical will most likely take a position of total elimination," Schmid wrote. "They have no incentive to take any other position. The product group will take a position that the business cannot afford it. The end result, in my opinion, will be that we eliminate all C8 emissions at our manufacturing sites in a way yet to be developed which does not economically penalize the business, and address the C8 emission and exposures of our dispersion customers."

Unfortunately for the regional environment, the mighty Ohio River, and the plant's neighbors, DuPont officials neglected to take their own best advice—until nearly twenty years later when a court battle would force the issue.