



**Can't You Smell That Smell?
Clean Air Act Fixes for Factory Farm Air Pollution**

By J. Nicholas Hoover*

Massive facilities that keep large numbers of livestock have overtaken small, independent farms as the primary source of meat, eggs, and dairy in the United States. These concentrated animal feeding operations (“CAFOs”) compare more to industrial manufacturing operations than to traditional farms, and emit huge quantities of air pollutants that are harmful to public health, sickening people and damaging the environment. The Environmental Protection Agency (“EPA”) possesses statutorily provided tools under the Clean Air Act that it uses to regulate other polluting industries. However, this article – after reviewing the rise of CAFOs, examining the threats they pose, and surveying current regulation – suggests that the EPA’s approach to CAFOs is grossly inadequate. The article argues that the agency, under the Clean Air Act, should regulate the emissions of hydrogen sulfide and ammonia, two pollutants for which factory farms are major sources. This approach is incomplete, however. Pollutant-based regulation is both overbroad in that it will regulate other sources of these pollutants and underbroad because CAFO air pollution includes more than just these pollutants. The EPA should therefore additionally or alternatively rely on a more thorough and flexible pollution source-specific tool, the New Source Performance Standards (“NSPS”). NSPS are analogous to the rigorous source-specific approach used to regulate CAFO water pollution under the Clean Water Act, and will provide a comprehensive antidote to the ills of modern, industrial animal agriculture.

Introduction	2
I. The Factory Farm Industry and its Environmental Costs	4
A. CAFO Culture	4
B. The Sources, Extent, and Effects of Factory Farm Air Pollution	5
II. The Weaknesses of Current Factory Farm Regulation Under the Clean Air Act	9
A. Factory Farm Regulation Under the Clean Air Act: In Theory	10
B. Factory Farm Regulation Under the Clean Air Act: In Practice	12

III. Ammonia and Hydrogen Sulfide Demand Clean Air Act Regulation	16
A. A Choice: Hazardous Air Pollutants or “Criteria” Pollutants?	18
B. Justification for Regulating Hydrogen Sulfide as a Hazardous Air Pollutant	19
C. Justification for Regulating Ammonia as a Hazardous Air Pollutant	21
IV. New Source Performance Standards: The Strongest Regulatory Option for Factory Farm Air Pollution	22
V. Conclusion	28

Introduction

On July 2, 2007, a Virginia farmer climbed into a manure pit to unclog a pipe, and succumbed almost instantly to deadly fumes.¹ In the scramble to save him, his wife, two young daughters, and a farmhand each suffered the same fate.² A year later, Minnesota public health officials urged residents living within a mile of a massive dairy farm to evacuate after hydrogen sulfide fumes spiked to more than 200 times the state air quality limits, causing headaches, nausea, and weakness.³ "I used to be happy all the time, and now I feel like I'm drowning," one affected resident later told the state legislature. "[The odor] burns your eyes, your throat It is so brutal, it takes your breath away, [and] it goes through the walls of your home."⁴ Sadly, these stories are not unique: farm workers and nearby residents routinely suffer the effects of air pollution from livestock and poultry operations, especially where farms have grown to industrial size.⁵ Moreover, these stories represent just the human side of an air pollution story that also adversely affects farm animals⁶ and the environment.⁷

* J. Nicholas Hoover. J.D. Candidate, 2013, University of Maryland Francis King Carey School of Law. The author would like to thank Matthew Oakes for his invaluable guidance. He also wishes to thank Robert Percival, Leslie Hill, and the staff of the Stanford Journal of Animal Law & Policy for their comments.

¹ Dionne Walker, *Two Kids Among Five Killed By Methane Gas*, ASSOCIATED PRESS, July 3, 2007, available at http://www.msnbc.msn.com/id/19580177/ns/us_news-life/.

² *Id.*

³ *Residents Living Near Northwestern Minn. Feedlot Evacuate*, ASSOCIATED PRESS, June 11, 2008, available at http://www.bismarcktribune.com/news/state-and-regional/article_e8fa9272-5e9b-5af2-9a34-1a8215a5b954.html.

⁴ Stephanie Hemphill, *Cleanup of Problematic Excel Dairy May Be Far Off*, MINN. PUBLIC RADIO, Jan. 22, 2010, available at <http://minnesota.publicradio.org/display/web/2010/01/21/excel-dairy-shutdown/>.

⁵ Dozens of cases encompassing a wide range of symptoms, for example, were reported in two rural Michigan counties over one five-year period. Kathy Melmoth, *Health Impacts from CAFOs and Liquid Manure Application Observed in Lenawee and Hillsdale County: Winter 2002 – September 2006*, available at <http://www.nocafos.org/HealthImpacts2002-2006.pdf>.

⁶ For example, releases of hydrogen sulfide at CAFOs have been linked to the deaths of livestock. Letter from Neil J. Carman, Ph.D., Sierra Club, to Lisa Jackson, Administrator, Env'tl. Prot.

Over the last seventy-five years, the locus of American animal agriculture has shifted from iconic “red barns” operated by family farmers to a consolidated industry of vertically-integrated “mega-farms” that keep large numbers of livestock in frequent confinement.⁸ These modern facilities compare more readily to streamlined industrial manufacturing operations than to traditional farms,⁹ and emit significant quantities of numerous air pollutants, including ammonia, hydrogen sulfide, nitrous oxide, methane, particulate matter, and volatile organic compounds (VOCs).¹⁰ CAFOs have been associated with an array of health and environmental problems, from respiratory inflammation and nausea¹¹ to acid rain.¹² However, while the Clean Air Act (CAA) possesses the tools to regulate CAFO air pollutants,¹³ factory farms often escape regulation.¹⁴ CAFOs are thoroughly regulated under the CAA’s regulatory twin, the Clean Water Act,¹⁵ further making the EPA’s avoidance of CAFO regulation under the CAA a puzzling decision. The EPA must do a better job at regulating CAFOs and the air pollutants they emit.

The initial section of this paper lays the groundwork for my argument for more thorough CAFO regulation by first, summarizing the rise, scope, and characteristics of CAFOs in the United States and second, detailing CAFO pollution to underscore the acute threats such pollution poses to public health and welfare. Part II assesses regulation of CAFOs under the CAA, and determines that the current regulatory approach insufficiently protects public health and

Agency 2 (Mar. 30, 2009), *available at*

<http://www.earthworksaction.org/files/publications/H2SLetterToEPA.pdf>.

⁷ For example, ammonia, which is emitted by CAFOs, contributes to acid rain and “dead zones” in bodies of water. Env’tl. Integrity Project et al., *Petition for the Regulation of Ammonia as a Criteria Pollutant Under Clean Air Act Sections 108 and 109* 43, 49 (2011), [hereinafter *Ammonia Petition*], *available at*

<http://www.environmentalintegrity.org/documents/PetitiontoListAmmoniaasaCleanAirActCriteriaPollutant.pdf>. See also CLAUDIA COPELAND, CONG. RESEARCH SERV., RL 32948, AIR QUALITY ISSUES AND ANIMAL AGRICULTURE: A PRIMER 3 (2010) [hereinafter *COPELAND, PRIMER*].

⁸ Susan M. Brehm, *From Red Barn to Facility: Changing Environmental Liability to Fit the Changing Structure of Livestock Production*, 93 CAL. L. REV. 797, 797–798, 802–806 (2005).

⁹ *Id.* at 798.

¹⁰ LINGYING ZHAO, THE OHIO STATE UNIVERSITY, FACT SHEET: UNDERSTANDING AIR EMISSIONS FROM ANIMAL FEEDING OPERATIONS (2007), *available at* <http://ohioline.osu.edu/aex-fact/pdf/0721.pdf>.

¹¹ U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-08-944, CONCENTRATED ANIMAL FEEDING OPERATIONS: EPA NEEDS MORE INFORMATION AND A CLEARLY DEFINED STRATEGY TO PROTECT AIR AND WATER QUALITY FROM POLLUTANTS OF CONCERN 25 (2008), *available at* <http://www.gao.gov/new.items/d08944.pdf>.

¹² Tarah Heinzen, *Stopping the Campaign to Deregulate Factory Farm Air Pollution*, 17 N.Y.U. ENVTL. L.J. 1482, 1495–1496 (2009) (citing OR. DEP’T OF ENVTL. QUALITY, SOUTHWEST CLEAN AIR AGENCY, COLUMBIA GORGE AIR STUDY AND STRATEGY REPORT 5 (2008)).

¹³ NAT’L RESEARCH COUNCIL, AIR EMISSIONS FROM ANIMAL FEEDING OPERATIONS: CURRENT KNOWLEDGE, FUTURE NEEDS 13 (2003) [hereinafter *NAT’L RESEARCH COUNCIL, AIR EMISSIONS*], *available at* <http://www.4cleanair.org/nascaforeport.pdf>.

¹⁴ J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 ECOLOGY L.Q. 263, 265 (2000).

¹⁵ See *infra* text accompanying notes 268–279.

welfare.¹⁶ The rest of the paper calls on the Environmental Protection Agency to do more under the CAA to address CAFO air pollution, and analyzes the EPA's options. Part III concludes that the EPA should regulate two currently under-regulated pollutants for which CAFOs are significant sources (ammonia and hydrogen sulfide) as Hazardous Air Pollutants (HAPs) under CAA § 112(b).¹⁷ Part IV then suggests that pollutant-specific regulation is insufficient to prevent the harmful effects of CAFO air pollution, and that the EPA should thus promulgate comprehensive and effective CAFO-specific New Source Performance Standards under CAA § 111.¹⁸

I. Factory Farms and their Environmental Costs

A. CAFO Culture

The small family farms that historically checkered large swaths of the American landscape posed few large-scale pollution threats.¹⁹ However, while the U.S. population more than doubled from 123 million to 309 million since 1930,²⁰ the number of American family farms decreased from seven million to two million,²¹ declining steadily as farm productivity rose.²² Increasing mechanization led to significant increases in output, and corn and grains became cheaper and more plentiful, both for humans and for use as animal feed.²³ Cheap corn made it increasingly profitable to engage in large-scale livestock operations.²⁴ Organizational changes in the agriculture industry, the continued introduction of technologies designed to increase productivity, and modern economies of scale further catalyzed the trend and have resulted in not only bigger but also frequently geographically concentrated facilities.²⁵ By 1997, the 2,075 feedlots with more than 1,000 head of cattle apiece accounted for eighty

¹⁶ See *infra* Part II.

¹⁷ See *infra* Part III.

¹⁸ See *infra* Part IV.

¹⁹ Sarah C. Wilson, Comment, *Hogwash! Why Industrial Animal Agriculture is Not Beyond the Scope of Clean Air Act Regulation*, 24 PACE ENVTL. L. REV. 439, 439 (2007).

²⁰ U.S. CENSUS BUREAU, RESIDENT POPULATION DATA, <http://www.census.gov/2010census/data/apportionment-pop-text.php> (last visited Feb. 23, 2013).

²¹ Wilson, *supra* note 19, at 439 n. 3 (citing ANDREW KIMBRELL, THE FATAL HARVEST READER: THE TRAGEDY OF INDUSTRIAL AGRICULTURE, 17 (Andrew Kimbrell ed., 2002)).

²² NAT'L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 24.

²³ PEW COMM'N ON INDUSTRIAL FARM ANIMAL PRODUCTION, PUTTING MEAT ON THE TABLE: INDUSTRIAL FARM ANIMAL PRODUCTION IN AMERICA 3 (2008) [hereinafter PEW COMM'N], available at <http://www.ncifap.org/bin/e/j/PCIFAPFin.pdf>.

²⁴ *Id.*

²⁵ CLAUDIA COPELAND, CONG. RESEARCH SERV., RL 32947, AIR QUALITY ISSUES AND ANIMAL AGRICULTURE: EPA'S AIR COMPLIANCE AGREEMENT 2 (2008) [hereinafter COPELAND, AIR COMPLIANCE AGREEMENT], available at <http://www.nationalaglawcenter.org/assets/crs/RL32947.pdf>.

percent of all beef sold in the United States.²⁶ That shift has continued in recent years. For example, across all categories – milk cows, cows and heifers that calved, beef cows, etcetera – since 2002, more bovines are being raised on big farms, and fewer are being raised on small farms.²⁷

Massive warehouses full of animals, packed feedlots, and large ponds of resulting manure are trademarks of this trend, which has even led to a codified definition of the term "concentrated animal feeding operations" in environmental regulations.²⁸ CAFOs congregate feed and manure, live and dead animals, and production operations all onto small plots of land.²⁹ These facilities are a sub-category of animal feeding operations, which the Code of Federal Regulations defines by animals being stabled or confined for more than 45 days a year, and as places where "crops, vegetation, forage growth, or post-harvest residues" are not kept during the normal growing season.³⁰ "Medium"-sized CAFOs have at least 200 cows, 750 hogs, 16,500 turkeys, 9,000 chickens, or similarly high numbers of confined sheep, lambs or ducks.³¹ The animals in CAFOs are confined for most of their lives in "battery cages, veal and gestation crates, and other warehouse-like conditions."³² As of 2008, there were 20,700 CAFOs in the United States.³³ Overall, CAFOs constitute a multi-billion dollar industry,³⁴ accounting for only 5% of all AFOs but more than 50% of all animals raised in the United States for food.³⁵

B. The Sources, Extent, and Effects of Factory Farm Air Pollution

The United Nations' Food and Agriculture Organization finds the livestock sector to be "one of the top two or three most significant contributors to the most serious environmental problems" worldwide.³⁶ Air pollution from CAFOs emanates from numerous sources on the facilities, including barns, feedlots,

²⁶ U.S. ENVTL. PROT. AGENCY EMISSION STANDARDS DIV., OFFICE OF AIR QUALITY PLANNING AND STANDARDS, EMISSIONS FROM ANIMAL FEEDING OPERATIONS DRAFT REPORT (2001) 3-1 [hereinafter ENVTL. PROT. AGENCY, DRAFT REPORT], *available at* <http://www.epa.gov/ttnchie1/ap42/ch09/draft/draftanimalfeed.pdf>.

²⁷ DEP'T OF AGRIC., 2007 CENSUS OF AGRICULTURE: SUMMARY AND STATE DATA 19 (2009), *available at* http://www.agcensus.usda.gov/Publications/2007/Full_Report/usv1.pdf.

²⁸ Concentrated Animal Feeding Operations, 40 C.F.R. § 122.23 (2008).

²⁹ U.S. ENVTL. PROT. AGENCY, WHAT IS A CAFO?, <http://www.epa.gov/region7/water/cafo/index.htm> (last accessed Feb. 23, 2013).

³⁰ 40 C.F.R. § 122.23(b)(1).

³¹ *Id.* § 122.23(b)(6).

³² The Humane Society of the U.S. et al., Petition to List Concentrated Animal Feeding Operations Under Clean Air Act Section 111(B)(1)(A) of the Clean Air Act [sic] and to Promulgate Standards of Performance Under Clean Air Act Sections 111(B)(1)(B) and 111(D) (2009) [hereinafter Humane Society], *available at* <http://www.humanesociety.org/assets/pdfs/farm/hsus-et-al-v-epa-cafo-caa-petition-final.pdf>.

³³ COPELAND, PRIMER, *supra* note 7, at 9.

³⁴ *Waterkeeper Alliance, Inc. v. U.S. Env'tl. Prot. Agency*, 399 F.3d 486, 493 (2nd Cir. 2005).

³⁵ Humane Society, *supra* note 32, at 13.

³⁶ FOOD AND AGRIC. ORG. OF THE UNITED NATIONS, LIVESTOCK'S LONG SHADOW: ENVIRONMENTAL ISSUES AND OPTIONS xx (2006).

manure storage,³⁷ and animals themselves.³⁸ Decomposing animal manure is the primary cause of this pollution.³⁹ The Department of Agriculture estimates CAFOs create three times more waste than the entire American population does annually.⁴⁰ EPA officials know of at least one beef farm that produces more animal waste on its own than the sewage produced by the more than two million residents of Houston, Texas.⁴¹ CAFOs store all this manure in pits under confinement buildings or in so-called "lagoons."⁴² Animals living indoors are kept on slatted cement floors designed to let waste fall into a holding area.⁴³ In order to prevent that waste from overflowing, CAFOs frequently pump it to waste storage lagoons until it can be applied to land as fertilizer.⁴⁴ Often, waste lies stewing in these lagoons for as long as multi-year periods.⁴⁵

The types and emission rates of CAFO air pollutants vary by animal sector, pollution source, geographical and weather-related features, and pollution management system.⁴⁶ However, CAFO air pollution generally comes in the form of various harmful gases, particulate matter, and odor.⁴⁷ Decomposing

³⁷ COPELAND, PRIMER, *supra* note 7, at 2.

³⁸ NAT'L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 3736.

³⁹ COPELAND, PRIMER, *supra* note 7, at 2. Other air pollution sources worth recognizing include feed, animal hair and dander, and urine. *See e.g.*, PEW COMM'N, *supra* note 23, at 16; NAT'L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 37.

⁴⁰ *Large Animal Feeding Operations: Reducing Their Impact on Air Quality*, ENFORCEMENT ALERT (Env'tl. Prot. Agency Office of Civil Enforcement), Aug. 2008, at 1 [hereinafter *Large Animal Feeding Operations*], available at <http://www.epa.gov/compliance/resources/newsletters/civil/enfalert/afo-0708.pdf>.

⁴¹ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 11, at 20.

⁴² COPELAND, PRIMER, *supra* note 7, at 2.

⁴³ Brehm, *supra* note 8, at 809.

⁴⁴ *Id.*

⁴⁵ Wilson, *supra* note 19, at 441.

⁴⁶ U.S. ENVTL. PROT. AGENCY, DRAFT REPORT, *supra* note 26, at 2-14-2-15; COPELAND, PRIMER, *supra* note 7, at 2.

⁴⁷ NAT'L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 4. Complaints about odor from neighbors of CAFOs most frequently alert public officials to air emission problems. *Id.* at 14. The CAA deals with particulate matter and noxious gases, but neither the CAA itself nor the EPA's implementing regulations directly regulate odor. 42 U.S.C. §§ 7401-7700 (2006); *Concerned Citizens of Bridesburg v. EPA*, 836 F.2d 777, 780, 782-83 (3d Cir. 1987). Listing "odor" as a regulated pollutant is likely to be administratively untenable due to the variety of odors and odorants and the subjectivity of odor levels. GEORGE H. WAHL, JR., U.S. ENVTL. PROT. AGENCY, PUB. NO. EPA-450/5-80-003, REGULATORY OPTIONS FOR THE CONTROL OF ODORS 52-53 (1980). However, states arguably retain limited ability to regulate odor under their own implementation of Clean Air Act regulations. *See Save Our Health Org. v. Recomp of Minn., Inc.*, 37 F.3d 1334, 1337 (8th Cir. 1994) (declining to hold whether the EPA may regulate odors under the CAA and thus tacitly acquiescing in state's continued enforcement of odor regulations as part of its own implementation of Clean Air Act regulations); *Concerned Citizens of Bridesburg v. EPA*, 836 F.2d 777, 779 (same). CAFO odor has typically been dealt with through common law nuisance cases. Richard H. Middleton Jr. & Charles F. Speer, *A Big Stink*, TRIAL, Mar. 2011, at 26 *et seq.*; *but see generally* Terence J. Centner, *Nuisances from Animal Feeding Operations: Reconciling Agricultural Production and Neighboring Property Rights*, 11 DRAKE J. AGRIC. L. 5 (2006) (discussing legal provisions such as right-to-farm laws that may limit nuisance suits against

manure emits at least 160 gases, including several gases regulated in one way or another by the Clean Air Act, such as hydrogen sulfide, ammonia, carbon dioxide, methane, nitrous oxide, and several VOCs.⁴⁸ Colorless gas hydrogen sulfide, which smells like rotten eggs, comes from microbial decomposition of sulfur-containing organic matter in animal manure.⁴⁹ Another pungent colorless gas, ammonia, is released in animal waste as well.⁵⁰ Methane is generated by enteric fermentation⁵¹ and manure decomposition, and is also a greenhouse gas.⁵² Nitrous oxide results from microbial processes in manure, and has 296 times the global warming potential of carbon dioxide.⁵³ Components of particulate matter emitted from CAFOs include fecal matter, feed, dander, products of the breakdown of manure and urine, and bioaerosols (particles containing tiny living organisms like bacteria).⁵⁴ An official two-year EPA- and industry-sponsored air monitoring study recently found levels of some pollutants at some CAFOs, including particulate matter, ammonia, and hydrogen sulfide, far higher than federal health-based guidelines recommend for human exposure.⁵⁵

It should be no surprise, then, that CAFO air pollution causes negative effects for nearby residents and the environment. The EPA itself appreciates that AFO pollution can be a detriment to local residents.⁵⁶ Scientific research bears

CAFOs). State regulation has been used as another means for odor mitigation. *See, e.g.*, WASH. ADMIN. CODE § 173-400-040 (5) (2012); *but see, e.g.*, W. VA. CODE R. § 45-4-7.1.b (2012) (exempting “[n]ormal and necessary operations associated with . . . livestock . . . and poultry grown on the premises” from the state’s odor regulation). Despite the EPA’s current inability to regulate CAFO odors directly, however, both pollutant-specific and source-specific federal regulation of CAFO air pollution could facilitate a reduction of odor on and around CAFOs. *See infra* text accompanying notes 48–49 (noting strong odors of hydrogen sulfide and ammonia); WAHL, *supra* note 47, at 36–37 (noting that “source performance standards for specific odor sources can be a very effective odor-control where . . . a few sources or source categories are responsible for most of the odor problem,” and highlighting an example of the regulation of anaerobic lagoons in Iowa).

⁴⁸ PEW COMM’N, *supra* note 23, at 16; NAT’L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 4.

⁴⁹ Zhao, *supra* note 10, at 2.

⁵⁰ *Id.*

⁵¹ Enteric fermentation is an animal digestive process in which microbes break down feed into products that the animals can absorb and metabolize. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2010, 6-2 (2012) [hereinafter EPA INVENTORY], available at <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-Main-Text.pdf>.

⁵² Zhao, *supra* note 10, at 2.

⁵³ *Id.*

⁵⁴ MICH. DEP’T OF ENVTL. QUALITY TOXICS STEERING GROUP, CONCENTRATED ANIMAL FEEDLOT OPERATIONS: CHEMICALS ASSOCIATED WITH AIR EMISSIONS 2 (2006) [hereinafter MICHIGAN STUDY].

⁵⁵ ENVTL. INTEGRITY PROJECT, HAZARDOUS POLLUTION FROM FACTORY FARMS: AN ANALYSIS OF EPA’S NATIONAL AIR EMISSIONS MONITORING STUDY DATA 1 (2011) [hereinafter ENVTL. INTEGRITY PROJECT, ANALYSIS].

⁵⁶ Animal Feeding Operations Consent Agreement and Final Order, 70 Fed. Reg. 4,959 (Jan. 31, 2005) [hereinafter EPA Consent Agreement].

this out. Ammonia, hydrogen sulfide, and particulate matter cause most of the health concerns about CAFOs, while VOCs, ammonia, particulates, methane, and nitrogen oxides pose ecological concerns.⁵⁷ More than seventy published studies associate CAFO air emissions with harm to public health and welfare.⁵⁸ Studies have linked CAFOs to respiratory symptoms, headaches, nausea, increased incidence of infant mortality,⁵⁹ and depression.⁶⁰ Researchers in North Carolina found that the closer children live to a CAFO, the greater their risk of asthma-related symptoms.⁶¹ Local hospital visits for respiratory and diarrheal illnesses tripled within five years of the construction in Utah of one of the nation's largest hog CAFOs.⁶² Farm workers are especially at risk, as CAFOs' toxic gases and dusts cause chronic respiratory irritation and organic dust toxic syndrome.⁶³ CAFO air pollution also endangers animals themselves. For example, high ammonia concentrations can lead to decreased activity and weaken the immune system of swine living in CAFOs, while dust and other gases can lead to pneumonia, inflammation of the lung cavity, and increased fetal mortality in such pigs.⁶⁴ Build-ups of methane and other gases have led to explosions throughout the Midwest that have killed as many as 1,500 pigs in one explosion.⁶⁵ Outside of direct health effects, livestock accounts for numerous gases that contribute to global warming, including 32.7% of U.S. methane emissions and 5.4% of U.S. nitrous oxide emissions,⁶⁶ while greenhouse gas emissions from manure management alone increased by 51.2% between 1990 and 2010.⁶⁷ CAFOs' ammonia and nitrous oxide emissions also contribute to over-abundance of nutrients in bodies of water that in turn causes dead zones devoid of sea life.⁶⁸

⁵⁷ COPELAND, PRIMER, *supra* note 7, at 2.

⁵⁸ Humane Society, *supra* note 32, at 38.

⁵⁹ Ammonia Petition, *supra* note 7.

⁶⁰ PEW COMM'N, *supra* note 23, at 17.

⁶¹ CARRIE HRIBAR, NAT'L ASSOCIATION OF LOCAL BOARDS OF HEALTH, UNDERSTANDING CONCENTRATED ANIMAL FEEDING OPERATIONS AND THEIR IMPACT ON COMMUNITIES 5 (Mark Schultz ed., 2010), *available at* http://www.cdc.gov/nceh/ehs/Docs/Understanding_CAFOS_NALBOH.pdf. In fact, four large studies have shown "strong and consistent associations" between CAFOs and asthma. PEW COMM'N, *supra* note 23, at 17.

⁶² DAVID WALLINGA, INST. FOR AGRIC. AND TRADE POLICY, CONCENTRATED ANIMAL FEEDING OPERATIONS: HEALTH RISKS FROM AIR POLLUTION (2004), *available at* http://www.iatp.org/files/421_2_37388.pdf.

⁶³ PEW COMM'N, *supra* note 23, at 16.

⁶⁴ THE HUMANE SOC'Y OF THE U.S., AN HSUS REPORT: THE WELFARE OF ANIMALS IN THE PIG INDUSTRY 5 (2010), *available at* http://www.humanesociety.org/assets/pdfs/farm/welfare_pig_industry.pdf; S. Pedersen et al., *Dust in Pig Buildings*, 6 J. AGRIC. SAFETY & HEALTH 261, 266 (2000).

⁶⁵ Kali Dingman, *Exploding Hog Barns Beckon U Researchers*, MINNESOTA DAILY (Feb. 7, 2012), <http://www.mndaily.com/2012/02/07/exploding-hog-barns-beckon-u-researchers> (last visited Feb. 26, 2013).

⁶⁶ COPELAND, PRIMER, *supra* note 7, at 21–22.

⁶⁷ EPA INVENTORY, *supra* note 51, at 2–13.

⁶⁸ NAT'L RESEARCH COUNCIL, ACUTE EXPOSURE, *supra* note 7, at 42–43.

Despite these concerns, Clean Air Act regulation of CAFOs remains incomplete at best.

II. The Weaknesses of Current Factory Farm Regulation Under the Clean Air Act

Agriculture is one of the few industries remaining largely outside the bounds of environmental regulations.⁶⁹ The government has frequently absolved it from responsibility that follows from such laws: under the Clean Air Act, for example, the EPA can excuse farmers from accidental release requirements for any hazardous air pollutant they use as a nutrient.⁷⁰ The National Association of Clean Air Agencies, which includes the air pollution control agencies from 54 states and territories and more than 165 metropolitan areas, has said that it is "troubled" by efforts to exempt CAFOs from environmental laws.⁷¹ However, questions about whether environmental laws should apply to CAFOs continue to give rise to controversy in Congress⁷² and the states,⁷³ and the \$297 billion and growing agricultural industry maintains an extensive bench of lobbyists to take advantage of that controversy.⁷⁴ The industry also carries out marketing campaigns that perpetuate the image of the small American farmer and avoid environmental issues,⁷⁵ adding to the regulatory challenge. Even where environmental laws do not exempt agriculture, the sheer number of farms,⁷⁶ their variety,⁷⁷ and the lack of dedicated enforcement funding and political will often

⁶⁹ "Agriculture remains the final frontier of the environmental movement. While smelters, power plants, mining operations, and automobiles are subject to a web of environmental regulations, farms still operate almost entirely outside that framework." Warren A. Braunig, *Reflexive Law Solutions for Factory Farm Pollution*, 80 N.Y.U. L. Rev. 1505, 1505–1506 (2005).

⁷⁰ 42 U.S.C. § 7412(r)(5).

⁷¹ *Human Health, Water Quality and Other Impacts of the Confined Animal Feeding Operation Industry: Hearing Before the S. Comm. On Env't and Pub. Works*, 110th Cong. 1 (2007) (statement of Catharine Fitzsimmons, Chief of the Air Quality Bureau of the Iowa Dept. of Nat. Res.) [hereinafter *Hearing*], available at http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=73afc323-c44d-4fff-915e-d4657b05167a.

⁷² COPELAND, PRIMER, *supra* note 7, at Executive Summary.

⁷³ In response to complaints by local CAFOs, for example, Missouri's legislature recently passed a law limiting citizens' ability to bring nuisance suits against them. Wes Duplanter, *Missouri Lawmakers Pass Limits on Farm Lawsuits*, ASSOCIATED PRESS, Apr. 14, 2011, available at <http://www.businessweek.com/ap/financialnews/D9MJODO80.htm>.

⁷⁴ Wilson, *supra* note 19, at 451, 472 n. 247. For the size of the U.S. agricultural industry, see U.S. DEP'T OF AGRIC., 2007 CENSUS OF AGRICULTURE: ECONOMICS (2007), available at http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/Fact_Sheets/Economics/economics.pdf.

⁷⁵ Wilson, *supra* note 19, at 451.

⁷⁶ COPELAND, PRIMER, *supra* note 7, at 7.

⁷⁷ "The . . . wide variety of operations, even among those for a single livestock type . . . in management practices, such as manure handling, topography and in climate" make it more challenging to measure air emissions from CAFOs, complicating regulation. NAT'L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 141.

inhibit adequate enforcement.⁷⁸ Most environmental farm policy therefore eschews heavy-handed regulation and instead uses economic incentives to encourage the adoption of conservation practices.⁷⁹ However, while proposing to regulate the multiple millions of nationwide farms may be a non-starter, CAFOs are low-hanging fruit: they are identifiable, fewer in number, and large and dominant enough to pass the cost of compliance on to consumers.⁸⁰

A. Factory Farm Regulation Under the Clean Air Act: In Theory

The CAA regulates so-called “criteria pollutants” that deteriorate ambient air quality,⁸¹ hazardous air pollutants,⁸² and emissions from certain specific sources of air pollution.⁸³ The CAA regulates many of the pollutants emitted by CAFOs. Among them, particulate matter is listed as a criteria pollutant and regulated by National Ambient Air Quality Standards (“NAAQS”), VOCs and nitrous oxide may be regulated as precursors to ozone (a criteria pollutant), ammonia may be regulated as a precursor for fine particulate matter (PM 2.5, also a criteria pollutant), and accidental releases of hydrogen sulfide are regulated as Hazardous Air Pollutants (“HAPs”).⁸⁴ The EPA has also added greenhouse gases to the list of pollutants regulated under the Clean Air Act via the Greenhouse Gas Reporting Rule and the Tailoring Rule (as modified).⁸⁵ Given that there is no national source-specific performance standard for CAFOs⁸⁶ and that HAP-based regulation of CAFOs covers only certain VOCs⁸⁷ and accidental releases of hydrogen sulfide,⁸⁸ the primary way CAFOs are affected by CAA regulation is via the national ambient air quality standards.

Under the section of the Act regulating criteria pollutants, the EPA sets NAAQS for air pollutants it has found may be reasonably expected to contribute to air pollution and endanger public health and welfare due to emissions from numerous or diverse sources.⁸⁹ The six current "criteria" pollutants under this

⁷⁸ PEW COMM'N, *supra* note 23, at 75.

⁷⁹ MEGAN STUBBS, CONG. RESEARCH SERV., R41622, ENVIRONMENTAL REGULATION AND AGRICULTURE 1 (2011).

⁸⁰ Ruhl, *supra* note 14, at 329, 335–336. *See also* Neil D. Hamilton, *Reaping What We Have Sown: Public Policy Consequences of Agricultural Industrialization and the Legal Implications of a Changing Production System*, 45 Drake L. Rev. 289, 299–300 (1997) (arguing that CAFOs should be regulated like “smoke stack” industries).

⁸¹ 42 U.S.C. § 7409.

⁸² *Id.* § 7412.

⁸³ *Id.* § 7411.

⁸⁴ NAT'L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 13.

⁸⁵ Mandatory Reporting of Greenhouse Gases, 74 Fed. Reg. 56,260 (Oct. 30, 2009); Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514 (June 3, 2010); Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule Step 3 and GHG Plantwide Applicability Limits, 77 Fed. Reg. 41,051 (July 12, 2012).

⁸⁶ Humane Society, *supra* note 32, at 2.

⁸⁷ COPELAND, PRIMER, *supra* note 7, at 9–10.

⁸⁸ 42 U.S.C. § 7412(r)(3).

⁸⁹ *Id.* § 7409(a)(1)(A)–(B).

section are sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter.⁹⁰ Precursors of criteria pollutants, such as VOCs (precursors of ozone) and ammonia (a precursor of PM) can also be regulated under this section.⁹¹ Air quality standards for criteria pollutants must allow an "adequate margin of safety" and be "requisite to protect the public health."⁹² The CAA breaks the country into air quality control regions which, depending on whether they meet the NAAQS or not, the EPA labels as attainment areas or non-attainment areas, respectively.⁹³ While the federal government sets the NAAQS, states implement them through State Implementation Plans (SIPs) that must meet certain requirements.⁹⁴ The CAA's regulatory scheme requires preconstruction permits and operating permits for major sources of air pollution,⁹⁵ but permit requirements differ for sources in attainment and non-attainment areas.⁹⁶ In attainment areas, major emitting facilities must install the "best available control technology" (BACT) for each regulated pollutant,⁹⁷ as determined on a case-by-case basis.⁹⁸ Facilities in non-attainment are subject to stricter measures.⁹⁹ There, they must comply with the "lowest achievable emission rate" (LAER),¹⁰⁰ which requires, in addition to stringent emissions requirements, that the regulator weigh benefits of new sources against their environmental costs.¹⁰¹

The CAA, unlike many environmental laws, does not provide a blanket exemption for any industry.¹⁰² In fact, in 2002, the EPA explicitly withdrew California's long-standing agricultural permitting exemption on the basis that it "unduly restrict[ed]" enforcement of the CAA¹⁰³ and said that CAFOs "plainly fit the definition of stationary source" under the CAA.¹⁰⁴ Courts may assess civil fines and the EPA itself administrative penalties of up to \$25,000 per day for violation of permit requirements, and owners and operators of sources may be

⁹⁰ 40 C.F.R. §§ 50.4–50.17 (2013).

⁹¹ NAT'L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 13.

⁹² 42 U.S.C. § 7409(b)(1).

⁹³ *Id.* § 7407(d).

⁹⁴ *Id.* § 7410.

⁹⁵ *Id.* §§ 7475, 7661.

⁹⁶ *Id.* §§ 7475, 7503.

⁹⁷ *Id.* § 7475(a)(4). BACT represents the "maximum degree of reduction ... which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques." *Id.* § 7479(3).

⁹⁸ 42 U.S.C. § 7479(3).

⁹⁹ *Id.* § 7503.

¹⁰⁰ *Id.*

¹⁰¹ *Id.* § 7503(a).

¹⁰² Partial Withdrawal of Approval of 34 Clean Air Act Part 70 Operating Permits Programs in California; Announcement of a Part 71 Federal Operating Permits Program, 67 Fed. Reg. 63,551, 63,554–55 (Oct. 15, 2002) [hereinafter Partial Withdrawal]. However, while there are no blanket exemptions, there are some minor caveats for farmers. *See, e.g., supra* text accompanying note 69.

¹⁰³ 67 Fed. Reg. 63,551.

¹⁰⁴ *Id.* at 63,556–57.

liable for criminal penalties for knowing violations of CAA requirements.¹⁰⁵ Further, the EPA may require permitted facilities to monitor their own emissions in order to "determine the effect" of the facilities' emissions on air quality.¹⁰⁶

The EPA has taken some action against CAFOs under the CAA. For example, in 2001, the EPA and the Department of Justice entered into a multi-million dollar settlement with Premium Standard Farms to resolve CAA violations at numerous CAFOs in Missouri.¹⁰⁷ As part of that settlement, Premium Standard Farms agreed to install technology to reduce air pollution (including ammonia and hydrogen sulfide),¹⁰⁸ fund a \$300,000 environmental project to reduce air emissions and odors from hog farms, and spend up to \$25 million developing next-generation pollution control technologies.¹⁰⁹ In 2004, Buckeye Egg Farms, the largest egg producer in Ohio, agreed to a Clean Air Act settlement after failing to comply with a regulatory order and failing to obtain required permits for PM emissions, whereby it would pay an \$880,598 penalty and spend \$1.6 million to install and test air pollution controls in order to cut emissions of PM and ammonia from three facilities.¹¹⁰

B. CAFO Regulation Under the Clean Air Act: In Practice

While, in letter, the CAA applies to CAFOs, truth here departs from theory. The Buckeye and Premium Standard Farms cases are exceptions, not the rule: the EPA has rarely taken enforcement action against CAFOs under the CAA.¹¹¹ Federal and state regulators have made CAFO air pollution a low priority.¹¹² While technically, the CAA does not exempt agriculture, the EPA has called agriculture as a "unique" industry for which permitting requirements pose challenges that are not found elsewhere.¹¹³

Numerous features differentiate CAFO air pollution from other air pollution regulated under the CAA and from CAFO water pollution regulated under the Clean Water Act. Most of the other sources of air pollution regulated

¹⁰⁵ 42 U.S.C. § 7413(b)–(d).

¹⁰⁶ *Id.* § 7475(a)(7).

¹⁰⁷ Consent Decree, *Citizens Legal Envtl. Action Network, Inc. v. Premium Standard Farms, Inc.*, No. 97-6073-CV-SJ-6 (W.D. Mo. Nov. 19, 2001), *available at* <http://www.epa.gov/oecaerth/resources/decrees/civil/mm/psfd.pdf>.

¹⁰⁸ *Id.* at 12.

¹⁰⁹ Press Release, Dep't of Justice, *Nation's Second Largest Hog Producer Reaches Settlement with U.S. & Citizen's Group* (Nov. 20, 2001), *available at* http://www.justice.gov/opa/pr/2001/November/01_enrd_604.htm.

¹¹⁰ Consent Decree, *United States v. Buckeye Egg Farm, L.P.* at 15, No. 3:03 CV 7681 (N.D. OH Jan. 30, 2004), *available at* <http://www.4cleanair.org/BuckeyeEggsettlement.pdf>; Press Release, Dep't of Justice, *Ohio's Largest Egg Producer Agrees to Dramatic Air Pollution Reductions from Three Giant Facilities* (Feb. 23, 2004), *available at* http://www.justice.gov/opa/pr/2004/February/04_enrd_105.htm.

¹¹¹ Laura Karvosky, Comment, *EPA Gives Animal Feeding Operations Immunity From Environmental Statutes in a "Sweetheart Deal,"* 8 VT. J. ENVTL. L. 115, 116, 120 (2006).

¹¹² COPELAND, PRIMER, *supra* note 7, at 11.

¹¹³ Partial Withdrawal, *supra* note 102, at 63,554–55.

under the Clean Air Act consist of “point sources” of pollution, such as smokestacks, pipes, and automobiles, while pollution at CAFOs is often emitted facility-wide.¹¹⁴ The aggressive agriculture lobby has long pushed for light regulation of CAFOs.¹¹⁵ The complexity of the CAA,¹¹⁶ a lack of good monitoring data on CAFO air pollution,¹¹⁷ and the irregular application of state plans to CAFOs¹¹⁸ also contribute to the challenge of regulating CAFOs under the CAA. In all, these factors have led the EPA to call enforcement “difficult” and “time consuming.”¹¹⁹

The EPA is not doing itself any favors, either. It does not collect accurate or consistent data on the number, size, or location of CAFOs, and lacks a systematic method to identify and catalog even those CAFOs that are operating with CAA permits.¹²⁰ And even when the EPA brings a successful enforcement action against a CAFO, only that CAFO will be directly affected.¹²¹

Policymakers are also off to a non-start regulating CAFOs' significant greenhouse gas emissions. In the aftermath of the Supreme Court's 2007 decision in *Massachusetts v. EPA*, which strengthened the prospect of federal greenhouse gas (“GHG”) regulation,¹²² agricultural stakeholders began raising concerns about the possibility of regulation of greenhouse gas emissions from farms.¹²³ The National Cattlemen's Beef Association, for example, was part of a consortium that petitioned the EPA for reconsideration of the agency's finding that greenhouse gases contribute to global warming and threaten public health,¹²⁴ and the American Farm Bureau Federation president “vehemently oppose[s]” any regulation of GHG under the CAA.¹²⁵ EPA administrator Lisa Jackson was quick to reassure the industry that the EPA had no plans to institute a “cow tax” on farmers or other “doomsday scenarios,”¹²⁶ whatever those unstated scenarios might have been. EPA thereafter promulgated rules setting high permitting

¹¹⁴ Wilson, *supra* note 19, at 451.

¹¹⁵ *Id.* See also *supra* notes 73–74, *infra* note 122 and accompanying text.

¹¹⁶ Heinzen, *supra* note 12, at 1487.

¹¹⁷ *Id.*

¹¹⁸ COPELAND, PRIMER, *supra* note 7, at 15–16.

¹¹⁹ EPA Consent Agreement, *supra* note 56, at 4958.

¹²⁰ Data reported for about a third of all states are “inconsistent [or] inaccurate,” according to an informal 2008 survey of state officials. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 11, at 4–5, 17.

¹²¹ EPA Consent Agreement, *supra* note 56, at 4958.

¹²² *Massachusetts v. EPA*, 549 U.S. 497, 534–35 (2007) (requiring the EPA to reassess whether sufficient information existed to make a finding that greenhouse gases endangered public health and welfare).

¹²³ COPELAND, PRIMER, *supra* note 7, at 23.

¹²⁴ Coalition for Responsible Regulation, Inc., et al, Petition for Reconsideration of the Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act – 74 Fed. Reg. 66496 (Dec. 15, 2009) (2010).

¹²⁵ Julie Murphree, *The Impact of the EPA's Endangerment Finding*, ARIZ. AGRIC., May 2010, at 1.

¹²⁶ *EPA Administrator Lisa Jackson*, AGRITALK (Mar. 25, 2011) (audio on file with the Stanford Journal of Animal Law & Policy); COPELAND, PRIMER, *supra* note 7, at 24.

thresholds for GHGs.¹²⁷ Furthermore, it set a reporting threshold¹²⁸ sufficiently high that only 107 livestock facilities nationwide would have been required to report methane and nitrous oxide emissions from their manure management systems.¹²⁹ EPA estimated the current rules would cost the agricultural industry a combined grand total of \$300,000,¹³⁰ but Congress nevertheless took action to further neuter EPA's regulations by preventing any use of funds to take GHG-based action against CAFOs.¹³¹

One consistently raised excuse for the failure to regulate CAFO air pollution has been a lack of standard measures for estimating emissions and the expense of actually measuring them.¹³² In 2005, the EPA embarked on a multi-year effort to bring more clarity to CAFO emissions and thereby simplify enforcement, calling it the "quickest and most effective way to . . . bring all AFOs into compliance."¹³³ However, the effort has been subject to much due criticism, with commentators and environmental groups calling it an unnecessary delay tactic that runs counter to the CAA's spirit,¹³⁴ bringing (an ultimately unsuccessful) suit against it as an illegal rulemaking,¹³⁵ and even questioning its methods¹³⁶ and results.¹³⁷ The study monitored CAFO emissions of ammonia, hydrogen sulfide, VOCs, and particulate matter from twenty-four sites over a two-year period.¹³⁸ It also granted temporary immunity for CAFOs against suits for past or ongoing CAA violations in exchange for offering up one's CAFO for

¹²⁷ Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule: Final Rule, 75 Fed. Reg. 31514, 31516 (June 3, 2010) (to be codified at 40 C.F.R. pt. 51-52, 70-71).

¹²⁸ Mandatory Reporting of Greenhouse Gases, 74 Fed. Reg. 56260, 56337 (Oct. 30, 2009) (to be codified at 40 C.F.R. pt. 86-87, 89-90, 94, 98, 1033, 1039, 1042, 1045, 1048, 1051, 1054, 1065).

¹²⁹ MEGAN STUBBS, CONG. RESEARCH SERV., RL 41622, ENVIRONMENTAL REGULATION AND AGRICULTURE 6 (2011).

¹³⁰ *Id.*

¹³¹ Congressional appropriators have repeatedly barred EPA from using funds to require manure management facilities to report their GHG emissions or to promulgate or implement rules requiring livestock facilities to acquire permits for their GHG emissions. *Id.*; Consolidated Appropriations Act of 2012, Pub. L. No. 112-74, § 426, 124 Stat. 786 (2011). For more on Congressional opposition to regulation of CAFOs' GHG emissions, *see, e.g.*, Letter from Rep. Frank D. Lucas, R-Okla., & Rep. Peterson, D-Minn., to colleagues (Apr. 5, 2011), *available at* <http://republicans.energycommerce.house.gov/Media/file/Letters/112th/dearcolleagueag.pdf>. However, the EPA administrator has said that the EPA plans to begin looking at how to regulate agricultural greenhouse gas emissions within the next few years. *EPA Administrator Lisa Jackson, supra* note 126.

¹³² "[F]arms lack 'point sources' such as smokestacks and pipes, which other industrial sources possess, making monitoring and measuring emissions troublesome." Wilson, *supra* note 19, at 451. *See also Large Animal Feeding Operations, supra* note 40, at 2.

¹³³ EPA Consent Agreement, *supra* note 56, at 4958.

¹³⁴ Wilson, *supra* note 19, at 468.

¹³⁵ *Ass'n of Irrigated Residents v. Env'tl. Prot. Agency*, 494 F.3d 1027 (D.C. Cir. 2007).

¹³⁶ The agricultural industry played a large part in the study, sparking some of this criticism. Karvosky, *supra* note 111, at 135.

¹³⁷ ENVTL. INTEGRITY PROJECT, ANALYSIS, *supra* note 55, at 7.

¹³⁸ EPA Consent Agreement, *supra* note 56, at 4960; *Large Animal Feeding Operations, supra* note 40, at 2.

study.¹³⁹ Almost 2,600 companies representing 14,000 facilities in forty-two states signed up for that deal.¹⁴⁰ The monitoring study was supposed to lead to the development of formal emission estimating methodologies and potentially to those methodologies' use in certifying compliance with the CAA.¹⁴¹

The study's shortcomings have been widespread. Initial data was not released until 2011 – a full six years after the EPA announced the study.¹⁴² That delay was reason for concern that the consent agreement would continue to drag out, as the agreement allows CAFOs to extend their compliance deadline indefinitely by agreement with the EPA.¹⁴³ As it turns out, however, the primary problem with the study was the unsoundness of the experiment itself and the resulting data. The study was non-exhaustive, failing to include either turkey or beef cattle operations¹⁴⁴ or manure land applications (as opposed to lagoons).¹⁴⁵ The emissions methodologies could be considered incomplete, even for the categories they cover, on grounds including: the small number of farms involved in the study, the EPA's choice not to begin with a process-based modeling approach¹⁴⁶ as suggested by a government-sponsored study,¹⁴⁷ the lack of

¹³⁹ EPA Consent Agreement, *supra* note 56, at 4959.

¹⁴⁰ *Large Animal Feeding Operations*, *supra* note 40, at 2.

¹⁴¹ EPA Consent Agreement, *supra* note 56, at 4958. Draft emissions estimating methodologies were made available in March 2012. *See, e.g.*, Notice of Availability: Draft Documents Related to the Development of Emissions Estimating Methodologies for Broiler Animal Feeding Operations and Lagoons and Basins for Swine and Dairy Animal Feeding Operations, 77 Fed. Reg. 14716 (March 13, 2012) (to be codified at 40 C.F.R. pt. 60); U.S. ENVTL. PROT. AGENCY, OFFICE OF AIR QUALITY AND STANDARDS, DEVELOPMENT OF EMISSIONS ESTIMATING METHODOLOGIES FOR LAGOONS AND BASINS AT SWINE AND DAIRY ANIMAL FEEDING OPERATIONS (DRAFT) (2012), *available at* [http://yosemite.epa.gov/sab/SABPRODUCT.NSF/81e39f4c09954fcb85256ead006be86e/AE6639DD6B79360E852579A4004E5529/\\$File/PDF+for+Development+of+Emissions+Estimating+Methodologies+for+Lagoons+and+Basins+at+Swine+and+Dairy+Animal+Feeding+Operation.pdf](http://yosemite.epa.gov/sab/SABPRODUCT.NSF/81e39f4c09954fcb85256ead006be86e/AE6639DD6B79360E852579A4004E5529/$File/PDF+for+Development+of+Emissions+Estimating+Methodologies+for+Lagoons+and+Basins+at+Swine+and+Dairy+Animal+Feeding+Operation.pdf). However, they may never see the light of day as final methodologies due to strong opposition from, among other groups, scientists close to the EPA. *See, e.g., Science Advisors Fault EPA Methods for Estimating CAFO Emissions*, INSIDE EPA WEEKLY REPORT, July 13, 2012 (indicating that EPA may have “to go back to the drawing board” with its emissions estimating methodologies).

¹⁴² Press Release, Env'tl. Prot. Agency, Emissions Data from Animal Feeding Operations Study Now Available (Jan. 13, 2011), *available at* <http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/dc13b657ff6203ce85257817005ed001!OpenDocument>.

¹⁴³ COPELAND, AIR COMPLIANCE AGREEMENT, *supra* note 25, at 6–7.

¹⁴⁴ U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 11, at 35.

¹⁴⁵ Call for Information: Information Related to the Development of Emission-Estimating Methodologies for Animal Feeding Operations, 76 Fed. Reg. 3060, 3061 (Jan. 19, 2011) (to be codified at 40 C.F.R. pt. 60) [hereinafter Call for Information].

¹⁴⁶ Process-based modeling “starts with defining feeding operations in terms of major stages or activities. However, it focuses on those activities that determine the movement of nutrients and other substances into, through, and out of the system. Experimental data and mathematical modeling are used to simulate the system and the movement of reactants and products through each component of the farm enterprise.” NAT'L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 16.

¹⁴⁷ *Id.* at 7.

accounting for numerous variables that can affect emissions,¹⁴⁸ and the taking of incomplete measurements.¹⁴⁹ The results of the study themselves are also suspect.¹⁵⁰ For example, the study measured negative emissions for some days – an impossible result.¹⁵¹ In turn, state regulators, the EPA's own Science Advisory Board, the livestock industry, and others have urged quick fixes to what they perceive as a flawed study.¹⁵²

Regardless of the study's internal problems, however, even its premise and purpose (the improvement of poor emissions estimating methodologies) lack sound bases in the CAA as cause for delaying regulation. Legislative history of the CAA indicates that it was meant to be a precautionary statute, a force for regulation "even in the face of uncertain science."¹⁵³ As one commentator has noted, "[t]o delay regulation of an entire industry known to emit substantial levels of dangerous pollutants is [thus] to subvert the very precautionary essence upon which the CAA was formulated."¹⁵⁴ While the study could still help lead to the development of robust emissions estimating methodologies and may even lead to a path toward fuller enforcement, its accompanying regulatory delay has been unacceptable. The harmful air pollution emitted by CAFOs merits immediate pollutant-specific and/or source-specific regulation.

III. Ammonia and Hydrogen Sulfide Demand Clean Air Act Regulation

The EPA could better attack CAFO pollution if it listed two of CAFOs' major pollutants, ammonia and hydrogen sulfide, as Hazardous Air Pollutants under section 112(b).¹⁵⁵ In order to list a substance as a HAP, the EPA must find that it "present[s], or may present, through inhalation or other routes of exposure, a threat of adverse human health effects . . . or adverse environmental effects whether through ambient concentrations, bioaccumulation, deposition, or

¹⁴⁸ BRENT NEWELL ET AL., COMMENTS OF THE ASSOCIATION OF IRRITATED RESIDENTS, CENTER ON RACE, POVERTY & THE ENVIRONMENT, ENVIRONMENTAL DEFENSE, ENVIRONMENTAL INTEGRITY PROJECT, AND SIERRA CLUB ON ANIMAL FEEDING OPERATIONS CONSENT AGREEMENT AND FINAL ORDER 15–16 (2005).

¹⁴⁹ For example, researchers conducted only limited sampling of VOCs over limited time periods – at one site, for example, the measurements were limited to seven total days in a three month period. ENVTL. INTEGRITY PROJECT, ANALYSIS, *supra* note 5, at 6–7.

¹⁵⁰ In fact, EPA has even called for more "quality-assured emissions and process data" on CAFOs to supplement the study. Call for Information, *supra* note 145, at 3060.

¹⁵¹ ENVTL. INTEGRITY PROJECT, ANALYSIS, *supra* note 55, at 7.

¹⁵² *After Years-Long Waiver, EPA Urged to Regulate CAFO Emissions*, INSIDE EPA WEEKLY REPORT, July 13, 2012; *Science Advisors Fault EPA Methods for Estimating CAFO Emissions*, INSIDE EPA WEEKLY REPORT, Mar. 21, 2012; Letter from Shelley Schneider, Co-Chair of the National Association of Clean Air Agencies to Environmental Protection Agency Docket Ctr. (June 11, 2012), *available at*

<http://www.4cleanair.org/Documents/NACAACCommentsAFOEEMsFINAL.pdf>.

¹⁵³ Wilson, *supra* note 19, at 468 (citing H.R. REP. NO. 95-294, at 46 (1977)).

¹⁵⁴ *Id.*

¹⁵⁵ 42 U.S.C. § 7412(b).

otherwise.¹⁵⁶ HAPs do not include pollutants otherwise listed as criteria pollutants,¹⁵⁷ and tend to be localized and less pervasive, but more toxic than the criteria pollutants listed under section 108 of the Clean Air Act and regulated via NAAQS.¹⁵⁸ Other CAFO air pollutants are either already subject to regulation or are insufficiently harmful to merit such regulation.¹⁵⁹ This article argues that CAFO air pollution in general is harmful and should be regulated. Ammonia and hydrogen sulfide are among the most deadly, dangerous and plentiful of CAFOs' emissions and command new Clean Air Act regulation.¹⁶⁰

Both ammonia and hydrogen sulfide qualify as regulable pollutants under Clean Air Act standards, and their regulation would improve air quality around CAFOs, as factory farms emit both substances through the degradation of waste¹⁶¹ at levels "well above federal health-based standards."¹⁶² Ammonia irritates the eyes and respiratory tract, causing coughing, sore throat, inflammation, burns, and even death at very high concentrations.¹⁶³ Hydrogen sulfide also irritates the eyes and respiratory tract, and it causes nervous system problems, unconsciousness, and death at higher levels.¹⁶⁴ However, while the EPA categorizes hydrogen sulfide and ammonia as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act,¹⁶⁵ which is better known as Superfund,¹⁶⁶ and as extremely hazardous substances under the Emergency Planning and Community Right-to-Know Act,¹⁶⁷ it has elected not to regulate hydrogen sulfide and ammonia as HAPs under CAA section 112(b)¹⁶⁸ and thereby deprives itself of important tools to safeguard health and welfare.

¹⁵⁶ *Id.* at § 7412(b)(2).

¹⁵⁷ *Id.*

¹⁵⁸ THE CLEAN AIR ACT HANDBOOK 14, 227 (Robert J. Martineau, Jr. & David P. Novello eds., 2nd ed. 2004).

¹⁵⁹ *See supra* Part II.A.

¹⁶⁰ *See infra* Parts III.B–C.

¹⁶¹ Brehm, *supra* note 8, at 813.

¹⁶² ENVTL. INTEGRITY PROJECT, ANALYSIS, *supra* note 55, at 1.

¹⁶³ *Id.* at 8.

¹⁶⁴ *Id.* at 3.

¹⁶⁵ 42 U.S.C. § 9604(i)(2) (2012) (requiring the Agency for Toxic Substances and Disease Registry to promulgate a list of toxic substances that pose "the most significant potential threat to human health"); 40 C.F.R. § 302.4 (implementing that requirement by listing toxic substances, including ammonia and hydrogen sulfide).

¹⁶⁶ CERCLA Overview, ENVTL. PROT. AGENCY, <http://www.epa.gov/superfund/policy/cercla.htm> (last visited Feb. 23, 2012).

¹⁶⁷ 42 U.S.C. § 11002(a)(2) (2012) (requiring the government to publish a list of "extremely hazardous substances"); 40 C.F.R. § 355 App. A (implementing that requirement by publishing a list that includes ammonia and hydrogen sulfide).

¹⁶⁸ 42 U.S.C. § 7412(b)(1). Although this is a statutory list, Congress has empowered the EPA to list or delist substances. 42 U.S.C. § 7412(b)(2)–(c). *See also* 40 C.F.R. §§ 63.60–63 (2011) (delisting substances as HAPs).

A. A Choice: Hazardous Air Pollutants or “Criteria” Pollutants?

Two primary pollutant-specific tools in the Clean Air Act could apply to CAFOs' ammonia and hydrogen sulfide emissions: section 112(b)'s regulation of Hazardous Air Pollutants¹⁶⁹ and section 108's regulation of criteria pollutants.¹⁷⁰ The HAP route is the stronger choice for regulating CAFO pollution. The two tools share commonalities. For example, both HAPs and NAAQS have preconstruction requirements¹⁷¹ and require permits if sources meet certain emission thresholds.¹⁷² However, enforcement mechanisms and triggers differ significantly between the two. The regulatory threshold for HAPs is generally significantly lower than that of criteria pollutants, for example.¹⁷³ While NAAQS are regulated state-by-state,¹⁷⁴ the EPA must set national category-specific regulations for HAPs,¹⁷⁵ and thus, for example, would need to set CAFO standards for ammonia and hydrogen sulfide emissions. The HAP standards, known as "maximum achievable control technology" (MACT), are designed to reduce HAPs by the "maximum achievable" degree taking into consideration cost, non-air quality health and environmental impacts, and energy requirements.¹⁷⁶ However, the NAAQS standards are designed only to ensure that states achieve or maintain NAAQS attainment – an "adequate margin of safety"¹⁷⁷ – for the particular criteria pollutant's presence in the ambient air in a given region.¹⁷⁸ NAAQS regulate pollutant sources to the stringent category-oriented "lowest achievable emission rate" standard¹⁷⁹ only in non-attainment zones.¹⁸⁰

In regulating pollutants emitted by CAFOs as HAPs, the EPA would require existing CAFOs to meet the emissions levels of the best-performing twelve percent of CAFOs, and new CAFOs to meet the level achieved by the best controlled CAFO.¹⁸¹ MACT emission limits can be set in tons per year,

¹⁶⁹ 42 U.S.C. § 7412.

¹⁷⁰ *Id.* § 7408.

¹⁷¹ *Id.* §§ 7410(a)(2)(C) (2012), 7412(i)(1).

¹⁷² *Id.* § 7412(j).

¹⁷³ Regulatory requirements kick in for HAPs if the source has the potential to emit 10 tons per year of any one HAP or 25 tons of HAPs in aggregate. 42 U.S.C. §§ 7412(a)(1), 7412(d). However, for criteria pollutants in areas that meet the NAAQS, pre-construction permits are only required for sources that have the potential to emit either 100 or 250 tons of criteria pollutants, depending on whether the source category is listed (CAFOs are not). 40 C.F.R. § 52.21 (2012).

¹⁷⁴ 42 USC § 7410(a).

¹⁷⁵ *Id.* § 7412(c)(1).

¹⁷⁶ *Id.* § 7412(d)(2).

¹⁷⁷ *Id.* § 7409(b)(1).

¹⁷⁸ *Id.* § 7410(a)(2)(D).

¹⁷⁹ *Id.* § 7501(3). This standard requires that sources of criteria pollutants meet the rate of emissions that "reflects the most stringent emission limitation which is contained in the implementation plan of any State for such class or category of source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable, or the most stringent emission limitation which is achieved in practice by such class or category of source, whichever is more stringent." *Id.*

¹⁸⁰ *Id.*

¹⁸¹ *Id.* § 7412(d)(3).

production ratios, or concentration limits.¹⁸² They can also be a performance standard like a percentage decrease from a baseline,¹⁸³ or even a combination of work practices in lieu of numerical emissions if the EPA finds that it is not feasible to prescribe or enforce an emission standard.¹⁸⁴ Subcategories of sources can also be created,¹⁸⁵ as "the operations of some source categories are quite variable."¹⁸⁶ As previously noted, CAFOs vary greatly in animal type and size, among other factors. Therefore, by listing ammonia and hydrogen sulfide as HAPs, the EPA would retain flexibility and have a more hands-on role and stiffer regulatory thresholds than it would under NAAQS, and would be able to specifically target emissions from CAFOs rather than relying on the states for that task.

B. Justification for Regulating Hydrogen Sulfide as a Hazardous Air Pollutant

The EPA should regulate hydrogen sulfide as a hazardous air pollutant in order to gain control over what a study of industrial farm animal production funded by Johns Hopkins University called "possibly the most dangerous gas common to" CAFOs.¹⁸⁷ At least seventy-three industrial categories, including CAFOs, emit hydrogen sulfide,¹⁸⁸ which is a flammable,¹⁸⁹ cyanide-like gas.¹⁹⁰ At CAFOs, hydrogen sulfide forms as manure decomposes anaerobically.¹⁹¹ Hydrogen sulfide's presence in the ambient air in areas not exposed to industrial releases is at levels not associated with adverse health effects.¹⁹² However, the toxin's risk profile places it squarely within the definition of HAPs.

Studies have regularly documented symptoms of hydrogen sulfide exposure among CAFO workers and in surrounding areas,¹⁹³ and in one study, eighty-six percent of residents living within four miles of a large electric plant that released hydrogen sulfide as a byproduct experienced central nervous system

¹⁸² ENVTL. PROT. AGENCY, *Guidelines for MACT Determinations Under Section 112(j) Requirements 2-2* (2002) [hereinafter ENVTL. PROT. AGENCY, GUIDELINES], available at <http://www.epa.gov/ttn/atw/112j/guidance.pdf>.

¹⁸³ *Id.*

¹⁸⁴ 42 U.S.C. § 7412(h).

¹⁸⁵ *Id.* § 7412(c)(1).

¹⁸⁶ ENVTL. PROT. AGENCY, GUIDELINES, *supra* note 182, at 3–16.

¹⁸⁷ PEW COMM'N, *supra* note 23, at 16. The Pew Commission is a project of the Pew Charitable Trusts and the Johns Hopkins Bloomberg School of Public Health. About PCIFAP, Pew Commission on Industrial Farm Animal Production, <http://www.ncifap.org/about/> (last visited Feb. 25, 2013).

¹⁸⁸ Letter from Neil J. Carman, *supra* note 6, at 2.

¹⁸⁹ Humane Society, *supra* note 32, at 19.

¹⁹⁰ Wallinga, *supra* note 62, at 1.

¹⁹¹ ENVTL. PROT. AGENCY, DRAFT REPORT, *supra* note 26, at 2–10.

¹⁹² Letter from Neil J. Carman to Lisa Jackson, *supra* note 6, at 3.

¹⁹³ IOWA STATE UNIVERSITY & THE UNIVERSITY OF IOWA STUDY GROUP, IOWA CONCENTRATED FEEDING OPERATIONS AIR QUALITY STUDY 125 (2002) [hereinafter IOWA STUDY], available at <http://www.public-health.uiowa.edu/ehsrc/CAFOstudy.htm>.

impairment.¹⁹⁴ Hydrogen sulfide causes numerous negative human health and environmental effects. High concentrations kill, rapidly shutting down the brain's ability to send nerve signals to the lungs.¹⁹⁵ However, even at lower levels, symptoms include eye irritation, respiratory irritation including coughing and shortness of breath, impaired reaction time and balance, insomnia, fatigue, dizziness, nausea, and vomiting.¹⁹⁶ Hydrogen sulfide also creates a strong rotten egg-like odor in communities surrounding CAFOs.¹⁹⁷ In terms of effects on animals, it has been held responsible for deaths of livestock.¹⁹⁸ Finally, when released in excess amounts, it contributes to the formation of particulate matter and acid rain.¹⁹⁹

Thus, hydrogen sulfide would qualify as a HAP because it "present[s], or may present, through inhalation or other routes of exposure, a threat of adverse human health effects or adverse environmental effects."²⁰⁰ Congress considered listing hydrogen sulfide as a HAP when it promulgated the HAP standards,²⁰¹ numerous states have established emissions thresholds for hydrogen sulfide,²⁰² and the EPA has promulgated standards of performance for hydrogen sulfide under the CAA for numerous sources.²⁰³ EPA staffers, after a 2006 internal review of scientific literature, recommended the agency list the gas as a HAP.²⁰⁴ It is time for the agency to take that step.

¹⁹⁴ Letter from Neil J. Carman to Lisa Jackson, *supra* note 6, at 5.

¹⁹⁵ *Id.*

¹⁹⁶ *Id.*; Wallinga, *supra* note 62; IOWA STUDY, *supra* note 193, at 126.

¹⁹⁷ Humane Society, *supra* note 32, at 19–20.

¹⁹⁸ Letter from Neil J. Carman to Lisa Jackson, *supra* note 6, at 2.

¹⁹⁹ Humane Society, *supra* note 32, at 19–21.

²⁰⁰ 42 U.S.C. § 7412(b)(2).

²⁰¹ At the time, it declined to do so, finding that "there appears to be no evidence that a significant threat to public health or the environment exists from routine emissions." ENVTL. PROT. AGENCY, *Report to Congress on Hydrogen Sulfide Air Emissions Associated with the Extraction of Oil and Natural Gas* i–iv (1993), available at <http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=00002WG3.txt>. However, in its analysis, it only considered emissions from sour oil and gas wells. *Id.* Further, that assumption "became medically outdated" within a few years based on numerous studies and reports at medical conferences. Letter from Neil J. Carman to Lisa Jackson, *supra* note 6, at 5.

²⁰² ENVTL. INTEGRITY PROJECT, ANALYSIS, *supra* note 55, at 18. CAFO operators in Minnesota, for example, must develop and implement an emissions control plan if the state pollution control agency detects elevated levels of hydrogen sulfide. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 11, at 42.

²⁰³ ENVTL. PROT. AGENCY, DRAFT REPORT, *supra* note 26, at 9–5.

²⁰⁴ Ilan Brat, *A Gas Under Pressure*, WALL ST. J., Dec. 11, 2007, available at <http://online.wsj.com/article/SB119733944293820332.html>.

C. Justification for Regulating Ammonia as a Hazardous Air Pollutant

The EPA should regulate ammonia as a hazardous air pollutant. Nitrogen in animal manure converts into ammonia by several different processes,²⁰⁵ making ammonia the "most prolific" pollutant from CAFOs.²⁰⁶ Animal facilities produce somewhere between half²⁰⁷ and eighty percent²⁰⁸ of the nation's overall ammonia emissions. Premium Standard Farms in Missouri releases three million pounds of ammonia annually from one of its facilities, and Threemile Canyon Farms in Oregon releases 5.7 million pounds, making them the fifth largest and largest emitters of ammonia in the country, respectively.²⁰⁹

Ammonia has a number of negative effects on health and the environment. At even low concentrations, ammonia can cause eye, nose and throat irritation,²¹⁰ coughing, wheezing, and worsened asthma.²¹¹ Higher concentrations lead to chemical burns and scarring to the respiratory system, and can even kill.²¹² Airborne ammonia also carries a "pungent, unpleasant smell often associated with urine" that nearby residents of CAFOs often complain of.²¹³ In terms of environmental effects, ammonia combines with nitrous oxides and sulfur dioxide to form PM that contributes to regional haze.²¹⁴ Ammonia can also contribute to acid rain,²¹⁵ and ammonia aerosols in rainfall help create "dead zones" in bodies of water.²¹⁶ Thus, ammonia would qualify as a HAP because it "present[s], or may present, through inhalation or other routes of exposure, a threat of adverse human health effects or adverse environmental effects."²¹⁷ Critics may argue that the EPA should instead list ammonia as a criteria pollutant. Activists have taken up that line of argument: in 2011, numerous environmental groups collectively petitioned the EPA to so regulate ammonia.²¹⁸ However, as previously noted, listing ammonia as a HAP would allow for more regulatory control and be more effective at decreasing ammonia emissions from CAFOs than would listing it as a criteria pollutant.

While ammonia and hydrogen sulfide are so inherently harmful that they should be listed as HAPs and regulated everywhere they are harmfully emitted,

²⁰⁵ NAT'L RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 43.

²⁰⁶ Wilson, *supra* note 19, at 445.

²⁰⁷ COPELAND, PRIMER, *supra* note 7, at 3.

²⁰⁸ Michiel R.J. Doorn et al., *Review of Emissions Factors and Methodologies to Estimate Ammonia Emissions from Animal Waste Handling*, ENVTL. PROT. AGENCY, Apr. 2002, at 1.

²⁰⁹ *Hearing*, *supra* note 71, at 3 (statement of Catharine Fitzsimmons).

²¹⁰ IOWA STUDY, *supra* note 193, at 123.

²¹¹ MICHIGAN STUDY, *supra* note 54, at 5.

²¹² IOWA STUDY, *supra* note 193, at 123.

²¹³ Ammonia Petition, *supra* note 7, at 40.

²¹⁴ *Id.* at 2.

²¹⁵ *Id.* at 42–43, 49.

²¹⁶ *Id.* at 42–43.

²¹⁷ This is the required standard for a HAP listing. 42 USC § 7412(b)(2).

²¹⁸ *See generally* Ammonia Petition, *supra* note 7.

such regulation is incomplete because, among other reasons, CAFOs may not emit sufficient pollutants to fall within CAA thresholds and HAP regulation would not reach other CAFO air pollutants.²¹⁹ These concerns can be ameliorated by regulating CAFOs with the Clean Air Act's source-specific regulatory tools in addition to or even instead of using a pollutant-specific tool like HAP listing.

IV. New Source Performance Standards: The Strongest Regulatory Option for Factory Farm Air Pollution

Section 111 of the Clean Air Act provides the EPA with the tool most suitable for CAFO regulation under the Act. While CAA sections 108 and 112(b) can only be used to tackle pollutants one by one, CAA section 111 authorizes the EPA to establish detailed requirements (New Source Performance Standards or "NSPS") for controlling various emissions from particular categories of stationary sources of pollution.²²⁰ CAFOs typically escape Clean Air Act enforcement since many do not reach thresholds necessary for them to be declared "major sources" under the act²²¹ and therefore rarely get regulated under the NAAQS or as major sources of HAPs. NSPS provide the EPA with a tool to draw all CAFOs into a regulatory scheme that ameliorates a wide variety of CAFO air pollutants and avoids unnecessary or untenable regulation of other possible pollution sources.

Under NSPS, EPA can regulate both regulated pollutants and pollutants not otherwise regulated by CAA section 108 or 112 (the latter are known as "designated pollutants") so they could regulate all pollutants emitted by CAFOs, not just those listed as criteria pollutants or HAPs.²²² No threshold would need to be reached for those pollutants, either. The standards also apply regardless of ambient air quality,²²³ and so would apply to CAFOs nationwide. Under this section, the EPA has made endangerment findings for more than sixty stationary sources and developed NSPS for a total of seventy categories and subcategories, and thus could easily do the same for CAFOs.²²⁴

Upon listing CAFOs as a source, the EPA would establish "standards of performance" that apply to all CAFOs that are newly constructed, modified, or

²¹⁹ Ruhl, *supra* note 14, at 305 (calling CAA thresholds "safe harbor[s] . . . for air pollution"); 42 U.S.C. § 7412(c)(1)–(2) (indicating that HAP emissions standards apply to individual pollutants emitted by specific source categories).

²²⁰ 42 U.S.C. § 7411.

²²¹ Ruhl, *supra* note 14, at 305.

²²² 42 U.S.C. § 7411(d); 40 C.F.R. § 60.21(a) (2013). For example, the NSPS for petroleum refineries regulates hydrogen sulfide. 40 C.F.R. § 60.104(a)(2)(ii). NSPS for CAFOs could conceivably also address greenhouse gases. See Kassie Siegel et al., *Strong Law, Timid Implementation. How the EPA Can Apply the Full Force of the Clean Air Act to Address the Climate Crisis*, 30 UCLA J. ENVTL. L. & POL'Y 185, 199–201 (2012).

²²³ THE CLEAN AIR ACT HANDBOOK, *supra* note 158, at 299.

²²⁴ ENVTL. PROT. AGENCY, *Background on Establishing New Source Performance Standards Under the Clean Air Act*, at 1 [hereinafter ENVTL. PROT. AGENCY, BACKGROUND], available at <http://epa.gov/carbonpollutionstandard/pdfs/111background.pdf>.

reconstructed, and slightly lesser standards for existing CAFOs.²²⁵ These standards would require CAFOs to institute practices that protect public health and welfare and would allow enforcement when factory farms violate emission limits under the standard.²²⁶ NSPS prohibits the operation of any new source in violation of the standard of performance.²²⁷ If the EPA determines that setting an emissions-based standard would not be feasible – such as where, in the case of CAFOs, emissions may be hard to measure and the science of estimating such emissions may be incomplete – the EPA may also prescribe particular design, equipment, work practice, or operational requirements that would apply to CAFOs across the board.²²⁸

The EPA can also set guidelines for existing sources for pollutants for which air quality criteria have not been issued or are not defined as HAPs, but to which the NSPS would apply if it were a new source.²²⁹ Thus, the standards could tackle pollution from both new and existing CAFOs. In consideration of some possible existing sources' inability to meet the standards for new or modified sources, regulators can even set less stringent standards or longer compliance schedules for existing sources under certain situations.²³⁰ The EPA can also set different standards for different classes, types and sizes of sources,²³¹ so the standards could account for the fact that pollution differs by animal and CAFO size. In short, NSPS are powerful, but also flexible, and thus can overcome some of the difficulties like lack of adequate emissions estimating methodologies and variability in CAFO size and type that have otherwise dissuaded the EPA from regulating CAFOs.

Before gaining this regulatory power and flexibility, the EPA must first prove that CAFOs meet the so-called "endangerment standard."²³² An endangerment finding requires the EPA to determine that air pollution of the type emitted by CAFOs "may reasonably be anticipated to endanger public health or welfare" and that CAFOs cause or contribute to this pollution.²³³ Listing under the NSPS requires only an endangerment finding for the source category, not for particular pollutants.²³⁴ Such a finding should not prove difficult. CAFOs emit numerous pollutants already regulated under the CAA.²³⁵ More than 70 published studies link air emissions from CAFOs to harm to public health and welfare.²³⁶ The Centers for Disease Control and Prevention have determined that CAFO air

²²⁵ 42 U.S.C. § 7411.

²²⁶ Humane Society, *supra* note 32, at 3.

²²⁷ 42 U.S.C. §§ 7411(b)(5), 7411(e).

²²⁸ *Id.* at § 7411(h).

²²⁹ *Id.* at § 7411(d)(1).

²³⁰ 40 C.F.R. § 60.22–24 (2013).

²³¹ 42 U.S.C. § 7411(b)(2).

²³² Humane Society, *supra* note 32, at 22.

²³³ 42 U.S.C. § 7411(b)(1)(A).

²³⁴ *Id.*; Standards of Performance for Coal Preparation and Processing Plants, 74 Fed. Reg. 51950, 51957 (Oct. 8, 2009) [hereinafter Coal Standards].

²³⁵ NATIONAL RESEARCH COUNCIL, AIR EMISSIONS, *supra* note 13, at 13.

²³⁶ Humane Society, *supra* note 32, at 38.

pollution "constitute[s] a public health problem."²³⁷ The EPA has also recognized that AFOs "contribute[] to negative environmental and health impacts."²³⁸ Furthermore, the CAA "does not require absolute scientific certainty or proof of actual harm when making an endangerment finding,"²³⁹ so the weight of evidence justifying an endangerment finding from CAFOs arguably goes far beyond what is required.

Once the EPA makes an endangerment finding, NSPS would allow the agency to set the performance standards for CAFOs: emission standards that reflect the emissions achievable with the best system of adequately demonstrated technology, taking into consideration cost, non-air health and environmental impacts, and energy requirements.²⁴⁰ These standards are known as "best demonstrated technology"²⁴¹ (BDT), and require that the emissions be achievable through a non-theoretical, non-experimental system that is reasonably reliable and efficient without being exorbitantly costly.²⁴² In the event the EPA finds it impractical to measure or estimate emissions from CAFOs, the EPA could instead require certain work practices.²⁴³ Many technologies designed to mitigate CAFO air pollution have not been "systematically" evaluated, so this may be the best path.²⁴⁴ However, technology reviews, which identify and study the performance of existing emission reduction systems, are common incidents of BDT determination.²⁴⁵ Additionally, environmental groups argue that "demonstrated and tested technology is available for commercial use"²⁴⁶ and that "relatively accurate but inexpensive instruments exist for measuring the major CAFO pollutants to determine what controls are needed."²⁴⁷

Technologies and methodologies for decreasing pollution from CAFOs are well known, and some are measurably effective and inexpensive. Factors affecting CAFO emissions include "whether waste storage conditions are aerobic

²³⁷ KENDALL M. THU, NEIGHBOR HEALTH AND LARGE-SCALE SWINE PRODUCTION 4, *available at* http://nasdonline.org/static_content/documents/1829/d001764.pdf.

²³⁸ ENVTL. PROT. AGENCY, ANIMAL WASTE: WHAT'S THE PROBLEM, July 2, 2007, *available at* <http://www.epa.gov/region09/animalwaste/problem.html>.

²³⁹ Humane Society, *supra* note 32, at 23 (citing *Massachusetts v. EPA*, 549 U.S. 497 at 506 n.7).

²⁴⁰ 42 U.S.C. § 7411(a)(1).

²⁴¹ Coal Standards, *supra* note 234, at 51950.

²⁴² *Essex Chemical Corp. v Ruckelshaus*, 486 F.2d 427, 433–34 (D.C. Cir. 1973).

²⁴³ For example, in dealing with coal preparation and processing plants, the EPA made a finding that it "believes it is difficult and prohibitively expensive to measure actual PM emissions from individual open storage piles or roadways" and therefore set work practice standards for open storage piles of coal, rather than emissions limitations. For example, it required one of several types of control measures such as a partial enclosure, water spray systems, or chemical dust suppression systems. Coal Standards, *supra* note 234, at 51950.

²⁴⁴ COPELAND, PRIMER, *supra* note 7, at 5–6.

²⁴⁵ ENVTL. PROT. AGENCY, BACKGROUND, *supra* note 224, at 2.

²⁴⁶ Humane Society, *supra* note 32, at 66.

²⁴⁷ *Id.* at 64 (quoting Bryan Bunton, et. al., *Monitoring and Modeling of Emissions from Concentrated Animal Feeding Operations: Overview of Methods*, 115 ENVTL. HEALTH PERSPECT. 2 303–307 (Feb. 2007) and noting that "inexpensive is defined as > \$10,000").

or anaerobic;²⁴⁸ the diet fed to the animals; the pH of the manure; and time and temperature of animal waste in storage."²⁴⁹ By using bio-filters in ventilation systems, CAFOs can remove up to 83% of ammonia and 86% of hydrogen sulfide from the air.²⁵⁰ Acidification of manure can suppress ammonia formation by as much as 70%.²⁵¹ Switching from a traditional lagoon to wastewater treatment and manure composting can reduce GHG emissions by 96.9%.²⁵² Numerous other techniques have also proven effective in removing high percentages of emissions of multiple pollutants.²⁵³ Other methods for minimizing emissions include washing walls, windbreaks, sprinkling vegetable oil on building floors, use of bedded solid manure, frequent manure removal, covering lagoons, aerating manure, and separating solids from liquids in manure.²⁵⁴ Although some of these technologies may require substantial initial capital investment, such costs can and have been defrayed by, for example, selling carbon credits or leveraging federal environmental stewardship incentives.²⁵⁵

There is little question of the feasibility of focused regulation of CAFOs. The EPA could use California, and specifically the state's San Joaquin Valley Air Pollution Control District, as an instructive case study. California laws divide the state into numerous Air Pollution Control Districts, including the San Joaquin Valley Unified Air Pollution Control District,²⁵⁶ that can adopt and enforce rules aimed at maintaining the NAAQS.²⁵⁷ The San Joaquin Valley is in non-attainment for PM 2.5 and extreme non-attainment for ozone, and part of the

²⁴⁸ For example, manure stored in anaerobic (oxygen-deprived) environments produces hydrogen sulfide and methane, while proper aeration of manure stored outdoors can reduce odors.

COPELAND, PRIMER, *supra* note 7, at 4.

²⁴⁹ Humane Society, *supra* note 32, at 63.

²⁵⁰ Bio-filters consist of microbes living in an organic media. ENVTL. PROT. AGENCY, DRAFT REPORT, *supra* note 26, at 9–20.

²⁵¹ *Id.* at 9–18.

²⁵² Matias B. Vanotti et al., *Greenhouse Gas Emission Reduction and Environmental Quality Improvement from Implementation of Aerobic Waste Treatment Systems in Swine Farms*, 1 WASTE MANAGEMENT 28, 765 (2008), available at <http://afrsweb.usda.gov/SP2UserFiles/Place/66570000/Manuscripts/2008/Man773.pdf>.

²⁵³ ENVTL. PROT. AGENCY, DRAFT REPORT, *supra* note 26, at Tables 9-1–9-3.

²⁵⁴ IOWA STUDY, *supra* note 193, at 204–10.

²⁵⁵ Globally, large CAFO operators like Chilean hog producer Agricola Super Limitad [sic] have used revenues from the sale of carbon credits to wastewater treatment plants. Vanotti, *supra* note 252, at 760–61. The United States Department of Agriculture's Environmental Quality Incentives Program, meanwhile, can in some cases pay for as much as \$300,000 worth of measures to control air pollution, including waste treatment and recycling, roofs and covers, and anaerobic digesters. U.S. DEP'T OF AGRIC., FACT SHEET: ENVIRONMENTAL QUALITY INCENTIVES PROGRAM AIR QUALITY INITIATIVE (2012), available at http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046339.pdf; U.S. DEP'T OF AGRIC., REQUIRED NRCS PRACTICES TO ADDRESS AIR QUALITY ISSUES – FY 2012, available at http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1045920.pdf.

²⁵⁶ Cal. Health & Safety Code § 40002 (2012).

²⁵⁷ See e.g., *id.* at § 40600.

district is in non-attainment for coarse particulates (PM 10).²⁵⁸ Thus, the district is subject to strict, source category-oriented LAER standards for ozone and PM.²⁵⁹ Agricultural emissions formed 26% of all smog forming emissions in the San Joaquin Valley in 2003.²⁶⁰ CAFOs in California – mostly dairies – constitute a \$7 billion business.²⁶¹ As of 2005, dairies in the San Joaquin Valley accounted for the largest quantity of VOC emissions in the area (about thirty-eight tons per day).²⁶²

In response to the high levels of air pollution, the San Joaquin Valley Air Pollution Control District adopted what are currently arguably the most restrictive air pollution regulations for CAFOs in the country.²⁶³ The rule targets VOCs as precursors to ozone, regulating their emissions through a comprehensive regime of requirements,²⁶⁴ including mandatory feeding and housing processes for feeding dairy cows, manure pile size management, more frequent monitoring of beef feed lots, and more.²⁶⁵ For example, the rule requires dairy CAFOs to maintain manure lagoon pH between 6.5 and 7.5.²⁶⁶ The district estimates that the regulations, amended last year, will lower its VOC emissions by 20.6% in the first year alone.²⁶⁷

However, despite their potential success, San Joaquin Valley's requirements also demonstrate how state-focused plans required by pollutant-specific regulatory regimes are an incomplete remedy to CAFO pollution. The district's requirements are so high only because the area is in extreme eight-hour ozone non-attainment, and the requirements only seek to regulate VOC emissions, not other pollutants,²⁶⁸ even though California's CAFOs account for 38% of the state's emissions of ammonia.²⁶⁹ NSPS would tackle both. California, too, is but one state, and the San Joaquin Valley one region within it. Many states have yet to adopt or enact programs that specifically affect AFO emissions at all under the NAAQS, and those that do regulate various combinations of pollutants to varying

²⁵⁸ ENVTL. PROT. AGENCY, CRITERIA POLLUTANT AREA SUMMARY REPORT (Dec. 17, 2010), available at <http://www.epa.gov/oaqps001/greenbk/anc12.html>.

²⁵⁹ 42 U.S.C. §§ 7501(3), 7503(a).

²⁶⁰ S. Bill No. 700 (Cal. 2003) (amending Cal. Health & Safety Code § 42310).

²⁶¹ DAVE WARNER, SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, CALIFORNIA CAFO UPDATE 3 (2005), available at <http://www.4cleanair.org/charleston/warner.pdf>.

²⁶² *Id.*

²⁶³ SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, FINAL DRAFT STAFF REPORT: AMENDED REVISED PROPOSED AMENDMENTS TO RULE 4570 1 (2010) [hereinafter SAN JOAQUIN VALLEY REPORT]. For other examples of state CAFO air pollution regulation, see Jody M. Endres & Margaret Rosso Grossman, *Air Emissions from Animal Feeding Operations; Can State Rules Help?*, 13 PENN. ST. ENVTL. L. REV. 1, 6–43 (2004).

²⁶⁴ SAN JOAQUIN VALLEY REPORT at 1.

²⁶⁵ *Id.* at 5.

²⁶⁶ *Id.* at 35.

²⁶⁷ *Id.* at 65.

²⁶⁸ *Id.* at 2.

²⁶⁹ WARNER, *supra* note 261, at 3.

degrees.²⁷⁰ NSPS would be national. An NSPS – and BDT – for CAFOs could do significantly more, on a national scale and for a wider variety of pollutants, than California's partially effective yet fragmentary NAAQS-based solution.

The Clean Water Act also takes a comprehensive approach to managing runoff from CAFOs²⁷¹ under the CWA's version of NSPS.²⁷² The CWA has been regulating CAFOs specifically since the mid-1970s,²⁷³ and even uses the term CAFO as part of the definition of "point source[s]" of water pollution.²⁷⁴ The EPA has created detailed regulations and strategies for regulating water pollution from CAFOs under the CWA, requiring CAFO owners to meet certain best practices,²⁷⁵ submit to a permit program,²⁷⁶ and develop site-specific Comprehensive Nutrient Management Plans that include details on, for example, the CAFOs' manure handling and feed management procedures in order to ensure the CAFO is complying with the CWA and soundly disposing of waste.²⁷⁷ CWA regulation of CAFOs was developed after extensive assessment of the need for and expected effectiveness of CWA regulation on runoff pollution.²⁷⁸

Not only is the Clean Water Act's regulation of CAFOs thorough and well-researched, it is also a top EPA priority: in 2008, EPA established Clean Water Act enforcement of CAFOs as one of eight multi-year national priorities for environmental regulation, labeling CAFO waste a "major environmental problem."²⁷⁹ EPA renewed that commitment for fiscal years 2011 through 2013.²⁸⁰ These requirements, and the scope of enforcement that has come with them, demonstrate how a comprehensive regulatory system can be a viable and effective mechanism for regulating CAFOs. For example, between fiscal 2008 and 2010, EPA conducted more than 900 CAFO inspections to ensure compliance with permit requirements and used its enforcement powers to gain commitments

²⁷⁰ COPELAND, PRIMER, *supra* note 7, at 15. Minnesota is another state with a fairly comprehensive regulatory regime for CAFOs, though outside the CAA framework. Feedlots in the state with more than 1,000 "animal units" require permits that specify detailed information about the facility, including a manure management plan that specifies methods and practices for minimizing air emissions via manure management practices. Minn. R. 7020.0505(4)(B)(1)(a) (2010). The plan also has to list each potential odor source at the facility and anticipated odor control strategies. Minn. R. 7020.0505(4)(B)(1)(c)(i)–(iii) (2010).

²⁷¹ *See generally* 40 C.F.R. §§ 412, 122.23 (2013).

²⁷² *Id.* §§ 412.15, 412.25, 412.35, 412.46.

²⁷³ Feedlots Point Source Category, 39 Fed. Reg. 5704 (Feb. 14, 1974); Concentrated Animal Feeding Operations, 41 Fed. Reg. 11458 (Mar. 18, 1976).

²⁷⁴ 33 U.S.C. § 1362(14) (2012) (defining a point source as any "discernable, confined and discrete conveyance, including . . . any . . . concentrated animal feeding operation . . . from which pollutants are or may be discharged").

²⁷⁵ 40 C.F.R. § 412.2.

²⁷⁶ *Id.* § 122.23.

²⁷⁷ *Id.*

²⁷⁸ *See, e.g.,* Waterkeeper Alliance, Inc. v. U.S. Env'tl. Prot. Agency, 399 F.3d 486, 513 (2d Cir. 2005).

²⁷⁹ Announcement of the National Enforcement and Compliance Assurance Priorities for Fiscal Years 2008, 2009 and 2010, 72 Fed. Reg. 58,084 (Oct. 12, 2007).

²⁸⁰ ENVTL. PROT. AGENCY, NATIONAL ENFORCEMENT INITIATIVES, <http://www.epa.gov/compliance/data/planning/initiatives/index.html> (last visited Feb. 26, 2013).

to reduce an estimated 7.6 million pounds of pollutants.²⁸¹ However, "[w]hile Congress responded to industrial animal agriculture's threat to the nation's water supply by including an express provision in the Clean Water Act (CWA) to regulate CAFOs, the CAA includes no such provision to protect the nation's air quality."²⁸² That shortcoming can and should be remediated through creation of a New Source Performance Standard for CAFOs. Further, while there may be no express regulation of CAFOs under the Clean Air Act itself, there is no indication that legislative silence should be interpreted as legislative intent that CAFOs not be regulated under the Clean Air Act, and thus the CAA permits such regulation.²⁸³

By listing CAFOs under the NSPS, the EPA would gain a standardized, nationwide approach to regulating CAFO air pollution. NSPS are a flexible, comprehensive and effective way to regulate CAFOs, could capture all CAFO air pollutants, and have repeatedly proven successful in "achieving long-term emissions reductions in numerous industries by assuring cost-effective controls are installed on new, reconstructed, and modified sources."²⁸⁴ CAFOs should be the next NSPS success story.

V. Conclusion

Much more can and should be done to regulate factory farms under the Clean Air Act. The EPA should act to add hydrogen sulfide and ammonia to the list of Hazardous Air Pollutants under section 112(b) of the Clean Air Act. However, that alone is insufficient. The EPA must resort to a stronger, more thorough, and more flexible tool, the New Source Performance Standards, in order to provide a comprehensive antidote to the air quality ills of modern industrial agriculture. By using an exhaustive, multi-modal approach, the EPA can help to ensure the health and welfare of those working at or living near CAFOs and beyond.

Factory farms continue to grow larger and more common, and that growth brings with it increasing pollution and a laundry list of problems for human health and welfare, animal health and welfare, and the environment. Industry groups and lobbyists representing the interests of massive agricultural corporations must no longer be allowed to stave off long-needed cleanup efforts. The Clean Air Act

²⁸¹ ENVTL. PROT. AGENCY, NATIONAL ENFORCEMENT INITIATIVES FOR FISCAL YEARS 2008–2010: CLEAN WATER ACT: CONCENTRATED ANIMAL FEEDING OPERATIONS, <http://www.epa.gov/compliance/data/planning/priorities/cwacafo.html> (last visited Feb. 26, 2013).

²⁸² Wilson, *supra* note 19, at 441; 42 U.S.C. §§ 7401–7176.

²⁸³ Sources of pollution under the CAA include "any building, structure, facility, or installation which emits or may emit an air pollutant," an umbrella definition that would not exclude CAFOs. 42 U.S.C. § 7411(a)(3). Requirements for creating NSPS for such a source are similarly broad, encompassing any source that "causes, or contributes significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare. *Id.* § 7411(b)(1)(A). Further, the EPA itself has tacitly recognized CAFOs as stationary sources of air pollution under the CAA by approving California's state implementation of the CAA. 68 Fed. Reg. 7,330 (Feb. 13, 2003).

²⁸⁴ Coal Standards, *supra* note 234, at 51950.

is a powerful toolkit that can be used effectively to mitigate the destructive fallout of CAFO air pollution. However, the EPA for far too long has failed to use numerous tools in that toolkit that can get at different parts of the problem. As a growing body of science adds to the weight of evidence of CAFOs' deleterious air pollution consequences and the soundness of the methods that can be used to mitigate them, lingering excuses for regulatory delay vanish.