

BIRD'S-EYE VIEW

IMPACTS OF NC POULTRY PRODUCTION ON PEOPLE AND THE ENVIRONMENT

October 2020



Clean Water
for **North Carolina**

Shelby Cline
CWFNC Environmental Justice
Organizer & Researcher

Contents

Overview	1
Part I: Eye on Industry	2
Contract-Bound Farmers	2
Industry Employment	4
An Issue of Justice.....	5
Part II: Monitoring Pollution and Health	6
Water Quality	6
Air Quality.....	9
Outbreaks and Disease	10
Cumulative Impacts.....	11
Part III: Envisioning a Just Poultry System	12
Environmental Justice and Communities	12
Cooperative Actions and Systemic Solutions	16
Building a Sustainable Future.....	17
Appendix: Does Policy Protect Us?	18

Acknowledgements

A big thank you to fellow CWFNC staff for their support in creating *Birds-eye View*. Many thanks to Polluter Accountability Program and Office Manager Amanda Strawderman for helping plan, implement, and edit this project every step of the way.

Overview

The poultry industry rules the roost in North Carolina. According to the U.S. Department of Agriculture, chickens raised for meat production in NC are the #1 farm commodity in terms of income, making close to 4 billion dollars in 2018 alone.¹ On the national level, the state is #2 in turkey production and #4 for chickens. Where are these poultry operations located? Who is keeping tabs on this industry? What are the risks for people's health and the environment? And how are communities impacted when this industry moves in next door?

These questions are central to *Bird's-eye View*, a four-part report series that aims to bring together research on the impacts of today's industrialized poultry production system. Part I, *Eye on Industry*, looks into the farmers and employees who raise and slaughter chickens on the behalf of a few major companies. Part II, *Monitoring Pollution and Health*, examines the different risks to people's health and their environments where poultry operations are located. Part III, *Envisioning a Just Poultry System*, digs deeper into the potential harm this industry may have on communities already burdened by disproportionate, cumulative impacts.

Finally, Part IV is an invitation to those farmers, workers, and neighbors who wish to speak about their experiences with the poultry industry. This series is incomplete without the addition of these community voices, opinions, and ideas. Anonymous submissions are welcome. If interested, please contact CWFNC staff (shelby@cwfn.org or amanda@cwfn.org), and let's have a conversation.

Part I: Eye on Industry

From chickens to turkeys to eggs, poultry products are an important part of today's food system. Until the 1920s, chicken meat was mainly a secondary product of households raising hens for their eggs. As the 20th century progressed, chicken rose in popularity, becoming one of the most consumed meats in the United States.² After World War II, companies like Tyson and Pilgrim's Pride started using a system of "vertical integration" to place almost every part of the production process under their own, total control.³ The resulting industry—composed of only a handful of mega-sized companies—grew to overtake small, independent poultry producers, monopolizing the market to create what we see today.

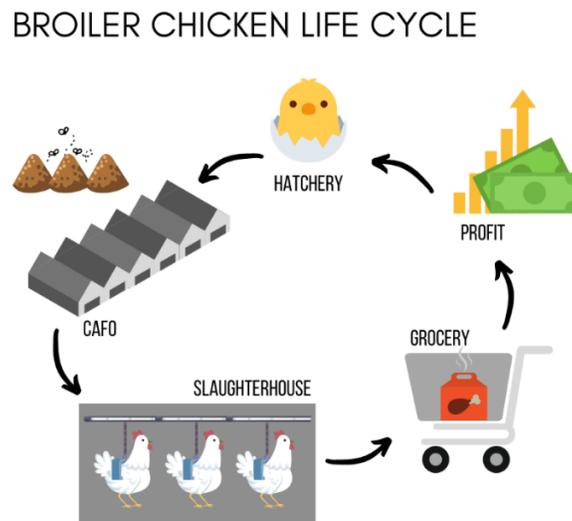


Figure 1: Diagram of the “farm-to-table” life cycle of a broiler chicken.

Contract-Bound Farmers

Poultry farmers are known as *growers* and are responsible for raising chicks until they are large enough to be shipped off for processing. Growers are under contract to a poultry company (e.g. Tyson, Perdue, Mountaire, Pilgrim's Pride) and required to follow specific standards to raise the birds. To keep their contracts, growers are expected to pay for the setup to build poultry houses and upgrade requested technologies. Often, these changes require hefty loans that are sometimes secured through property liens, adding significant pressure on the grower to maintain or increase their profits. This burden places farmers in a difficult position, as they risk losing their homes, farms, and livelihoods.

To add on to an already challenging occupation, contracted farmers are paid based on a “tournament” system. When their flock is picked up from growers and sent to slaughter, the

birds' quality and quantity are measured. The amount growers are paid depends on that appraisal. Essentially, contracted farmers compete with one another for higher pay, as whoever produces "better" animals will be paid more at the expense of the other growers' paychecks. Advocates of this system say that it is a fair way to ensure farmers meet companies' quality standards, encouraging hard work through competition, and framing payments beyond the contracted base rate as "bonuses" (see Figure 2).⁴



Figure 2: National Chicken Council infographic on the tournament system used to pay poultry growers.⁵

Opponents, on the other hand, say that contracted growers have no control over the quality of the chicks and feed they receive from the integrating companies (also known as integrators) in the first place, which could influence final earnings. Farmers may end up losing money on a flock if significant mortality occurs or the cost of raising the chicks outweighs the paycheck. The debt incurred from loans may also siphon away profit and challenge a grower's financial stability. Several farmers have spoken out about the unfairness of the tournament process, leading to documentaries, news features, and even a U.S. Department of Agriculture (USDA) rule under the Obama administration to reform the tournament system by establishing ranking criteria for the integrators to follow.⁶ In *Under Contract*, a documentary about poultry farmers, a grower describes how this tournament impacts contractors:

"How many people, that live in America, dread going to the mailbox to get their check? If you're a chicken grower, this has happened numerous times. And it all kind of boils down to opening that envelope."⁷

While these contracted growers may be the owners and operators of their farms, making them "family farms," their contracts to poultry companies create an unbalanced working relationship. According to the 2017 USDA Agricultural Census, 96% of farms and

ranches in the U.S. are family owned,⁸ and in North Carolina, 85% of farms are family operations.⁹ These statistics appear to suggest that America supports a heritage of family farmers to produce our food, conjuring images of red barns, mixed livestock, and idyllic pastures. While this may be true for some family-owned operations, this initial assumption is clearly not the norm in today's increasingly industrialized food system. In the case of poultry operations, *family* farms may simultaneously be *factory* farms.¹⁰ Growers are contracted to follow industry standards, which are producing bigger birds, with more waste, at greater costs, modifying what could have been reasonably sustainable operations. While the integrator supplies the inputs, the grower is the one who must deliver the product and deal with bird mortality and waste, the riskiest aspects of the business.

Industry Employment

Before the fully-grown chickens can be processed into packaged meat for the grocery store shelf, they must be collected from a concentrated animal feeding operation (CAFO) and transported to the slaughterhouse. Each step of this meat production process contains dangers for workers. Research on the Canadian poultry industry found that unhealthy amounts of dust—filled with bacteria, particulate matter, ammonia, and other contaminants—were common in CAFOs.¹¹ Air exposure to toxins released from bacterial cells, known as endotoxins, was a particular concern in the report, as workers may develop a “toxin fever,” with symptoms such as headaches, nausea, and respiratory issues.¹²

In a study of western North Carolina poultry processing plants, chicken catchers were interviewed regarding their working conditions. This demanding job involves capturing the chickens in CAFOs and loading them onto trucks for shipment. Interviewees reported electrical hazards, low lighting, and intense physical strain, among a variety of other risks on the job. Substance abuse among interviewees was reportedly common. A similar study documented dermatological concerns for those employed by poultry processing facilities, as many were found to have skin diseases associated with the harsh working conditions, leading to a decreased quality of life.¹³ The poultry processing industry is also the leading source of occupational finger amputations in the U.S., putting workers into the vulnerable position of risking their health and safety for a paycheck.¹⁴

These occupational hazards are further amplified by the threat of disease. Since poultry livestock are often raised in unsanitary, cramped conditions, these birds may carry and spread pathogens to humans. Viruses such as the Bird flu, or the 2009 outbreak of Swine flu, put both human and animal lives at risk. Not only do CAFOs present the perfect breeding ground for new diseases, workers in the meat industry are exposed to these animals with little protection.

The reality of a disease outbreak was quickly made apparent by the spread of COVID-19. This novel coronavirus traveled across the globe, infecting millions and killing hundreds of

thousands. In the United States, agricultural workers, especially those in the poultry industry, have been some of the people hardest hit by the virus. A lack of social distancing, personal protective equipment, and sick leave all contributed to the disease's spread in meat processing facilities. In an August 2020 research brief published by Oxfam America, poultry employees from across the nation spoke about their experiences working through the pandemic. One NC worker stated:

"The company doesn't care about the health of the workers. They're barely improving conditions after many of us tested positive at work, and some of our co-workers died."¹⁵

These plants have been labeled as "critical infrastructure" and ordered by the federal government to remain open.¹⁶ Subsequently, several poultry facilities were issued waivers by the USDA to adjust line speeds from 140 to 175 birds per *minute*, an increase that could become a permanent change for all operations if the industry succeeds at influencing the USDA. These increased rates simultaneously increase the risk for accidents and injuries, placing a strain on workers' bodies, ultimately showing companies' choice to favor profits over the wellbeing of those they employ.

An Issue of Justice

Despite the need to produce enough food to feed the public, industrial agriculture comes with a high cost to those who work and live near these operations. Not only do farmers and poultry workers have to deal with unjust working standards and occupational hazards, but the neighbors of CAFOs and slaughterhouses suffer too, as poultry production can pollute their communities. Often these nearby neighborhoods are already comprised of vulnerable populations, such as immigrant laborers, low-income residents, and People of Color, making this concern an Environmental Justice issue.

In order to better support these Environmental Justice communities, it is necessary to understand the potential the poultry industry has to harm the air, water, and natural resources people depend upon to live. Part 2 of *Birds-eye View* will cover the types of environmental pollution and health effects associated with the poultry industry.

Part II: Monitoring Pollution and Health

North Carolina has a long, proud heritage of farming; in fact, agriculture and agrobusiness together are the leading industry in the state.¹⁷ There is a lot of good that comes from farming, and we all certainly depend on farmers to put food on our plates. But feeding communities doesn't have to mean polluting communities, and when pollution goes unchecked, that's when we need to take a look at the systems that are in place. Industrialized poultry production contains a variety of opportunities for pollution and health risks, ranging from chick hatcheries to transportation to the byproducts of slaughter.¹⁸ Degradation of the water and air is of major concern, alongside several risks to the wellbeing of nearby communities. Current practices for managing concentrated animal feeding operations (CAFOs) are simply not enough to prevent harmful contaminants from entering the water or for protecting local air quality.¹⁹ In this second installment of *Birds-eye View*, we give an overview of the environmental pollution and health impacts associated with poultry operations, along with the federal and state policies related to these issues.

Water Quality

For water pollution, perhaps the biggest area of concern is the handling of poultry manure, particularly the waste of broiler (i.e. meat) chickens. This manure is usually in the form a dry "litter," a mixture of feathers, bedding, feces, and other waste and is often used as fertilizer for crops. Research by the nonprofit Environmental Integrity Project has shown that broiler chickens have been gradually increasing in size nationally.²⁰ In essence, not only are there thousands of birds in each CAFO, but the bigger the bird, the more waste it produces. A recent statistic published by another national nonprofit organization, the Environmental Working Group, illustrates that a year's worth of poultry manure produced from three North Carolina counties—Duplin, Sampson, and Robeson—weighs 4,500 times the Statue of Liberty.²¹ Where does all this waste go, and what can be done to alleviate its impact?

While poultry litter can be a valuable asset to farmers, it must be used responsibly to avoid pollution. This litter contains various potential pollutants, many of which could contaminate drinking water supplies.²² These contaminants include, but are not limited to: excess nutrients, pathogens, antibiotics, naturally occurring growth hormones, heavy metals, and pesticides.²³ The over-application of litter may result in leaching and runoff into local water sources. Poultry manure is strongly recommended to be covered and placed on an impervious surface, in order to control its release into the environment.²⁴ Nevertheless, improper storage

is a common occurrence, especially in states like North Carolina where regulations are minimally enforced.²⁵



Figure 3: Aerial photograph of uncovered manure piles outside poultry CAFO barns in Cleveland County, NC.

Despite storage concerns, poultry litter is regularly touted for being an important organic fertilizer, as it provides a wide range of nutrients to plants. Nitrogen and phosphorus, as well as micro-nutrients such as copper, manganese, and iron, are fertilizers that crops can use to support growth.²⁶ The problem is not the nutrients themselves, but their overabundance and improper ratio for plant uptake. While many farmers use poultry litter for its nitrogen benefits to crops, applying based on nitrogen needs can mean over-applying phosphorus, which is not only bad for the soil but can decrease crop yields.²⁷ Moreover, this over-application increases the potential for nutrient runoff into nearby waters.²⁸ As a result, eutrophication and algal blooms may occur (see Figure 4). These blooms can negatively impact ecological and human health: algae decrease the dissolved oxygen in water, killing aquatic life, while some also create toxins that can cause rashes, stomach illnesses, respiratory problems, and neurological issues.²⁹

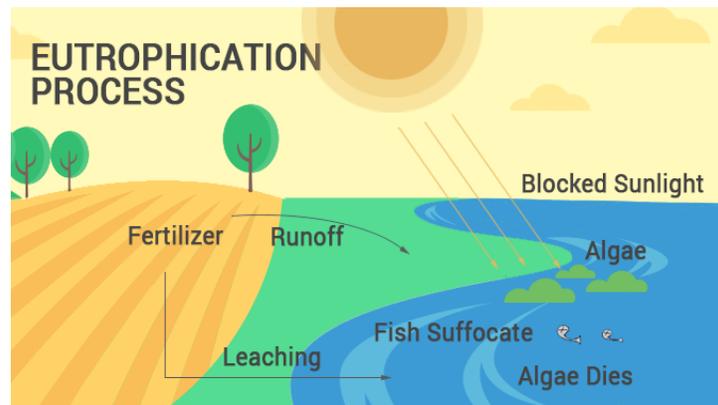


Figure 4: Illustration depicting the eutrophication process from fertilizer runoff and leaching (Image: Earth How).³⁰

In a 2017 analysis done by the NC Department of Environmental Quality’s Division of Water Resources (NCDEQ-DWR), the amounts of plant available nitrogen (PAN) and phosphorus (specifically orthophosphate) were calculated for all counties in the state.³¹ Each county was categorized into a river basin and compared for their percent change of nutrients and poultry inventory between 1992 and 2014 (see inventory changes in Table 1). This data shows a general increase in the amount of poultry being raised for sale, with some river basins, such as the Broad and Lumber rivers, experiencing massive poultry growth since 1992. Importantly, NCDEQ concluded that in 2014, poultry operations produced more pounds of phosphorus and nitrogen than swine or cattle.³² This finding helps legitimize similar claims made by other researchers, such as Environmental Working Group’s report “Under the Radar,” which states that “there is 4.8 times more nitrogen waste from poultry than from pigs and 4.1 times more phosphorous waste from poultry than from pigs.”³³

River Basin	Poultry Inventory				Percent Inventory Change (Δ %)		
	1992	2000	2006	2014 ¹	1992-2014	2000-2014	2006-2014
Yadkin-PeeDee	52,364,000	64,744,000	73,372,000	60,793,600	16	-6	-17
Cape Fear	52,975,000	54,445,000	56,208,000	57,906,600	9	6	3
Catawba	7,458,000	8,028,000	8,040,000	14,283,800	92	78	78
Lumber	2,604,000	4,540,000	6,628,000	12,829,700	393	183	94
Neuse	10,146,400	11,485,000	11,974,700	9,631,500	-5	-16	-20
Roanoke	5,180,000	5,000,000	6,225,000	7,465,000	44	49	20
Tar-Pamlico	9,375,400	8,240,000	7,536,000	6,601,301	-30	-20	-12
Chowan	4,540,000	5,460,000	5,680,000	6,020,000	33	10	6
Broad	1,270,000	1,850,000	2,340,000	5,475,400	331	196	134
Pasquotank	2,380,000	2,280,000	1,680,000	2,100,000	-12	-8	25
White Oak	1,122,000	1,060,000	1,064,000	1,681,300	50	59	58
Other	2,677,000	1,607,000	2,633,300	6,587,600	146	310	150

¹ 2014 data does not include rooster inventory.

Table 1: Changes in poultry inventory from 1992 to 2014, categorized by river basins in NC.³⁴

In addition to these reports, several peer-reviewed articles have been published regarding the pollution of water through the waste produced in CAFOs. In a 2015 article on industrial swine and poultry operations, data was gathered and analyzed from the Stocking Head Creek watershed in NC’s Cape Fear River Basin, with the authors concluding:

“The magnitude of industrial livestock production indicates that not only are immediate watersheds severely polluted but the collective impacts of the numerous subwatersheds draining CAFO-rich areas contribute to major ecosystem impacts far downstream as well.”³⁵

A more recent, 2020 study of the Cape Fear River watershed supported this conclusion, as researchers found that the region’s swine and poultry CAFOs were greater contributors to nitrogen pollution than other forms of agriculture, and that under certain hydrological conditions, this nitrogen could be found far downstream from these operations.³⁶

Beyond surface waters, a 2018 statistical analysis of NC well data concluded that areas with high leaching capacity—such as coastal soils—and dense populations of agricultural operations have the highest levels of groundwater nitrate pollution.³⁷ If drinking water were to be contaminated with nitrates, several health impacts could occur as a result. The most well-known danger is methemoglobinemia, commonly known as “blue baby syndrome,” which can occur in infants who ingest nitrates, such as through food or the water used for formula milk. If left untreated, the illness may result in a coma or death.³⁸ A 2018 review of nitrates in drinking water also linked exposure to “colorectal cancer, thyroid disease, and neural tube defects,” as well as a risk factor for gestational, reproductive problems such as spontaneous abortions and prematurity.³⁹

Further contaminants include heavy metals, pesticides, antibiotics, bacteria, and hormones, all of which pose a threat to human health.⁴⁰ In particular, antibiotics—used to prevent disease and increase growth—and pesticides—used to kill insect larvae in poultry bedding—can leach into water sources.⁴¹ After new regulation from the FDA in 2017, antibiotic usage has been drastically reduced in broiler chicken and turkey production;⁴² however, antimicrobial resistant bacteria like *campylobacter*—a pathogen associated with digestive and neurological disorders—may remain in the environment even years after ceasing the antibiotic’s administration.⁴³ Research suggests that the increased presence of *campylobacter* in highly concentrated poultry operations is connected to the greater occurrence of diarrheal infections in nearby communities.⁴⁴ Other bacteria such as *E. coli*, coliforms, enterococcus, and staphylococci have also been sampled in poultry litter in the United States.⁴⁵

Additionally, while hormones are not used to increase poultry growth in the U.S., poultry litter does contain naturally occurring hormones, including estrogens and testosterone.⁴⁶ Depending on how the litter is cleaned out from facilities, higher concentrations of these hormones may be released into the environment,⁴⁷ potentially affecting surface waters through runoff.⁴⁸

Air Quality

Much like water pollution, the air pollutants from CAFOs have garnered a fair share of attention and research, partly because of noxious odors and other noticeable impacts. CAFOs have been shown to emit ammonia, hydrogen sulfide, and carbon dioxide.⁴⁹ Poultry manure is also a source of methane and nitrous oxide.⁵⁰ Emissions such as ammonia (NH₃), hydrogen sulfide (H₂S), and particulate matter (PM) have all been studied in relation to the poultry industry.⁵¹ Ammonia, known for being a pungent irritant,⁵² is a frequently cited air contaminant of chicken farms that can settle on water as nitrates through atmospheric deposition, adding to any existing nitrate pollution.⁵³ Malodor is likely the most obvious issue; it directly impacts the

quality of life for nearby neighbors. Research has shown that the noxious scents emitted from swine operations are linked to psychological difficulties, including stress and low moods.⁵⁴

Respiratory issues from these emissions may affect neighboring communities as well. This concern was a feature of the 2019 documentary *Right to Harm*. In the film, Sonia Lopez, a resident of Tonopah, AZ, speaks about her family's deteriorating health, particularly regarding her son's asthma, due to their home's location close to a large egg laying operation and a financial inability to move away.⁵⁵ A study on community acquired pneumonia (CAP) diagnoses for patients of a Pennsylvanian health system found that "residing closer to more and larger poultry operations was associated with CAP, a cause of significant illness and mortality."⁵⁶ Concerns over animal-originating, respiratory viruses for those living near poultry and swine CAFOs also led to a recent pilot epidemiological study in NC, which reflects the large-scale threat of airborne exposure to poultry CAFOs and a current lack of knowledge on the topic.⁵⁷ Other concerns include exposure to endotoxins through the dust from poultry bedding and litter,⁵⁸ as well as greenhouse gases that contribute to climate change.⁵⁹

More research is needed on the airborne environmental and health impacts of *all* CAFOs. In November 2020, the Environmental Protection Agency is set to release draft models for ammonia, hydrogen sulfide, and particulate matter from broiler and layer poultry farms, as part of the results from their "National Air Emissions Monitoring Study."⁶⁰ The data from this study will be an important indicator of the potential for future regulations on CAFO emissions, as current regulations are severely limited,⁶¹ with progressive efforts such as Maryland's "Community Healthy Air Act" failing to pass due to industry push back and a lack of support.⁶²

Outbreaks and Disease

In addition to water and air pollution, the outbreak of diseases, both in humans and animals, is a large area of concern. Poultry operations have been found to be a source of pests, such as rodents and flies, for nearby residents.⁶³ Flies are well known carriers of disease, including eye and enteric infections,⁶⁴ and in an Ohio study on the presence of houseflies near laying hen operations, researchers have noted "significantly higher" amounts of flies near laying hen CAFOs, recommending these facilities not be built within 2 miles of residential areas.⁶⁵

In birds, the spread of avian influenza may cause farmers to cull their whole flocks. This is what happened in April 2020, when a flock of over 30,000 turkeys in South Carolina had to be euthanized due to the spread of avian influenza.⁶⁶ After such losses, poultry carcasses must be dealt with, leading to the potential for pollution from a variety of disposal procedures. While methods such as incineration or composting are recommended, dead poultry may also be

buried in emergency situations.⁶⁷ This method of disposal may contaminate groundwater sources depending on where and how the birds are buried.⁶⁸

Crises like an outbreak of bird flu are inevitable with the current factory farming system. In part due to climate change, emergencies such as diseases, hurricanes, and flooding are occurring more frequently. These situations present a threat to both people and the environment, especially when they happen near a CAFO or meat processing facility. Yet, there is still much denial from influential figures and rule makers. During a committee meeting in June 2019, North Carolina state senator Tom McInnis declared in defense of the poultry industry:

“We ain’t had no problems out of them, and I like fried chicken and had some on Sunday.”⁶⁹

A year prior to McInnis’ remark, Hurricane Florence swept through the state, flooding at least 35 poultry operations, killing millions of birds, spreading their waste, and costing taxpayers “at least \$11 million to dispose of poultry killed by the flooding”.⁷⁰ The poultry industry may be perceived as harmless, but the actual risks of this form of animal agriculture are apparent when studied. Current practices and regulations mainly benefit the industry (See Appendix: Does Policy Protect Us?). Highlighted by the variability of these events is the critical need to implement preventative measures, rather than simply responding to tragedies. By doing so, we may better mitigate the impacts of the poultry industry, while also creating possible alternatives to reform our modern food system.

Cumulative Impacts

Alongside this multitude of environmental and health risks, poultry operations are often located near other sources of pollution. This burden of multiple, cumulative impacts is compounded for Environmental Justice communities, where residents may not have the resources to fight back against polluting industries. Part 3 of *Birds-eye View* will explore this topic in greater depth, documenting how factory farming disproportionately affects low-income and minority communities, especially in the Southeast.

Part III: Envisioning a Just Poultry System

When it comes to healthy communities and clean environments, it would be untrue to say “what we don’t know can’t hurt us.” While the impacts of poultry production have been studied less than other polluting industries, this doesn’t imply that threats to health, the environment, and communities should be ignored. Additionally, when investigating such threats, Environmental Justice (EJ) is an important piece to consider. Those who live close to and work in the poultry industry may be disproportionately impacted low income and communities of color. Often such EJ communities may be facing compounded threats from other industries also operating in their backyards. We must examine what we know from existing research, look to examples of good practices, and listen to the folks who are directly impacted, so that we can build a system that is just for workers and neighbors alike.

Environmental Justice and Communities

The EJ movement helped expand the definition of “environment” to include where people “live, work, and play.”⁷¹ Pushed by the work of many community change-makers (e.g. activists in Warren County, NC; Dr. Robert Bullard; the first National People of Color Environmental Leadership Summit), the EPA responded by creating the Office of Environmental Justice in 1992. Today, the EPA recognizes EJ as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.”⁷² Environmental Justice encompasses a wide variety of approaches to improve the lives of those disproportionately impacted by environmental degradation, including those who have been harmed by today’s industrial animal system.

From an EJ standpoint, factory farming is essentially unregulated, with potentially even less oversight in regions that have high percentages of low-income and non-white populations.⁷³ This stance is supported by research on the swine industry in North Carolina. Many of the state’s hog CAFOs are clustered in low-income, minority communities.⁷⁴ Whether the siting of these farms is intentional discrimination or simply “the path of least resistance” remains subject to debate.⁷⁵ Regardless of intentions, the fact remains that the “Black Belt” — where many formerly enslaved African Americans remained after emancipation from plantations throughout the South — consists of communities that lack the socioeconomic and political power to resist an influx of industrial farming operations.⁷⁶

According to a 2014 North Carolina study, the “proportions of Blacks, Hispanics and American Indians living within 3 miles of an industrial hog operation are 1.54, 1.39 and 2.18 times higher, respectively, than the proportion of non-Hispanic Whites.”⁷⁷ Similarly, air pollution modelling of an eastern NC watershed found a positive correlation between racial minority populations and downwind ammonia concentrations from hog CAFOs.⁷⁸ In Mississippi, one study found that “the majority” of the state’s hog operations “are located in areas with high percentages of African Americans and persons in poverty.”⁷⁹

While the swine industry has been the subject of many studies, research on the EJ implications of the poultry industry is gathering momentum. In 2013, a nationwide analysis revealed a positive correlation between the density of chicken CAFOs and African American populations on the county-level.⁸⁰ This mapping of animal agriculture across the US displayed hotspots of chicken farms from the southeast to the mid-Atlantic (see Figure 5). In NC, a recent

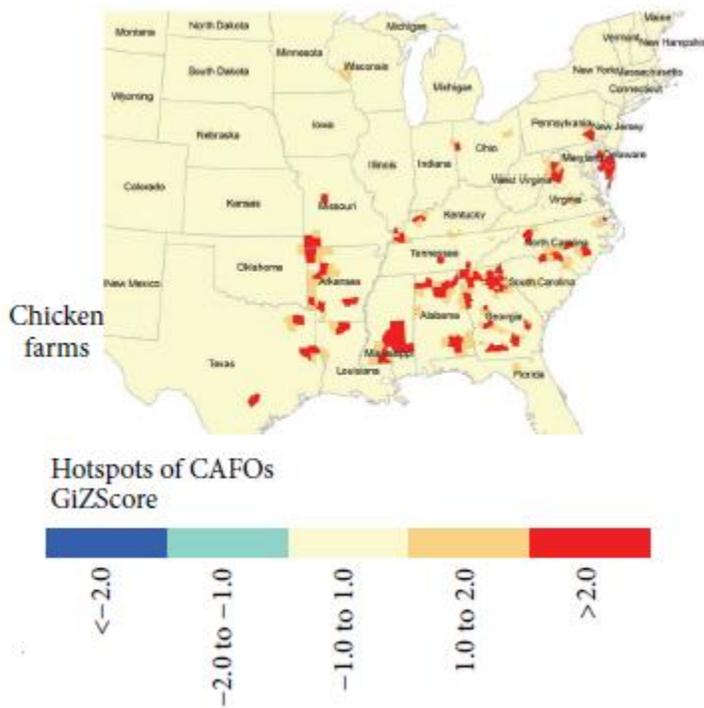


Figure 5: Hotspots of chicken farms from 2002 and 2007.¹¹

update to Environmental Working Group and Waterkeeper’s Alliance’s report “Exposing Fields of Filth” revealed that Duplin, Sampson, and Robeson counties have experienced a 31, 24, and 80 percent increase respectively in chickens and turkeys grown since 2012.⁸² Combined, this growth in poultry stock leads to an *additional* 260,000 tons of waste per year, on top of the manure already produced by the counties’ intensive hog and poultry industries.⁸³ These counties in particular have high percentages of non-white residents, nearly double NC’s average, which places the cumulative burden of industrial agriculture on predominately communities of color.⁸⁴

The Chesapeake Bay area has also dealt with the negative effects of densely concentrated poultry operations for decades. In an April 2020 report published by the nonprofit organization Environmental Integrity Project, the Bay’s poultry industry is linked to both environmental pollution and human health impacts. The report documents the concerns of

community members, as they experienced degraded air quality, respiratory illnesses, property devaluation, and general frustration with the industry and government.⁸⁵ One Virginia woman stated that her home near a poultry operation became unusable outdoors, along with respiratory problems and a difficult decision to move away from the area.⁸⁶ In Pennsylvania, a homeowner faced a swarm of flies when an egg laying facility opened up nearby, dumping chicken manure into the fields behind his property.⁸⁷ Another interviewee, a Maryland resident whose drinking water well became contaminated after a large poultry farm moved into the adjacent property, described the situation in relation to low-income communities:

“...these huge operations and the companies that oversee them target the poorer counties because it’s easier to move more chicken houses in. There’s less opposition, because they say, ‘Hey, think of the tax dollars that are going to go into your county.’ Tax dollars are well and good, but the other costs – the environmental and social costs – are just too high.”⁸⁸

Comments such as this highlight the overarching environmental injustices at work when the poultry industry becomes your new neighbor. By accounting for socio-economic factors like race and income, systemic inequalities can be reduced or eliminated, ensuring fair, anti-discriminatory practices when siting new poultry facilities.

This logic was put into practice in Millsboro, Delaware, where a health impact assessment was issued when a poultry processing plant tried to enter a community already plagued by environmental pollutants.⁸⁹ The assessment found that “the Harim Millsboro processing plant would contribute to air and water pollution, further worsening the health of residents, which has economic and health disparities when compared to the rest of the County and the state of Delaware,” and that “[n]ot only would this community be impacted by contaminants released from the new facility that can cause respiratory problems, developmental issues, and cancer, their health risks would also increase because they already suffer from environmental injustice.”⁹⁰ Without issuing this study, the community would have been subject to yet another source of pollution. The Millsboro impact assessment emphasizes that because pre-existing burdens were already placed on this low-income town, a poultry processing plant would have only served to further damage their health and environment.

In 2011, a similar assessment was made when the company Fibrowatt wanted to build three poultry litter power plants in three NC counties—Surry, Montgomery, and Sampson. Compared to the rest of the state, these counties all had low education levels and high levels of poverty, as well as a multitude of industrial animal operations.⁹¹ These litter incineration plants also increased the risk for community exposure to arsenic,⁹² as it was used as a poultry feed additive at the time.⁹³ The nonprofit Blue Ridge Environmental Defense League ran a campaign in collaboration with groups of local concerned residents and the NC Environmental Justice

Network against Fibrowatt's proposed construction project, pushing Surry County's commissioners to reject the project and the company to abandon its own plans for Montgomery County.⁹⁴



Figure 6: Advertisement placed in the Sampson Independent on March 15, 2009.⁹⁵

On top of these specific studies, recent events have exposed other examples of environmental injustice in North Carolina's growing poultry industry. Hurricane Matthew (2016) and Hurricane Florence (2018) both brought major flooding to North Carolina. These floods killed millions of chickens, floating their waste into nearby residential neighborhoods,⁹⁶ many of which were low-income and African American communities in eastern NC.⁹⁷ As hurricane seasons become longer and increase in rainfall intensity, similarly destructive events are more likely to occur, leading vulnerable EJ communities to bear part of the brunt of climate change.

Many of these same communities also house the workers for the poultry industry. In addition to natural disasters, humanity's increasing contact with animals through industrial agriculture, creates more opportunities for the spread of animal borne diseases to humans (e.g. Swine Flu, Ebola, and the Coronavirus) and the mutation of new viruses. As many have

experienced, the COVID-19 pandemic has functioned as a wake-up call, revealing a gaping hole in the food system that the federal government has failed to fill. During this emergency, President Trump signed an executive order to ensure that meat-processing plants stayed open.⁹⁸ This decision put an entire workforce—consisting of predominately Hispanic and immigrant workers—at risk of exposure to the virus. The poultry industry has continued with a ‘business as usual’ approach, pushing for increased production over health and safety efforts.⁹⁹ Workers reported how their companies neglected to give warnings about sick coworkers, provide protective equipment, comply with social distancing guidelines, or even acknowledge the deaths of fellow employees.¹⁰⁰ This lack of caution for public health underlines how the industry’s priority is profit, with little regard for people and Environmental Justice principles.

Cooperative Actions and Systemic Solutions

With all these different risks to communities, the EJ implications of the poultry industry may seem overwhelming. From start to finish, poultry production can negatively affect the environment and human health. CAFOs alone pose significant pollution threats, yet they are only one phase of the production line. In a June 2020 law article on the EJ implications of poultry operation siting decisions, the author, Diana Stanley, cautions:

“...from an environmental justice perspective, when a county accepts or courts a poultry complex it is not just inviting a simple factory building. A poultry operation requires a hatchery, a feed mill, and a processing complex. It also requires enough CAFOs in the area to raise the chicks. All of these components of the poultry industry combine for a severe environmental impact on the community around it.”¹⁰¹

If a county can choose to allow the poultry industry access, Stanley encourages local officials to “ask a series of questions,” ranging from a review of applicable laws to a gauge of the local economy, in order to prevent harm to their communities.¹⁰² Since North Carolina is not a “home rule” state, local governments currently lack the authority to reject poultry operations.¹⁰³ Still, when community members are actively engaged in their local governments, they may better be able to push back against the intrusion of factory farming operations.

States have the power to determine how to approach the factory farming industry. One often mentioned example is Michigan, which essentially requires all CAFOs to get NPDES permits, in practice upholding more stringent EPA standards from 2003.¹⁰⁴ Although this type of requirement would take tremendous effort to be implemented in North Carolina, the neighboring state of Virginia has a general permitting model that could be an approachable first step. Virginia requires “poultry operations that confine more than 20,000 chickens or 11,000 turkeys” to register under the “VPA General Permit for Poultry Waste Management,” allowing for public knowledge of the locations of these operations.¹⁰⁵ The Virginia Department of

Environmental Quality also implemented a “Poultry Litter Transport Incentive Program” that encourages poultry litter to be driven to areas that are in greater need of the fertilizer, rather than letting the manure oversaturate the soil in locations with high densities of operations.¹⁰⁶ While these efforts are still in need of improvement, they reflect a more progressive stance toward mitigating the effects of industrial farming on communities and the environment and should be examined as a feasible model for future reference and use in other states.

Another option is just to say “no” to any new development of the poultry industry until the impacts of the current system can be properly studied. Calls for a nationwide moratorium on factory farming are gaining traction. In November 2019, the American Public Health Association issued a “Precautionary Moratorium” statement to support the cessation of new and expanding CAFOs.¹⁰⁷ In December 2019, John Hopkins Center for a Livable Future published the results of a national poll on CAFO moratoria, with 57% of respondents in favor of more government regulation and 43% in favor of a countrywide ban.¹⁰⁸ And since Senator Cory Booker introduced it at the end of 2019, the “Farm System Reform Act” has gained the support of other senators, along with over 300 stakeholder organizations.¹⁰⁹ The bill would stop the creation of new CAFOs and phase out existing operations by the year 2040, replacing the current model with a more sustainable and fair animal agriculture system.¹¹⁰

Building a Sustainable Future

Now, more than ever, it is critical to look for better systems to provide the nation with food while protecting community members from harm. Recognizing the risks that the poultry industry brings to communities is the first step. Organizing to raise awareness of this issue is vital. Listening to individual narratives, such as those from Mountaire poultry plant workers and homeowners in Delmarva Peninsula, can shed light on the injustices already existing in our modern food system. Crises like the COVID-19 pandemic or Hurricane Florence, which have severely impacted communities associated with the poultry industry, should hasten preventative efforts from lawmakers. Ultimately, keeping the poultry industry from running rampant will require complex, cooperative solutions and can only happen if there is an ongoing united front against these impacts to the environment and human life.

The final installment of the Bird’s-Eye View series will feature the voices of folks who live near or work at poultry operations in NC. Without community voices, the study of industrial poultry production is incomplete. We want to hear about your experiences. Contact CWFNC staff (shelby@cwfn.org or amanda@cwfn.org), and let’s have a conversation.

Appendix: Does Policy Protect Us?

A brief look into the policies that regulate the poultry industry.

Clean Water Act

The Federal Water Pollution Control Act was passed in 1948 as the “first major U.S. law to address water pollution”.¹¹¹ Decades later, in 1972, this act was amended and commonly became known as the Clean Water Act, which aimed to eliminate “the discharge of pollutants” in the country’s ‘navigable waters’.” In the Clean Water Act, CAFOs are defined as a “point source” of pollution; however, the act further specifies that “[t]his term does not include agricultural stormwater discharges and return flows from irrigated agriculture”.¹¹² Since then, CAFOs have been a widely debated topic, with their regulations specified over the years.

NPDES

In terms of the EPA’s guidelines, CAFOs are grouped as small, medium, and large according to the National Pollutant Discharge Elimination System’s (NPDES) inspection manual. In addition to the size of their operations, small and medium AFOs must meet specific discharge requirements in order to be labeled CAFOs. Large poultry CAFOs are defined as follows:

Number of Animals	Type of Animal
55,000	Turkeys
30,000	Laying hens or broilers, if the AFO uses a liquid-manure handling system
125,000	Chickens (other than laying hens), if the AFO uses other than a liquid-manure handling system
82,000	Laying hens, if the AFO uses other than a liquid-manure handling system
30,000	Ducks, if the AFO uses other than a liquid-manure handling system
5,000	Ducks, if the AFO uses a liquid-manure handling system

*Table 2: NPDES guidelines for animal feeding operations to be labeled large CAFOs.*¹¹³

Since broiler chickens are usually produced with an “other than a liquid-manure handling system,” they are only categorized as a large CAFO when the operation has 125,000 or more animals. Other poultry, such as ducks or turkeys, are subject to lower head counts.

Despite the clear-cut categorizations for CAFOs provided in the inspection manual, these operations are only required to apply for wastewater permits when they actually discharge into waters of the US. This is the result of the 2011 decision in *National Pork Producers Council v. United States Environmental Protection Agency*.¹¹⁴ A previous rule declared *all* CAFOs were required to have NPDES permits (2003), until it was later changed to CAFOs that discharge or

propose to discharge (2008).¹¹⁵ The 2011 ruling found the EPA only had the authority under the CWA to regulate those CAFOs that were actually discharging, rather than proposing or an assumed risk. Currently, the EPA requires unpermitted CAFOs to maintain “site-specific nutrient management plans that ensure appropriate agricultural utilization of the nutrients as specified previously under the 2003 rule.”¹¹⁶ For large, unpermitted CAFOs, runoff is only considered agricultural stormwater discharge “where the manure, litter, or process wastewater has been land applied in accordance with site-specific nutrient management practices.”¹¹⁷

Role of the State

The main issue for North Carolina is the lack of knowledge and transparency on the locations of dry-litter poultry operations. In NC, this type of CAFO is “deemed permitted” and only required to follow certain guidelines for waste management.¹¹⁸ Some major guidelines include: maintaining records of waste management for three years, upholding a 100 feet buffer from wells and bodies of water, not leaving stockpiled waste uncovered for more than 15 days, and not applying litter during “precipitation events” or “on land that is flooded, saturated with water, frozen, or snow covered.”¹¹⁹ For these “deemed permitted” operations, unless a complaint is made, the NC Department of Environmental Quality (NCDEQ) has no way of knowing where the farms are located,¹²⁰ although Environmental Working Group and Waterkeeper Alliance have created a [map](#) of these operations.

To further complicate matters, the state has “right-to-farm” statutes that severely limit the nuisance claims nearby neighbors may file. In order for a nuisance action to be viable, it must be submitted by the legal property owner, within half a mile of the activity or structure, and within one year of the operation’s establishment or since a fundamental change has occurred.¹²¹ A “fundamental change” *does not* include changes of ownership, size, type of product produced, technology used, and more. These rules restrict many situations where a nuisance action may have been filed in the past.

In essence, poultry production takes precedence over the wellbeing of local residents and workers. North Carolina’s “Civil Remedies for Interference with Property,” commonly referred to as an “ag-gag” law, until recently prevented people from entering “nonpublic areas of another’s premises” and capturing any footage or photographs.¹²² This law prohibited whistleblowers from documenting any wrongdoing from their employers, while also preventing organizations and individuals from setting foot into most agricultural operations. The statute, which was passed in 2015, has since been deemed unconstitutional under the First Amendment in a June 2020 ruling in the U.S. District Court.¹²³ Not all lawmakers are opposed to change. Last year, NC Sen. Peterson proposed an amendment to the 2019 Farm Act to study the impacts of dry poultry litter operations; this proposal was struck down before it went to vote.

REFERENCES

- ¹ Steve Troxler and Dee Webb, "One Hundred Years and Counting: A Century of Partnering to Provide North Carolina Agriculture Data" (Raleigh, NC: USDA National Agricultural Statistics Service, NC Department of Agriculture and Consumer Services, 2019), https://www.nass.usda.gov/Statistics_by_State/North_Carolina/Publications/Annual_Statistical_Bulletin/AgStat/NCHighlights.pdf.
- ² "U.S. Chicken Industry History," *The National Chicken Council* (blog), accessed August 25, 2020, <https://www.nationalchickencouncil.org/about-the-industry/history/>.
- ³ Diana Stanley, "Hatching a Plan for Local Communities: Environmental Justice in Poultry Siting Decisions," *Washington Journal of Environmental Law & Policy* 10, no. 1 (June 1, 2020): 36.
- ⁴ National Chicken Council, "What Is the Tournament System? How Does the Tournament System Work?," Chicken Check In, September 10, 2019, <https://www.chickencheck.in/faq/tournament-system/>.
- ⁵ National Chicken Council.
- ⁶ Charlie Anderson, "Three USDA Actions to Help Farmers Get a Fair Shake, Explained," [whitehouse.gov](https://obamawhitehouse.archives.gov/blog/2016/12/14/three-usda-actions-help-farmers-get-fair-shake-explained), December 14, 2016, <https://obamawhitehouse.archives.gov/blog/2016/12/14/three-usda-actions-help-farmers-get-fair-shake-explained>.
- ⁷ Sally Lee and Marcello Cappellazzi, *Under Contract: Farmers and the Fine Print*, Documentary (Rural Advancement Foundation International, 2017), sec. The Loan, <https://vimeo.com/ondemand/undercontract/202806950>.
- ⁸ Teresea White and Sue King, "2017 Census of Agriculture Data Now Available," U.S. Department of Agriculture, April 11, 2019, <https://www.usda.gov/media/press-releases/2019/04/11/2017-census-agriculture-data-now-available>.
- ⁹ Steve Troxler and Dee Webb, "One Hundred Years and Counting: A Century of Partnering to Provide North Carolina Agriculture Data" (Raleigh, NC: USDA National Agricultural Statistics Service, NC Department of Agriculture and Consumer Services, 2019), https://www.nass.usda.gov/Statistics_by_State/North_Carolina/Publications/Annual_Statistical_Bulletin/AgStat/NCHighlights.pdf.
- ¹⁰ Alicia Harvie, "What Is a Family Farm? How Is It Different from a Factory Farm?," Farm Aid, April 9, 2010, <https://www.farmaid.org/issues/industrial-agriculture/what-exactly-is-a-family-farm/>.
- ¹¹ Natasha Just, Caroline Duchaine, and Baljit Singh, "An Aerobiological Perspective of Dust in Cage-Housed and Floor-Housed Poultry Operations," *Journal of Occupational Medicine and Toxicology (London, England)* 4 (June 10, 2009): 13, <https://doi.org/10.1186/1745-6673-4-13>.
- ¹² Just, Duchaine, and Singh.
- ¹³ Sara A. Quandt et al., "Dermatological Illnesses of Immigrant Poultry-Processing Workers in North Carolina," *Archives of Environmental & Occupational Health* 60, no. 3 (May 1, 2005): 165–69, <https://doi.org/10.3200/AEOH.60.3.165-169>.
- ¹⁴ Remington L. Nevin, Jon Bernt, and Michael Hodgson, "Association of Poultry Processing Industry Exposures With Reports of Occupational Finger Amputations: Results of an Analysis of OSHA Severe Injury Report (SIR) Data,"

Journal of Occupational and Environmental Medicine 59, no. 10 (October 2017): e159,
<https://doi.org/10.1097/JOM.0000000000001135>.

¹⁵ Oxfam America, “Disposable: In the Face of COVID-19, the Poultry Industry Seems Willing to Pay for Cheap Chicken with Workers’ Lives,” August 12, 2020, <https://www.oxfamamerica.org/explore/research-publications/disposable/>.

¹⁶ Taylor Telford, Kimberly Kindy, and Jacob Bogage, “Trump Orders Meat Plants to Stay Open in Pandemic,” *Washington Post*, accessed July 22, 2020, <https://www.washingtonpost.com/business/2020/04/28/trump-meat-plants-dpa/>.

¹⁷ North Carolina Department of Agriculture and Consumer Services, “N.C. Department of Agriculture and Consumer Services,” accessed October 13, 2020, <http://www.ncagr.gov/>.

¹⁸ E.g. Kira Burkhart et al., “Water Pollution from Slaughterhouses” (Washington, DC: Environmental Integrity Project, October 11, 2018), <https://environmentalintegrity.org/reports/water-pollution-from-slaughterhouses/>; P. Glatz, Miao Zhihong, and Rodda Belinda, “Handling and Treatment of Poultry Hatchery Waste: A Review,” *Sustainability* 3 (December 1, 2011), <https://doi.org/10.3390/su3010216>; Ana M. Rule, Sean L. Evans, and Ellen K. Silbergeld, “Food Animal Transport: A Potential Source of Community Exposures to Health Hazards from Industrial Farming (CAFOs),” *Journal of Infection and Public Health* 1, no. 1 (January 1, 2008): 33–39, <https://doi.org/10.1016/j.jiph.2008.08.001>.

¹⁹ JoAnn Burkholder et al., “Impacts of Waste from Concentrated Animal Feeding Operations on Water Quality,” *Environmental Health Perspectives* 115, no. 2 (February 2007): 308–12, <https://doi.org/10.1289/ehp.8839>; Leah Douglas, “A Breathtaking Lack of Oversight for Air Emissions from Animal Farms,” Food & Environment Reporting Network, December 20, 2019, <https://thefern.org/2019/12/a-breathtaking-lack-of-oversight-for-air-emissions-from-animal-farms/>.

²⁰ Tom Pelton, Maria Lamm, and Abel Russ, “Poultry Industry Pollution in the Chesapeake Region” (Washington, DC: Environmental Integrity Project, April 22, 2020), <https://environmentalintegrity.org/reports/poultry-industry-pollution-in-the-chesapeake-region/>.

²¹ Sarah Graddy, Ellen Simon, and Soren Rundquist, “UPDATE: Exposing Fields of Filth: Factory Farms Disproportionately Threaten Black, Latino and Native American North Carolinians,” June 30, 2020, <http://www.ewg.org/interactive-maps/2020-fields-of-filth/>.

²² Jesse Newman and Patrick McGroarty, “Farms, More Productive Than Ever, Are Poisoning Drinking Water in Rural America,” *Wall Street Journal*, January 18, 2019, sec. US, <https://www.wsj.com/articles/farms-more-productive-than-ever-are-poisoning-drinking-water-in-rural-america-11547826031>.

²³ Margaret Kyakuwaire et al., “How Safe Is Chicken Litter for Land Application as an Organic Fertilizer?: A Review,” *International Journal of Environmental Research and Public Health* 16, no. 19 (October 2019), <https://doi.org/10.3390/ijerph16193521>.

²⁴ Lee M. Myers et al., “Impact of Poultry Mortality Pits on Farm Groundwater Quality” (1999 Georgia Water Resources Conference, University of Georgia, 1999), <https://smartech.gatech.edu/handle/1853/47925>.

²⁵ Soren Rundquist and Don Carr, “Under the Radar: New Data Reveals N.C. Regulators Ignored Decade-Long Explosion of Poultry CAFOs” (Washington, DC: Environmental Working Group, February 2019), <https://www.ewg.org/research/under-radar>.

²⁶ Kyakuwaire et al., “How Safe Is Chicken Litter for Land Application as an Organic Fertilizer?,” 3,13.

-
- ²⁷ Leo Espinoza et al., “The Use of Poultry Litter in Row Crops” (University of Arkansas Division of Agriculture Cooperative Extension Service), accessed September 18, 2020, <https://www.uaex.edu/publications/PDF/FSA-2147.pdf>.
- ²⁸ Joshua S. Reichert et al., “Big Chicken: Pollution and Industrial Poultry Production in America” (Washington, DC: The Pew Environment Group, July 27, 2011), 11, <https://www.pewtrusts.org/-/media/legacy/uploadedfiles/peg/publications/report/pegbigchickenjuly2011pdf.pdf>; Mary Berg et al., “Phosphorus Behavior In the Environment,” North Dakota State University, June 2018, <https://www.ag.ndsu.edu/publications/environment-natural-resources/phosphorus-behavior-in-the-environment>.
- ²⁹ US EPA, “The Effects: Human Health,” Overviews and Factsheets, US EPA, March 12, 2013, <https://www.epa.gov/nutrientpollution/effects-human-health>.
- ³⁰ Earth How, “How Does Eutrophication Work? Causes, Process and Examples,” *Earth How* (blog), May 17, 2020, <https://earthhow.com/eutrophication-causes-process-examples/>.
- ³¹ NC Department of Water Resources, “A Comparison of PAN and P2O5 Produced from Poultry, Swine and Cattle Operations in North Carolina” (NC Department of Environmental Quality, March 2017), 3, https://files.nc.gov/ncdeq/Environmental%20Management%20Commission/Water_Quality_Committee_Meetings/2017/March/Attachments/Basinwide%20Manure%20Production%20Report%20%20Appendices.pdf.
- ³² NC Department of Water Resources, 4.
- ³³ Rundquist and Carr, “Under the Radar.”
- ³⁴ NC Department of Water Resources, “A Comparison of PAN and P2O5 Produced from Poultry, Swine and Cattle Operations in North Carolina,” 5.
- ³⁵ Michael A. Mallin et al., “Industrial Swine and Poultry Production Causes Chronic Nutrient and Fecal Microbial Stream Pollution,” *Water, Air and Soil Pollution; Dordrecht* 226, no. 12 (December 2015): 11, <http://dx.doi.org.ezproxy.lib.davidson.edu/10.1007/s11270-015-2669-y>.
- ³⁶ Colleen N. Brown, Michael A. Mallin, and Ai Ning Loh, “Tracing Nutrient Pollution from Industrialized Animal Production in a Large Coastal Watershed,” *Environmental Monitoring and Assessment* 192, no. 8 (2020), <https://doi.org/10.1007/s10661-020-08433-9>.
- ³⁷ Naylor et al., “Evaluation of Nitrate Concentrations and Potential Sources of Nitrate in Private Water Supply Wells in North Carolina,” *Journal of Environmental Health* 80 (May 1, 2018).
- ³⁸ L Knobloch et al., “Blue Babies and Nitrate-Contaminated Well Water.,” *Environmental Health Perspectives* 108, no. 7 (July 2000): 675–78.
- ³⁹ Mary H. Ward et al., “Drinking Water Nitrate and Human Health: An Updated Review,” *International Journal of Environmental Research and Public Health* 15, no. 7 (July 2018), <https://doi.org/10.3390/ijerph15071557>.
- ⁴⁰ Yuanan Hu, Hefa Cheng, and Shu Tao, “Environmental and Human Health Challenges of Industrial Livestock and Poultry Farming in China and Their Mitigation,” *Environment International* 107 (October 2017): 111–30, <https://doi.org/10.1016/j.envint.2017.07.003>; Kyakuwaire et al., “How Safe Is Chicken Litter for Land Application as an Organic Fertilizer?”
- ⁴¹ Kyakuwaire et al., “How Safe Is Chicken Litter for Land Application as an Organic Fertilizer?,” sec. 3.2.

-
- ⁴² Randall S. Singer and Leah Porter, “Estimates of On-Farm Antimicrobial Usage in Broiler Chicken and Turkey Production in the United States, 2013 – 2017” (Falcon Heights, MN: Mindwalk Consulting Group, August 2019), https://mindwalkconsultinggroup.com/wp-content/uploads/2019/08/Poultry_On-Farm_Antimicrobial_Use_Report_2013-2017.pdf.
- ⁴³ Lance B. Price et al., “The Persistence of Fluoroquinolone-Resistant *Campylobacter* in Poultry Production,” *Environmental Health Perspectives* 115, no. 7 (July 2007): 1035–39, <https://doi.org/10.1289/ehp.10050>.
- ⁴⁴ Melissa N. Poulsen et al., “Residential Proximity to High-Density Poultry Operations Associated with *Campylobacteriosis* and Infectious Diarrhea,” *International Journal of Hygiene and Environmental Health* 221, no. 2 (2018): 323–33, <https://doi.org/10.1016/j.ijheh.2017.12.005>.
- ⁴⁵ Kyakuwaire et al., “How Safe Is Chicken Litter for Land Application as an Organic Fertilizer?,” fig. 3.
- ⁴⁶ Christine E. Bevacqua et al., “Steroid Hormones in Biosolids and Poultry Litter: A Comparison of Potential Environmental Inputs,” *The Science of the Total Environment* 409, no. 11 (May 1, 2011): 2120–26, <https://doi.org/10.1016/j.scitotenv.2011.02.007>.
- ⁴⁷ M. L. Cabrera et al., “Litter Type and Number of Flocks Affect Sex Hormones in Broiler Litter,” *Journal of Environmental Quality* 47, no. 1 (2018): 156–61, <https://doi.org/10.2134/jeq2017.08.0301>.
- ⁴⁸ Kyakuwaire et al., “How Safe Is Chicken Litter for Land Application as an Organic Fertilizer?,” sec. 3.4.
- ⁴⁹ Dick Heederik et al., “Health Effects of Airborne Exposures from Concentrated Animal Feeding Operations,” *Environmental Health Perspectives* 115, no. 2 (February 2007): 298–302, <https://doi.org/10.1289/ehp.8835>.
- ⁵⁰ Claudia S Dunkley, “Global Warming: How Does It Relate to Poultry?,” *University of Georgia Extension*, March 30, 2011, 8.
- ⁵¹ E.g. Jordan Baker et al., “Modeling and Measurements of Ammonia from Poultry Operations: Their Emissions, Transport, and Deposition in the Chesapeake Bay,” *The Science of the Total Environment* 706 (March 1, 2020): 135290, <https://doi.org/10.1016/j.scitotenv.2019.135290>; H.R. Pohl et al., “Modeling Emissions from CAFO Poultry Farms in Poland and Evaluating Potential Risk to Surrounding Populations,” *Regulatory Toxicology and Pharmacology* 84 (March 2017): 18–25, <https://doi.org/10.1016/j.yrtph.2016.11.005>; T. S. Roumeliotis and B. J. Van Heyst, “Summary of Ammonia and Particulate Matter Emission Factors for Poultry Operations,” *Journal of Applied Poultry Research* 17, no. 2 (July 1, 2008): 305–14, <https://doi.org/10.3382/japr.2007-00073>; Ketwee Saksrithai and Annie J King, “Controlling Hydrogen Sulfide Emissions during Poultry Productions,” *Journal of Animal Research and Nutrition* 03, no. 01 (2018), <https://doi.org/10.21767/2572-5459.100040>.
- ⁵² P Gerber, C Opio, and H Steinfeld, “Poultry Production and the Environment – a Review” (Rome: Food and Agriculture Organization of the United Nations, 2007), 3, http://www.fao.org/ag/againfo/home/events/bangkok2007/docs/part2/2_2.pdf.
- ⁵³ Hu, Cheng, and Tao, “Environmental and Human Health Challenges of Industrial Livestock and Poultry Farming in China and Their Mitigation.”
- ⁵⁴ Rachel Avery Horton et al., “Malodor as a Trigger of Stress and Negative Mood in Neighbors of Industrial Hog Operations,” *American Journal of Public Health* 99, no. S3 (November 1, 2009): S610–15, <https://doi.org/10.2105/AJPH.2008.148924>.

-
- ⁵⁵ Right to Harm Film, “Sonia Lopez,” Right to Harm Film, accessed September 16, 2020, https://righttoharm.film/fwp_portfolio/sonia-lopez/.
- ⁵⁶ Melissa N. Poulsen et al., “High-Density Poultry Operations and Community-Acquired Pneumonia in Pennsylvania,” *Environmental Epidemiology* 2, no. 2 (June 2018): 6, <https://doi.org/10.1097/EE9.000000000000013>.
- ⁵⁷ X. Wang et al., “Epidemiological Study of People Living in Rural North Carolina for Novel Respiratory Viruses,” *Zoonoses and Public Health* 65, no. 1 (2018): e265–69, <https://doi.org/10.1111/zph.12436>.
- ⁵⁸ Natasha Just, Caroline Duchaine, and Baljit Singh, “An Aerobiological Perspective of Dust in Cage-Housed and Floor-Housed Poultry Operations,” *Journal of Occupational Medicine and Toxicology (London, England)* 4 (June 10, 2009): 13, <https://doi.org/10.1186/1745-6673-4-13>.
- ⁵⁹ Hu, Cheng, and Tao, “Environmental and Human Health Challenges of Industrial Livestock and Poultry Farming in China and Their Mitigation”; Gerber, Opio, and Steinfeld, “Poultry Production and the Environment – a Review,” 18–19.
- ⁶⁰ US EPA, “National Air Emissions Monitoring Study,” Overviews and Factsheets, US EPA, June 3, 2016, <https://www.epa.gov/afos-air/national-air-emissions-monitoring-study>.
- ⁶¹ Douglas, “A Breathtaking Lack of Oversight for Air Emissions from Animal Farms.”
- ⁶² Georgina Gustin, “Giant Chicken Houses Overrun Delmarva, and Neighbors Fear It’s Making Them Sick,” InsideClimate News, April 23, 2018, <https://insideclimatenews.org/news/23042018/poultry-industry-epa-asthma-respiratory-illness-chicken-houses-delmarva-legislature-health-study-delaware-maryland-virginia>.
- ⁶³ Gerber, Opio, and Steinfeld, “Poultry Production and the Environment – a Review.”
- ⁶⁴ Jan A. Rozendaal et al., “Houseflies,” in *Vector Control: Methods for Use by Individuals and Communities* (World Health Organization, 1997), 302–23.
- ⁶⁵ Kim A. Winpisinger et al., “Spread of *Musca Domestica* (Diptera: Muscidae), from Two Caged Layer Facilities to Neighboring Residences in Rural Ohio,” *Journal of Medical Entomology* 42, no. 5 (September 2005): 736–37, <https://doi.org/10.1093/jmedent/42.5.732>.
- ⁶⁶ David Pitt, “Industry Scrambles to Stop Fatal Bird Flu in South Carolina,” PBS NewsHour, April 10, 2020, <https://www.pbs.org/newshour/health/industry-scrambles-to-stop-fatal-bird-flu-in-south-carolina>.
- ⁶⁷ “Guide: Mass Poultry Mortality Disposal Options for North Carolina Growers,” Rural Advancement Foundation International-USA, December 17, 2012, <https://www.rafiusa.org/blog/mass-poultry-mortality/>; “North Carolina Prepares for Highly Pathogenic Avian Influenza,” North Carolina Department of Agriculture & Consumer Services, accessed May 28, 2020, <https://www.ncagr.gov/avianflu/Industry/Disposal-Info.htm>.
- ⁶⁸ E.g. Hyun-su Kim and Kangjoo Kim, “Microbial and Chemical Contamination of Groundwater around Livestock Mortality Burial Sites in Korea — a Review,” *Geosciences Journal* 16, no. 4 (December 1, 2012): 479–89, <https://doi.org/10.1007/s12303-012-0036-1>; Myers et al., “Impact of Poultry Mortality Pits on Farm Groundwater Quality”; Junseop Oh et al., “Delineating the Impacts of Poultry Burial Leachate on Shallow Groundwater in a Reclaimed Agro-Livestock Farming Area, Using Multivariate Statistical Analysis of Hydrochemical Data,” *Environmental Science and Pollution Research*, March 26, 2020, <https://doi.org/10.1007/s11356-020-08178-5>.

⁶⁹ Travis Fain, "Know Where the Nearest Poultry Farm Is? Neither Do NC Regulators," WRAL.com, June 10, 2019, <https://www.wral.com/know-where-the-nearest-poultry-farm-is-neither-do-nc-regulators/18436022/>.

⁷⁰ Ellen Simon, "Waterkeeper Alliance and EWG Investigation Finds Hurricane Florence Flooded Poultry Operations Housing 1.8 Million Birds," EWG, accessed May 11, 2020, <https://www.ewg.org/news-and-analysis/2018/11/waterkeeper-alliance-and-ewg-investigation-finds-hurricane-florence>; Travis Fain, "NC Spent \$11M-plus to Compost Dead Livestock Post-Florence," WRAL.com, November 13, 2018, <https://www.wral.com/nc-spent-11m-plus-to-compost-dead-livestock-post-florence/17992244/>.

⁷¹ Dana Alston, "Transforming a Movement," *Race, Poverty and the Environment* 2, no. 3/4 (Fall /Winter 1992 1991), <https://www.reimaginerpe.org/files/Alston.20th.17-1.pdf>.

⁷² US EPA, "Environmental Justice," Collections and Lists, US EPA, November 3, 2014, <https://www.epa.gov/environmentaljustice>.

⁷³ Jedediah Purdy, "The Long Environmental Justice Movement," *Ecology Law Quarterly* 44 (2018 2017): 854, 858.

⁷⁴ Wendee Nicole, "CAFOs and Environmental Justice: The Case of North Carolina," *Environmental Health Perspectives (Online); Research Triangle Park* 121, no. 6 (June 2013): 183, <http://dx.doi.org.ezproxy.lib.davidson.edu/10.1289/ehp.121-a182>.

⁷⁵ Nicole, 183.

⁷⁶ Christine Ball-Blakely, "CAFOs: Plaguing North Carolina Communities of Color," *Sustainable Development Law and Policy Brief* 18, no. 1 (2017): 4–5, <https://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1598&context=sdlp>.

⁷⁷ Steve Wing and Jill Johnston, "Industrial Hog Operations in North Carolina Disproportionately Impact African-Americans, Hispanics and American Indians" (The University of North Carolina at Chapel Hill, August 29, 2014), 1, <http://www.ncpolicywatch.com/wp-content/uploads/2014/09/UNC-Report.pdf>.

⁷⁸ Yelena Ogneva-Himmelberger, Liyao Huang, and Hao Xin, "CALPUFF and CAFOs: Air Pollution Modeling and Environmental Justice Analysis in the North Carolina Hog Industry," *ISPRS International Journal of Geo-Information* 4, no. 1 (March 2015): 150–71, <https://doi.org/10.3390/ijgi4010150>.

⁷⁹ Sacoby M. Wilson et al., "Environmental Injustice and the Mississippi Hog Industry.," *Environmental Health Perspectives* 110, no. suppl 2 (April 1, 2002): 199, <https://doi.org/10.1289/ehp.02110s2195>.

⁸⁰ S. M. Rafael Harun and Yelena Ogneva-Himmelberger, "Distribution of Industrial Farms in the United States and Socioeconomic, Health, and Environmental Characteristics of Counties," ed. Siyue Li, *Geography Journal* 2013 (August 13, 2013): 385893, <https://doi.org/10.1155/2013/385893>.

⁸¹ Harun and Ogneva-Himmelberger, 6.

⁸² Sarah Graddy, Ellen Simon, and Soren Rundquist, "UPDATE: Exposing Fields of Filth: Factory Farms Disproportionately Threaten Black, Latino and Native American North Carolinians," June 30, 2020, <http://www.ewg.org/interactive-maps/2020-fields-of-filth/>.

⁸³ Graddy, Simon, and Rundquist.

⁸⁴ Graddy, Simon, and Rundquist.

⁸⁵ Tom Pelton, Maria Lamm, and Abel Russ, “Poultry Industry Pollution in the Chesapeake Region” (Washington, DC: Environmental Integrity Project, April 22, 2020), <https://environmentalintegrity.org/reports/poultry-industry-pollution-in-the-chesapeake-region/>.

⁸⁶ Pelton, Lamm, and Russ, 25–26.

⁸⁷ Pelton, Lamm, and Russ, 22.

⁸⁸ Pelton, Lamm, and Russ, 20.

⁸⁹ Leah Baskin-Graves et al., “Rapid Health Impact Assessment of a Proposed Poultry Processing Plant in Millsboro, Delaware,” *International Journal of Environmental Research and Public Health*; *Basel* 16, no. 18 (2019), <http://dx.doi.org.ezproxy.lib.davidson.edu/10.3390/ijerph16183429>.

⁹⁰ Baskin-Graves et al., 13–14.

⁹¹ Jeanette A. Stingone and Steve Wing, “Poultry Litter Incineration as a Source of Energy: Reviewing the Potential for Impacts on Environmental Health and Justice,” *New Solutions: A Journal of Environmental and Occupational Health Policy*; *NS* 21, no. 1 (2011): 34–36, <https://doi.org/10.2190/NS.21.1.g>.

⁹² Stingone and Wing, “Poultry Litter Incineration as a Source of Energy.”

⁹³ Daniel J. DeNoon, “FDA Raises Concerns Over Arsenic in Chickens,” WebMD, accessed July 23, 2020, <https://www.webmd.com/food-recipes/food-poisoning/news/20110608/fda-arsenic-drug-in-chicken-feed-suspended>.

⁹⁴ BREDL, “Archived Campaign: Fibrowatt, LLC Poultry Waste Burners,” Blue Ridge Environmental Defense League, accessed July 23, 2020, <http://www.bredl.org/energy/fibrowatt.htm>.

⁹⁵ BREDL, sec. “CSE Places Full Page Newspaper Ad Highlighting Problems With Burning Poultry Litter.”

⁹⁶ Tom Polansek, “Millions of North Carolina Chickens Die in Hurricane Matthew Floods: State,” *Reuters*, October 12, 2016, <https://www.reuters.com/article/us-storm-matthew-poultry-idUSKCN12C2J6>; Michael Graff, “Millions of Dead Chickens and Pigs Found in Hurricane Floods,” *The Guardian*, September 22, 2018, sec. Environment, <https://www.theguardian.com/environment/2018/sep/21/hurricane-florence-flooding-north-carolina>.

⁹⁷ Steve Wing, Stephanie Freedman, and Lawrence Band, “The Potential Impact of Flooding on Confined Animal Feeding Operations in Eastern North Carolina,” *Environmental Health Perspectives* 110, no. 4 (April 2002): 387–91.

⁹⁸ Taylor Telford, Kimberly Kindy, and Jacob Bogage, “Trump Orders Meat Plants to Stay Open in Pandemic,” *Washington Post*, accessed July 22, 2020, <https://www.washingtonpost.com/business/2020/04/28/trump-meat-plants-dpa/>.

⁹⁹ Shayla Thompson, “Speeding Up Poultry Lines in a Pandemic Puts Workers’ Lives in Danger,” *Civil Eats*, July 17, 2020, <https://civileats.com/2020/07/17/speeding-up-poultry-lines-in-a-pandemic-puts-workers-lives-in-danger/>.

¹⁰⁰ E.g. Victoria Bouloubasis, “I’m Very Scared to Go Back There,” *Enlace Latino*, May 11, 2020, <https://enlancelatinonc.org/im-very-scared-to-go-back-there/>; Victoria Bouloubasis, “They Didn’t Tell Us Anything’: North Carolina Poultry Plant Workers Say Butterball Isn’t Protecting Them from COVID-19,” *Southerly*, May 1,

2020, <https://southerlymag.org/2020/05/01/they-didnt-tell-us-anything-north-carolina-poultry-plant-workers-say-butterball-isnt-protecting-them-from-covid-19/>; Dave Davies, “White House Used Pandemic To Weaken Safety Regulations, Reporter Says,” NPR, July 15, 2020, <https://www.npr.org/2020/07/15/891369048/white-house-used-pandemic-to-weaken-safety-regulations-reporter-says>; Suzanne Gamboa, “Coronavirus Reported in More than Half of Latino Meat, Poultry Workers in 21 States,” NBC News, July 8, 2020, <https://www.nbcnews.com/news/latino/coronavirus-reported-over-half-latino-meat-poultry-workers-21-states-n1233192>.

¹⁰¹ Diana Stanley, “Hatching a Plan for Local Communities: Environmental Justice in Poultry Siting Decisions,” *Washington Journal of Environmental Law & Policy* 10, no. 1 (June 1, 2020): 39.

¹⁰² Stanley, 65.

¹⁰³ Frayda Bluestein, “Is North Carolina a Dillon’s Rule State?,” *Coates’ Canons* (blog), October 24, 2012, <https://canons.sog.unc.edu/is-north-carolina-a-dillons-rule-state/>.

¹⁰⁴ Claudia Copeland, “Animal Waste and Water Quality: EPA’s Response to the Waterkeeper Alliance Court Decision on Regulation of CAFOs,” n.d., 16; Sierra Club, “Why Are CAFOs Bad?,” Sierra Club, February 24, 2015, <https://www.sierraclub.org/michigan/why-are-cafos-bad>.

¹⁰⁵ Virginia DEQ, “Livestock & Poultry,” Virginia Department of Environmental Quality, accessed May 13, 2020, <https://www.deq.virginia.gov/Programs/Water/LandApplicationBeneficialReuse/LivestockPoultry.aspx>.

¹⁰⁶ Virginia DEQ, “Litter Transport Program,” Virginia Department of Conservation and Recreation, accessed May 13, 2020, <https://www.dcr.virginia.gov/soil-and-water/nmlitter>.

¹⁰⁷ APHA, “Precautionary Moratorium on New and Expanding Concentrated Animal Feeding Operations,” American Public Health Association, November 5, 2019, <https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2020/01/13/precautionary-moratorium-on-new-and-expanding-concentrated-animal-feeding-operations>.

¹⁰⁸ Johns Hopkins Center for a Livable Future, “CAFO Moratorium Poll Results 2019,” Johns Hopkins Center for a Livable Future, December 10, 2019, <https://clf.jhsph.edu/projects/food-citizen/cafo-moratorium-poll-results-2019>.

¹⁰⁹ Rebecca Wolf, “This Is How We Pry The Corporate Stranglehold Off Of Our Farm System,” Food & Water Watch, September 21, 2020, <https://foodandwaterwatch.org/news/how-we-pry-corporate-stranglehold-our-farm-system>.

¹¹⁰ Ezra Klein, “Farmers and Animal Rights Activists Are Coming Together to Fight Big Factory Farms,” Vox, July 8, 2020, <https://www.vox.com/future-perfect/2020/7/8/21311327/farmers-factory-farms-cafos-animal-rights-booker-warren-khanna>.

¹¹¹ US EPA, “History of the Clean Water Act,” Overviews and Factsheets, US EPA, February 22, 2013, Great Lakes, <https://www.epa.gov/laws-regulations/history-clean-water-act>.

¹¹² “Clean Water Act,” Sec. 502 (14), <https://www.epa.gov/cwa-404/clean-water-act-section-502-general-definitions>.

¹¹³ US EPA, “NPDES Permit Writers’ Manual for Concentrated Animal Feeding Operations,” Collections and Lists, US EPA, August 25, 2015, <https://www.epa.gov/npdes/npdes-permit-writers-manual-concentrated-animal-feeding-operations>.

¹¹⁴ Copeland, “Animal Waste and Water Quality: EPA’s Response to the Waterkeeper Alliance Court Decision on Regulation of CAFOs,” 16.

¹¹⁵ Copeland, sec. Summary.

¹¹⁶ US EPA, “Concentrated Animal Feeding Operations Final Rulemaking - Q & A,” December 3, 2008, https://www3.epa.gov/npdes/pubs/cafo_final_rule2008_qa.pdf.

¹¹⁷ US EPA, “Compiled 2008 CAFO Final Rule,” EPA, July 30, 2012, 8, https://www.epa.gov/sites/production/files/2015-08/documents/cafo_final_rule2008_comp.pdf.

¹¹⁸ 15A NCAC 02T .1303, <http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environmental%20quality/chapter%2002%20-%20environmental%20management/subchapter%20t/15a%20ncac%2002t%20.1303.pdf>.

¹¹⁹ 15A NCAC 02T .1303.

¹²⁰ Fain, “Know Where the Nearest Poultry Farm Is?”

¹²¹ “Nuisance Liability of Agricultural and Forestry Operations,” N.C. G.S. §§ 106-700 to 106-702, https://www.ncleg.gov/EnactedLegislation/Statutes/HTML/ByArticle/Chapter_106/Article_57.html.

¹²² “Civil Remedies for Interference with Property,” N.C. G.S. §99A-2, https://www.ncleg.net/EnactedLegislation/Statutes/PDF/ByChapter/Chapter_99A.pdf.

¹²³ Sabrina Conza, “North Carolina ‘Ag-Gag’ Law Ruled Unconstitutional,” The Reporters Committee for Freedom of the Press, June 22, 2020, <https://www.rcfp.org/nc-ag-gag-law-unconstitutional/>.