Factory farms continue to take over the agricultural landscape of the United States. There are currently 1.6 billion animals in our nation’s 25 thousand factory farms (see Figure 1 on page 2). Together, these animals produce an estimated 885 billion pounds of manure each year, polluting our air and water and releasing climate-warming emissions.

Research and analysis from Food & Water Watch continue to reveal the dangerous trends of factory farm expansion and increasing consolidation in the meat, poultry, dairy and egg industries. We compiled county-level data from the USDA’s 2017 Census of Agriculture, assigning each county a density rating based on the number of livestock living on the largest operations. The five years since the last Agricultural Census (2012) have brought massive changes, including:

- 190 million more animals living on factory farms (a 14 percent increase);
- 82 billion additional tons of manure produced annually — equivalent to the human sewage generated by creating a new city of 60 million residents (or three New York Cities);
- An increase in the average number of animals at factory farms across all livestock categories except beef cattle, as factory farms get even bigger.

Yet this growth masks a parallel problem: the loss of smaller, family-run operations. For example, there were nearly 10,000 fewer dairies of any size in 2017 compared to 2012 (a nearly 15 percent decrease).

---
a See methodology section for more details on livestock density rankings.
Rural America is in crisis. The factory farm system is in part to blame, making it difficult for all but the largest, most polluting operations to survive. We are losing family farms to these mega-operations that foul our soil and water, fuel climate change, exploit workers and cause needless animal suffering.

We need a fundamental change in how we produce meat, dairy and eggs in our country, starting with an immediate ban on new and expanding factory farms. We must also revamp our state and federal policies so they work to support farmers and consumers, not giant agribusinesses.

**Hog Waste Is Destroying Our Water Resources**

Over the past few decades, the hog industry became highly concentrated across the American South and Midwest. Thirty-eight percent of North Carolina counties rank 4 (Extreme) or 3 (Severe) for factory hog density (see Figure 2 on page 3); in Iowa, 94 percent of counties earned these rankings.
As each hog produces roughly one and a half tons of manure each year, their combined manure in a county can meet or exceed the equivalent weight in human sewage of major metropolitan areas (see Table 1). For example, hogs on factory farms in Duplin County, North Carolina produce the same weight in manure as residents of Boston. But unlike human sewage, hog and other livestock waste is not treated before being released into the environment.

As the hog industry transformed from small family farms to industrial mega-operations, it shifted the burdens and risks of hog manure disposal onto rural communities. Hog waste spreads human pathogens into the environment, including strains of antibiotic-resistant bacteria. Additionally, many industrial operations produce more manure than can be sustainably applied as fertilizer to crops onsite, creating runoff that pollutes soil and water. Nationwide, pollution from animal feeding operations threatens or impairs more than 14,000 miles of rivers and streams and 90,000 acres of lakes and ponds.

Extreme weather events — which are getting stronger and more prevalent in our changing climate — contribute to major manure releases. When Hurricane Florence ravaged eastern North Carolina in 2018, it caused extensive flooding of factory farms, drowning thousands of hogs and causing dozens of manure spills.

### Table 1. Top Factory Hog Farm Counties and Human Sewage Equivalent

<table>
<thead>
<tr>
<th>State/County</th>
<th>Hogs on Factory Farms</th>
<th>Human Sewage Population Equivalent</th>
<th>Comparable Metropolitan Area*</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina/Duplin</td>
<td>1,950,583</td>
<td>4,643,191</td>
<td>Boston</td>
</tr>
<tr>
<td>North Carolina/Sampson</td>
<td>1,878,165</td>
<td>4,470,806</td>
<td>Detroit</td>
</tr>
<tr>
<td>Iowa/Washington</td>
<td>1,324,498</td>
<td>3,152,851</td>
<td>San Diego</td>
</tr>
<tr>
<td>Iowa/Sioux</td>
<td>1,220,743</td>
<td>2,905,871</td>
<td>Tampa</td>
</tr>
<tr>
<td>Oklahoma/Texas</td>
<td>1,094,823</td>
<td>2,606,130</td>
<td>Denver</td>
</tr>
<tr>
<td>Iowa/Lyon</td>
<td>1,058,365</td>
<td>2,519,345</td>
<td>Orlando</td>
</tr>
<tr>
<td>Iowa/Hamilton</td>
<td>1,006,857</td>
<td>2,396,734</td>
<td>Pittsburgh</td>
</tr>
<tr>
<td>Iowa/Plymouth</td>
<td>909,046</td>
<td>2,163,904</td>
<td>Las Vegas</td>
</tr>
<tr>
<td>Minnesota/Martin</td>
<td>824,258</td>
<td>1,962,074</td>
<td>Austin</td>
</tr>
<tr>
<td>Iowa/Carroll</td>
<td>733,229</td>
<td>1,745,387</td>
<td>Nashville</td>
</tr>
<tr>
<td>United States</td>
<td>70,162,897</td>
<td>167,016,592</td>
<td>1/2 of the U.S. population</td>
</tr>
</tbody>
</table>

*Comparison is to the population of the entire greater metropolitan area, not only the city population.
lagoons to overflow or breach entirely. Floodwaters carried this toxic mixture of hog carcasses and “fecal soup” downstream into flooded homes and neighborhoods, and contributed to a spike in E. coli contamination of private drinking water wells.⁷

**Broiler Chickens Create Hazardous Air Pollution**

The broiler meat industry is heavily concentrated in certain regions, including Maryland’s Eastern Shore, where communities are often located near multiple facilities housing hundreds of thousands of birds at a time (see Figure 3). These factory broiler operations make bad neighbors, releasing foul odors that travel off the farms and into residents’ homes, even with the windows closed.⁸ They also release a slew of toxic pollutants — including ammonia, particulate matter and endotoxins — which irritate the respiratory system and are linked to lung disease. Industrial poultry houses also spread human pathogens and create volatile organic compounds that can harm the nervous system and contribute to ground-level ozone.⁹

In addition, industrial poultry operations generate an enormous volume of poultry litter (a mixture of manure, feathers and bedding). In Maryland in 2017, factory broiler operations generated an estimated 560 million pounds of poultry litter (see Table 2).

<table>
<thead>
<tr>
<th>County</th>
<th>Broilers on Factory Farms</th>
<th>Annual Litter Production (in Pounds)</th>
<th>Ratio Broiler Litter to Human Sewage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worcester</td>
<td>8,813,394</td>
<td>126,543,226</td>
<td>1.8x human sewage</td>
</tr>
<tr>
<td>Wicomico</td>
<td>8,664,015</td>
<td>124,398,425</td>
<td>0.9x human sewage</td>
</tr>
<tr>
<td>Somerset</td>
<td>7,767,737</td>
<td>111,529,622</td>
<td>3.2x human sewage</td>
</tr>
<tr>
<td>Caroline</td>
<td>5,527,044</td>
<td>79,357,616</td>
<td>1.8x human sewage</td>
</tr>
<tr>
<td>Dorchester</td>
<td>4,033,248</td>
<td>57,909,612</td>
<td>1.3x human sewage</td>
</tr>
<tr>
<td>Queen Anne’s</td>
<td>3,136,971</td>
<td>45,040,809</td>
<td>0.7x human sewage</td>
</tr>
</tbody>
</table>

**FIGURE 3. Broiler Chickens on Maryland’s Factory Farms**

---

foodandwaterwatch.org
The manure alone was enough to overflow an Olympic-sized swimming pool every day. Poultry litter is high in nitrogen and phosphorus, and overapplication can contaminate groundwater, polluting drinking water sources. Maryland is second only to Delaware for the prevalence of nitrate in groundwater, which is linked to the life-threatening condition known as “blue baby syndrome.” Additionally, agriculture is the leading source of nitrogen and phosphorus loads to the Chesapeake Bay. Poultry litter contributes to this load, impeding efforts to restore this important estuary.

The extreme concentration of facilities in a given region is all part of the poultry industry’s model of industrial production. Ninety-six percent of broiler chickens in the U.S. are raised under production contracts. In this system, growers do not own the birds but instead raise them under contract with agribusinesses like Perdue and Tysons (the integrators), which slash costs by contracting with multiple growers in a specific region. Integrators further increase their profits by shifting the burden of litter disposal onto the shoulders of growers. Since the poultry industry is so consolidated, many regions have only one integrator, leaving growers with neither leverage to negotiate better contract terms nor an open market on which to raise and sell birds.

Expanding Egg Operations Will Increase Worker Injuries and Animal Suffering

Nationally, the total number of egg-producing factory farms fell by 17.3 percent between 2012 and 2017, but the total birds on these operations increased, suggesting that these mega-operations are expanding their capacities. For instance, Iowa has a quarter fewer factory egg-laying operations than it did in 2012, but the average size of these operations increased by nearly 50 percent (see Figure 4). The average factory egg-laying operation in the U.S. today houses just under 800,000 birds, each generating 10 Olympic swimming pools’ worth of manure annually (see Table 3).

<table>
<thead>
<tr>
<th>State</th>
<th>Egg-laying Hens on Factory Farms</th>
<th>Annual Manure Production (in Olympic Pools/Day)</th>
<th>Average Inventory per Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>54,120,593</td>
<td>1.9</td>
<td>1,866,227</td>
</tr>
<tr>
<td>Ohio</td>
<td>24,129,757</td>
<td>0.8</td>
<td>778,379</td>
</tr>
<tr>
<td>Indiana</td>
<td>23,812,468</td>
<td>0.8</td>
<td>1,082,385</td>
</tr>
<tr>
<td>Texas</td>
<td>17,575,599</td>
<td>0.6</td>
<td>925,032</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>16,206,211</td>
<td>0.6</td>
<td>558,835</td>
</tr>
<tr>
<td>United States</td>
<td>254,765,800</td>
<td>9</td>
<td>796,143</td>
</tr>
</tbody>
</table>

**FIGURE 4. Hens on Iowa’s Egg-Producing Factory Farms, 1997-2017**

<table>
<thead>
<tr>
<th>Egg-laying Hen Density</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme</td>
<td>4</td>
</tr>
<tr>
<td>Severe</td>
<td>3</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
</tr>
<tr>
<td>Moderate</td>
<td>1</td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
</tbody>
</table>
Expanding egg operations mean even more hazardous air and water pollution that plagues nearby residents and the environment. But for workers, these conditions can be a nightmare. Long-term exposure to toxic poultry dust is linked to a slew of respiratory problems including chronic phlegm, asthma and chronic bronchitis. Injuries are another workplace hazard. In fact, the animal production industry as a whole (which includes workers raising animals on farms and feedlots) has an alarmingly high rate of non-fatal workplace injuries — more than eight times that of the oil and gas extraction industry. These figures only included reported incidents; workers may be reluctant to report injuries, especially undocumented immigrants, who often undertake the most dangerous jobs on factory farms.

Life inside a factory egg farm is bleak for the hens as well; animal welfare takes a back seat to industry profits. An estimated 95 percent of hens are locked in cages where they have less than a piece of printer paper’s worth of floorspace per bird. Chicks are “debeaked” without anesthesia in order to prevent the birds from harming one another in their crowded environments, but this causes lasting pain and stress. Cattle and hogs undergo tail docking and dehorning for similar reasons. Unsurprisingly, the factory farm industry is largely resistant to any proposals to improve welfare conditions for workers and animals. We cannot wait for industry to choose health and safety over profits; reform must come from revamping our federal agricultural policies that currently uphold the factory farm system.

Mega-Dairies Erode Rural Communities

Explosive growth in factory farms often masks a parallel occurrence: the shuttering of small- and medium-sized family farms, which are the lifeblood of rural communities. Michigan provides a stark example: The number of factory dairy operations in the state more than quadrupled between 1997 and 2017 — and the total number of cows living on these operations increased eightfold. Yet today, Michigan has fewer than half as many small- and medium-sized dairies (those under 500 head) than it did 20 years ago (see Figure 5).

With expanding factory farms, the state now produces more milk than it can process in-state, depressing milk prices (and consequently farm income). Due to
these and other economic challenges, many dairies are not even able to meet the cost of production. Unfortunately, smaller dairies may be less able to weather these economic storms year after year. Dairy closures can have a cascading effect in a community, reducing the incentives for haulers to travel to these areas. Michigan is bleeding small-and medium-sized dairy farms (see Figure 6) — all while state leaders praise the industry for increasing its milk production.

Decades of research conclude that the rise in factory farms coincides with stark declines in the economic and social well-being of communities, leading to higher levels of poverty and economic inequality, increased use of supplemental nutrition assistance and out migration. Farm policies that focus merely on increasing production — not on supply management or diversifying operations — perpetuate this damaging scenario.

### Market Consolidation

#### Guts Farmer Profit and Raises Beef Prices

Most beef cattle begin their lives on pasture-based farms — nearly half on operations with fewer than 100 head of cattle — before being sold to feedlots where they are finished on grain diets. Until the mid-1960s, the majority finished on small “farmer-feedlots” where farmers raised their own feed. Today, however,

#### From Family Farms to Factory Operations

Iowa is another tragic case study in the consequences of a state opening its doors to factory farms. The average number of hogs on Iowa factory farms grew tenfold between 1982 and 2007. However, the total number of hog farms plummeted by more than 80 percent, and the state lost more than 40 percent of all farm jobs. Moreover, the total real value of Iowa’s hog sales declined, even though farmers were selling more hogs. The factory farm model is bad for Iowa’s economy, its farmers and the environment.
mega-feedlots dominate middle America, with five states accounting for 75 percent of all factory feedlot cattle (see Figure 7). The average factory feedlot houses 4,000 head of cattle, but the largest ones can pack in up to 150,000 head or more at one time. In 2017, U.S. factory feedlots produced 296 billion pounds of manure — the same weight as sewage generated by two-thirds of U.S. residents (see Table 4).

As feedlot size expanded, so too did the meat-packing industry’s stranglehold on the market.

In 1980, the top four beef-packing firms slaughtered one out of three cattle on feed; this increased to four out of five by 1995 and remains steady to this day. Extreme consolidation enables major beef packers to engage in unfair practices that distort the market price of cattle. Unfortunately, federal regulations enacted 100 years ago to protect farmers and ranchers in a highly-consolidated market did not prevent further consolidation or these abusive practices, and recent proposals to update these rules fall short of much-needed changes.

**FIGURE 7. Beef Cattle on U.S. Factory Farms**

**TABLE 4. Top Factory Feedlot States**

<table>
<thead>
<tr>
<th>State</th>
<th>Beef Cattle on Factory Farms</th>
<th>Average Head per Feedlot</th>
<th>Annual Manure Production (in Pounds)</th>
<th>Human Sewage Population Equivalent</th>
<th>Comparable Metropolitan Area*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nebraska</td>
<td>2,752,571</td>
<td>4,418</td>
<td>63,309,133,000</td>
<td>46,626,258</td>
<td>3.5x Los Angeles</td>
</tr>
<tr>
<td>Texas</td>
<td>2,634,548</td>
<td>26,612</td>
<td>60,594,604,000</td>
<td>44,627,047</td>
<td>2x New York City</td>
</tr>
<tr>
<td>Kansas</td>
<td>2,365,718</td>
<td>11,374</td>
<td>54,411,513,998</td>
<td>40,073,291</td>
<td>2x New York City</td>
</tr>
<tr>
<td>Iowa</td>
<td>1,152,949</td>
<td>1,225</td>
<td>26,517,827,000</td>
<td>19,529,995</td>
<td>3x Houston</td>
</tr>
<tr>
<td>Colorado</td>
<td>984,727</td>
<td>11,190</td>
<td>22,648,721,000</td>
<td>16,680,454</td>
<td>3x Atlanta</td>
</tr>
<tr>
<td>United States</td>
<td>12,856,898</td>
<td>4,055</td>
<td>295,708,653,996</td>
<td>217,785,133</td>
<td>2/3 of the U.S. population</td>
</tr>
</tbody>
</table>

*Comparison is to the population of the entire greater metropolitan area, not only the city population.
Agribusiness giants perpetuate the myth that factory farms provide cheap meat to American consumers. But if this were the case, the real cost of beef should have fallen as feedlot size expanded. Instead, the opposite is true. Over the past two decades, farmers’ share of beef sales declined 8 percent while the cost of ground beef surged 70 percent. Consumers and farmers are getting fleeced while giant meatpackers profit.

We Can Fix Our Factory Farm Problem

Our nation’s agricultural policies incentivize the overproduction of corn and soybeans, fueling climate change and providing artificially cheap feed for factory farms. Failure to enforce our nation’s anti-trust laws has allowed a handful of companies to gain even greater control of the livestock market. And factory farms continue to evade regulation under our nation’s premier environmental laws such as the Clean Water Act and Clean Air Act.

We need a complete overhaul of our federal farm policies so that they work for farmers and consumers — not agribusiness giants — all while reducing livestock’s climate footprint. This must include:

- An immediate, national ban on new factory farms and on the expansion of existing ones;
- Research and funding to help current factory farms transition to smaller, more sustainable crop and/or livestock systems;
- Investment to expand local markets and build the infrastructure needed to help farmers bring their products to market;
- Reestablishing supply management controls, including the national grain reserve and price floors;
- Expanding crop insurance and other subsidies to cover more crops that directly feed humans;
- Closing loopholes that allow factory farms to hijack funds earmarked for conservation practices;
- Enforcing Clean Water Act and Clean Air Act regulations with respect to livestock operations.

Americans are already rethinking the role of meat in their diets, with an estimated two-thirds reporting a reduction in meat consumption for health and environmental reasons. Eating less meat and dairy, and purchasing these products from farms implementing sustainable practices, is a win-win-win for consumers, farmers and the planet.

However, we cannot shop our way out of this problem. We need to vote for candidates who share this vision of a more just and sustainable food system — and who are willing take on the agribusiness giants that are only out to promote their corporate interests.

The first step towards fixing our food system is to ban factory farms. Only then can we transition away from polluting, unethical factory operations to sustainable, holistic farming systems.

Methodology

Density Maps

Food & Water Watch compiled data from the five most recent USDA Census of Agriculture reports (1997, 2002, 2007, 2012 and 2017), a comprehensive survey that includes data such as livestock inventory, number and size of operations, and livestock sales from every U.S. county. We classified operations as “factory farms” if they met the following Census categories: 500 or more beef cattle on feed, 500 or more dairy cows, 1,000 or more hogs, 500,000 or more broiler chickens sold annually, and 100,000 or more egg-laying hens. These size categories roughly align with the U.S. Environmental Protection Agency’s definition of a medium-sized concentrated animal feeding operation (CAFO).

We totaled the county-level inventory data for operations we classify as factory farms and assigned each county a density ranking ranging from “Low” to “Extreme.” This ranking system is a quartile distribution of factory farm livestock inventories from the 2007 USDA Ag Census, and we applied the same ranking criteria for the Census.
years preceding and following 2007. We created the maps using ArcGIS, ArcMap Version 10.7.1, joining the county-level livestock inventory data (and our ranking system) to the USGS National Atlas county boundaries.

USDA does not report county-level inventory and sales data for broilers and layers by farm size. Instead, Food & Water Watch first used state-level data to calculate the average inventories and sales per factory layer/broiler farm. We then applied the state average to each operation within that state's counties before calculating their county-level inventories. Similarly, we also applied state-wide averages in instances where USDA withheld inventory figures for factory operations within a given county (in order to protect the identities of operations in counties where few exist).38

For the “All Livestock” density maps, Food & Water Watch first converted inventory data into animal units, a weight-based measurement that is used to aggregate livestock inventories across various species. Animal unit measurements vary slightly between different state and federal agencies, but roughly speaking, one beef cow equals approximately two-thirds of a dairy cow, 8 hogs, 400 broiler chickens or 220 laying hens.39 (For the broiler category, which reports sales rather than inventories, we first divided the county sales in the given year by 5.5 — the approximate number of flocks raised annually per operation.)40

### TABLE 5. Factory Farm Map Density Table

<table>
<thead>
<tr>
<th>Density</th>
<th>Map Color</th>
<th>All Livestock (Animal Units)</th>
<th>Dairy Cows</th>
<th>Beef Cattle on Feed</th>
<th>Hogs</th>
<th>Broiler Chickens Sold</th>
<th>Egg-Laying Hens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme</td>
<td>Dark Red</td>
<td>More than 13,200</td>
<td>More than 4,200</td>
<td>More than 17,400</td>
<td>More than 48,500</td>
<td>More than 2.75 million</td>
<td>More than 1.25 million</td>
</tr>
<tr>
<td>Severe</td>
<td>Red</td>
<td>5,200 – 13,200</td>
<td>2,100 – 4,200</td>
<td>7,300 – 17,400</td>
<td>19,000 – 48,500</td>
<td>1 million – 2.75 million</td>
<td>750,000 – 1.25 million</td>
</tr>
<tr>
<td>High</td>
<td>Orange</td>
<td>2,000 – 5,199</td>
<td>1,200 – 2,099</td>
<td>2,175 – 7,299</td>
<td>9,500 – 18,999</td>
<td>350,000 – 999,999</td>
<td>500,000 – 749,999</td>
</tr>
<tr>
<td>Moderate</td>
<td>Yellow</td>
<td>Fewer than 2,000</td>
<td>Fewer than 1,200</td>
<td>Fewer than 2,175</td>
<td>Fewer than 9,500</td>
<td>Fewer than 350,000</td>
<td>Fewer than 500,000</td>
</tr>
<tr>
<td>None</td>
<td>Light Yellow</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

### Manure Production and Human Sewage Equivalencies

Food & Water Watch previously relied on estimates for livestock and human manure production from a 2004 EPA factory farm risk assessment.41 For this map release, we updated our calculations on livestock manure production using the most recent agency estimates we could find — specifically, a 2013 EPA report that employed USDA methodologies.42 The estimates for livestock manure production were nearly identical to those in EPA (2004) and were used when estimating the total weight of manure produced by all five livestock categories, and for cattle and hogs individually.

When considering broilers alone, we calculated litter production (the combination of manure, feathers and bedding from chicken houses) using estimates developed for the Chesapeake Bay Foundation.43 As this methodology only relates to broiler (meat) chickens, we could not apply it to egg-laying hens, and instead used a USDA estimate on manure volume to compare hen manure production to Olympic-sized swimming pools.44

For this map release, Food & Water Watch no longer used EPA (2004) to estimate human manure production, as it only considers fecal matter, whereas its livestock estimates include both urine and feces, creating an insufficient comparison.45 Instead, we used the most recent estimate of human manure (urine and feces) production we could find referenced in an agency document, a 2008 Government Accountability Office report.46 This lowered the livestock-to-human waste ratios from previous map iterations and reports. We continued to use U.S. Census Bureau’s American Community Survey 5-year population estimates in order to compare county-level livestock waste production to major metropolitan areas.
Endnotes


29 FWW. [Fact sheet]. “Horizontal consolidation and buyer power in the beef industry.” July 2010 at 2.

30 FWW 2010 at 1 to 2; National Farmers Union. [Press release]. “Livestock competition rule unlikely to provide needed protections to farmers.” January 10, 2020.


34 Pew Environment Group. [Fact sheet]. “Animal agriculture and the clean water act.” December 1, 2010 at 1 to 2; EPA OIG At a Glance.

35 FWW. “The Urgent Case for a Ban on Factory Farms.” May 2018 at 10.


37 40 CFR § 122.23.


44 USDA NRCS. “Agricultural Waste Management Field Handbook, Chapter 4: Agricultural waste characteristics.” 210–VI–AWMFH. March 2008 at 4-12 to 4-20.


---

**Food & Water Watch** mobilizes regular people to build political power to move bold and uncompromised solutions to the most pressing food, water and climate problems of our time. We work to protect people’s health, communities and democracy from the growing destructive power of the most powerful economic interests.

---

FOOD & WATER WATCH

(202) 683-2500

foodandwaterwatch.org • info@fwwatch.org

Copyright © April 2020 Food & Water Watch