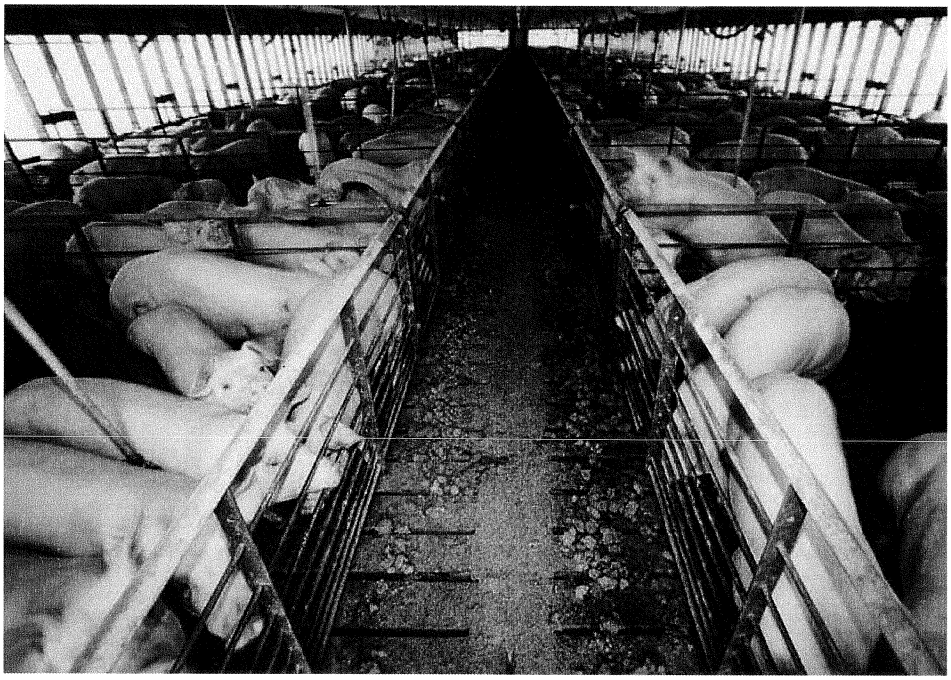
Managing CAFOs: Regulatory and Grassroots Control



(Source: EPA, 2004a)

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Many concentrated animal feeding operations (CAFOs) have become a blight on the landscape. In addition to their aesthetic offenses – "A dozen hogs don't smell like a bed of roses, but a few thousand hogs could knock a rat off a gut wagon" (Sierra Club, 2002) – their effects on water resources can threaten the health of both ecosystems and humans. Although the regulatory framework for animal production facilities was revised in 2002, it is still likely to be ineffective. Certain regions of the country are seeing the proliferation of these animal production facilities; therefore, effective regulation and enforcement are needed.

CAFOs in the Environment

The production of animals, regardless of the size of the operation, will likely have concomitant problems. CAFOs are a unique perversion of natural processes. Confined feeding, readily available food, and efficient transportation allow CAFOs to "circumvent the ecological constraints otherwise imposed by the landscape" and therefore outstrip the land's assimilatory capacity (Mallin and Cahoon, 2003). From an environmental perspective, the massive amount of waste generated by CAFOs presents a nasty problem. Manure is often stored in waste lagoons, designed to allow some bacterial digestion of the waste matter before it is applied to fields as fertilizer. There is usually not enough cropland within economical distances to safely apply the nutrient-laden manure, and poor management practices of this manure can increase the risk of non-point source pollution. Even if manure is properly managed, the emission of ammonia from CAFOs also causes ecosystem damage (Jackson et al., 2000).

Evidence of CAFOs' effects on ecosystems abounds. In addition to the clearly problematic situation of lagoon spills, due either to rupture or storm events, the normal operation of CAFOs also introduces nutrients to the environment. Rain and the resulting runoff can carry nutrients from fields to receiving waters. Furthermore, nutrients can leach into groundwater: studies of lagoons in North Carolina showed nitrate concentrations above 140 mg/L in nearby groundwater, and that nitrate can move through groundwater and back to streams over a distance of 1.5km (Mallin and Cahoon, 2003). As a point of comparison, the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) for nitrate in drinking water is 10 mg/L (U.S. EPA, 2002). Furthermore, the General Accounting Office (GAO) has identified animal feedlots as the cause of 9% of the nation's impaired river and stream, while agriculture as a whole accounts for 59% of these impairments. It should be noted (and it should also cause alarm) that these data probably underestimate the extent of the problem: they are based on only twenty states, and five of the top six cow and pig producing states in the nation did not report data (Centner and Mullen, 2002). Clearly, existing regulations for agriculture and CAFOs in particular, are insufficient.

Evidence of CAFOs' effects on humans is also clear. Waste lagoons do not reach temperatures that can kill pathogens, and *E. coli* has been shown to survive up to 11 weeks in such lagoons (Mallin and Cahoon, 2003). While the lifespan of pathogens is much shorter in natural environments, there is still an acute threat: the EPA lists 9 manure-related outbreaks of disease and loss of human life between 1990 and 2000 (U.S. EPA, 2004a). Slightly more tenuous but perhaps more threatening, endocrine disruptors are also of concern. These chemicals interrupt reproduction and development; exceedingly small concentrations (i.e., 10-100 ng/L) of endocrine disruptors have been shown to adversely impact the reproductive systems of aquatic

life, while effects on humans are not well known (Hanselman et al., 2003). Hanselman's article cites four studies that link high (i.e., tens or hundreds of ng/L) estrogen concentrations with animal production facilities. Furthermore, Hanselman et al. cite a USGS study which found significant levels of estrogen in 139 animal-impacted streams in 30 states. Finally, groundwater from Arkansas was found to have related levels of fecal coliform, *E. coli*, and estrogen; the correlation between these three indicated that they were moving through the aquifer in similar fashions.

CAFOs and Rural Economies

In addition to their demonstrated and potential negative environmental impacts, CAFOs can bring positive economic impacts. Advocates of animal facilities argue that the industry can add jobs to rural towns facing population loss (Blaney, 2002). For cities such as Pampa, Texas (pop. 17,800), a former oil town perched atop the Ogallala aquifer, the economic allure of a CAFO is real. As one resident of Amarillo, the region's largest city, noted, "IBM and General Motors aren't coming to Pampa anytime soon" (Young, 2002).

In this context, the proposed construction of a 50,000-head swine facility outside of Pampa stimulated much discussion. The debate was played out in many venues, including the editorial pages of the Amarillo Globe-News. One alliterative citizen, referring to two cases of CAFO groundwater contamination in Oklahoma (in one, Seaboard, Inc. was forced to provide drinking water to a town's residents), wrote, "The people of North and South Carolina, Missouri, Kansas, Iowa, Colorado and more recently Oklahoma once believed the corporate pig promoters' promises of prosperity. Now they face grim environmental and social problems far beyond mere 'hog stink' - and the taxpayers must foot the bill" (Haydon, 2002a). In another letter, Ms.

Haydon focused on water supply problems, noting that the Ogallala is already declining 10 times faster than it is recharged, and animal production facilities are "gluttonous users of water" (Haydon, 2002b).

Rejoinders were plenty: a few months later, an employee of Microbeef Tech in Amarillo wrote an editorial to disabuse Ms. Haydon of some of her misinformation. Mr. Young argued that conventional agriculture accounts for 95% of water use in the Panhandle. He denied Ms. Haydon's claim that there was manure contamination in Oklahoma; he added that the pig-producing region of North Carolina, with a much higher water table, was free of fecal contamination. (It should be noted that Mallin and Cahoon's article flatly contradicts this claim.) Mr. Young ends with some punchy parallelism: "Do hogs smell like hogs? Do cattle smell like cattle? Does natural gas smell like hydrogen sulfide? Yes. Are swine producers good environmentalists? Yes" (Young, 2002). This concept was shared by others besides Mr. Young, for another Pampa resident was quoted in a news article as claiming that National Pig Development (NPD) USA, the swine company looking to build outside of Pampa, "has an exceptionally good environmental record … NPD will be a good steward of the environment here. I believe the economic benefits are crucial to this area" (Storm, 2002a).

Naturally, good stewardship of the environment is desirable. However, most would agree the adherence to regulations is a good starting point for stewardship. A cursory examination of the record indicates that swine producers are most emphatically not good stewards. The EPA has estimated that only 20% of the country's CAFOs had secured the permits required of them by federal law (U.S. EPA, 2001). In the case of Smithfield Foods, which owns NPD USA (Smithfield Foods, 2000), the record is even more dismal. In August 1997, The Washington Post

ran a story titled "Court Fines Smithfield $12.6 Million; Va. Firm Is Assessed Largest Such Pollution Penalty in History." The story noted that "[f]ederal officials have seen Smithfield … as a particularly flagrant violator of pollution laws" (U.S. Senate Committee on Government Affairs, 2002). In 1998, the United States District Court for the Eastern District of Virginia fined Smithfield $12,600 for violations of the Clean Water Act (U.S. Dept. of Justice, 2003b). It should be noted that Smithfield's record is tarnished not just with respect to the environment: in November 2004, Smithfield was fined $2 million for antitrust violations (U.S. Dept. of Justice, 2004). In 2002, Smithfield was found – for a second time – to have violated federal civil rights legislation (United Food and Commercial Workers, 2002).

The Regulatory Framework

The EPA's estimate of 20% compliance (U.S. EPA, 2001) with federal permitting and the GAO's estimate that CAFOs account for nearly 10% of water impairment in the nation (Centner and Mullen, 2002) demonstrate shortcomings in the regulatory environment. It is not trivial, however, to pin down the causes of these failures. A successful program of regulations has several components: regulations must be legislated, the relevant standards need to be communicated to dischargers, dischargers must understand their responsibilities, regulators must show a willingness to enforce standards, and violators must be appropriately punished. Without one of these pieces, the regulatory process will be ineffective (Centner and Mullen, 2002). After a discussion of the current regulations of CAFOs, problems with enforcement will be addressed.

The activities of CAFOs are only partially regulated through the Clean Water Act (CWA). Because CAFOs often use waste lagoons, discharges from those lagoons have fallen under the purview of the National Point Discharge Elimination Program (NPDES). Outside of

the NPDES program, however, regulation is "piecemeal and varies from state to state" (Mallin and Cahoon, 2003). Originally, even the NPDES regulation of lagoons was narrow in its application, for it was not until 2001 that the EPA proposed including dry litter poultry operations, swine nurseries, dairy cow facilities, and veal production facilities (U.S. EPA, 2001). The state of Texas' regulations for CAFOs are quite similar to the federal regulations and make frequent reference to CFR Title 40 (Texas Administrative Code, 2004). Though there are differences, federal regulations will be discussed as representative of both.

Title 40 of the U.S. Code of Federal Regulations defines CAFOs and the distinctions between large, medium, and small CAFOs. A medium swine CAFO, for example, has 750-2499 swine weighing at least 55 pounds or 3000-9,999 swine weighing less than 55 pounds (U.S. CFR, 2004). It is not, however, made clear what happens if a feedlot's swine are split above and below this cutoff. Nonetheless, the regulations are encouraging, for "once an operation is defined as a CAFO, the NPDES requirements for CAFOs apply with respect to all animals … and all manure, litter, and process wastewater generated by those animals or the production of those animals" (U.S. CFR, 2004). Lagoons – the point sources easily targeted by regulations – are well controlled. For example, overflow, the release of manure or process wastewater due to the failure of a lagoon, is allowed only during catastrophic or chronic rain events. For chronic events, the waste handling area must be intended to contain the 25-year, 24-hour rainfall event (Centner, 2004).

CAFOs do not, however, keep their all waste in lagoons. Land application – ideally as a fertilizer – is a common method of dealing with animal waste. Once manure is applied to the land, it shifts from being a regulated, point source discharge: if manure is applied in accordance

with "site specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients in the manure," then storm-induced runoff is considered an "agricultural stormwater discharge" and is outside of the NPDES system (U.S. CFR, 2004). Title 40 refers to the United States Code to define "agricultural stormwater discharge," which lists what is a point source and what is not: point source "does not include agricultural stormwater discharges and return flows from irrigated agriculture" (U.S. Code, 2003).

One of the points on which the above definition turns is that manure applied to the land in accordance with a nutrient management plan (NMP) is considered to be an agricultural discharge, a nonpoint source of pollution. Therefore, the quality of these NMPs will dictate the success or failure of this component of the regulation. Unfortunately, NMPs are only loosely defined in Section 122.24 of Title 40, which states, "At a minimum, a nutrient management plan must include best management practices and procedures necessary to implement applicable effluent limitations and standards" (U.S. CFR, 2004). This vague definition of NMPs is only one of the shortcomings of the revised Title 40 CAFO regulations. Other problems are that nutrient management plans are not required to be certified, medium and small CAFOs are not required to adopt best management practices, groundwater monitoring is not mandatory, and there are not limits on heavy metals, pathogens, or antibiotics (Centner, 2004). Though it is not toxic or exclusively anthropogenic, phosphorous is another contaminant that should be regulated. Most NMPs are centered on nitrogen. Manure application rates, if calculated based on phosphorous, would require up to five times as much land (Weinheimer, 2002). This indicates that current NMPs – even if correctly designed for nitrogen and even if followed – would allow phosphorous accumulation, which can impair receiving waters.

A key component for successful NMPs is implementation of the nonpoint source pollution controls that already exist. The Clean Water Act's Total Maximum Daily Load (TMDL) program, Section 303(d), provides provisions for water quality based management of pollution. States are required to develop lists of waters that remain impaired despite control of point sources; TMDLs are then developed for these water bodies and pollutant loading is allocated amongst point and nonpoint loadings to each water body. Though the TMDL program was created in the 1972 Clean Water Act, the states and EPA had not begun to use TMDLs until recently (U.S. EPA, 2003). It was citizen suits against the EPA that got the program going, though it should be noted that it is still in its infancy. For example, it was not until 1998 that Texas began a ten year process of creating TMDLs for all of the 303(d)-listed waters in the state (Texas Commission on Environmental Quality, 2004). It should also be noted that there are citizen suits trying to slow the implementation of TMDLs: the 2001 case *American Farm Bureau Federation v. Whitman* challenged the inclusion of nonpoint sources in TMDLs (Texas Farm Bureau, 2001).

Legislation for nonpoint controls also exists in the Clean Water Act's Section 319, the Nonpoint Source Management Program. Congress added section 319 in 1987 as a response to recognition that nonpoint pollution was responsible for a great deal of waterway impairment. Under this program, states apply for grants to implement controls on nonpoint sources of pollution (U.S. EPA, 2004b). Like the TMDL program, this program is not widespread. Thus, although the legislation exists to control nonpoint sources, it is not yet effective. Until the TMDL program, with the help of Section 319, is truly in place nationwide, NMPs cannot effectively handle the waste from CAFOs.

The Importance of Enforcement

As noted previously, enforcement is critical to successful regulation. Testimony to the U.S. Senate by Richard Dove, of the Waterkeeper Alliance, convincingly makes this point:

> Indeed, without breaking the law, pork factories cannot make money and produce hogs as efficiently or cheaply as family farmers. Industrial pork producers instead rely on rare inspections and small fines by state regulators. The rare penalties and small dollar amounts occasionally dispensed by state enforcers never provide sufficient incentive for the industrial pork barons to stop their lawbreaking. These fines amount only to a trivial cost of doing business. (U.S. Senate Committee, 2002)

Impediments to enforcement are many. Polluters with political connections are often able to intimidate local agencies. State agencies, if they have regulatory power, may not be responsive to local citizenry, whose criticism often prompts regulatory action. Frequently, state agencies do not have enough clout and must turn to the state attorney general for legal action (Centner and Mullen, 2002).

Prior to the EPA's rule change in 2002, the GAO had identified adequate enforcement as an impediment to the existing regulations' effectiveness (Centner, 2004). Given the ubiquity of state budget shortfalls, the enforcement status quo will be ineffective: "Until better enforcement mechanisms are implemented, significant water denigration may continue from operators who fail to adhere to the requirements of the existing regulations" (Centner, 2004).

There is clearly room for improvement, both in enforcement (as outlined above) and in legislation. Current regulations approach CAFOs and their waste as discrete units and processes. Because of the cost of transporting large quantities of both specialized feed and finished animals, there are often regional concentrations of CAFOs around feed production and meat packing facilities (Mallin and Cahoon, 2003). Regulations ignore effects of this spatial density; it would

be preferable to account for CAFOs on watershed or regional scales (Mallin and Cahoon, 2003, Jackson et al., 2000). Regulations also often do not recognize the possible intrinsic value of nutrient-rich manure (Centner, 2000). Jackson et al. echo this sentiment: "Rather than rely ever more heavily on regulations and monitoring, we should research and demonstrate the economic viability of integrated livestock-crop production systems whose intrinsic features encourage efficient nutrient use and protect our groundwater and surface water" (Jackson et al., 2000). In place of focusing on punishment, economic incentives, such as fertilizer taxes or tax breaks for environmentally-friendly manure handling systems, could be a preferable regulatory tool (Centner and Mullen, 2002).

CAFOs in Pampa: Prospects for the Future

It was in this context of imperfect regulation and enforcement that the Texas Natural Resource Conservation Commission granted National Pig Development USA a permit in 2002. There was elation from economic boosters, such as Richard Stowers, the former president of the former Pampa Economic Development Corp (which was dissolved by voters in part due to turmoil with the livestock facility), who clucked, "I think it's about six months late, but I'm tickled to death that they finally got it" (Amarillo Globe-News, 2002b). Those opposed to the CAFO were less enthused. Ms. Lewis wryly noted the ironies of the CAFO permit: a land-owner with less than 20 acres has to use a approved septic system; the city of Pampa (with over 17,000 residents) spent $2 million to reduce ammonia volatilization; the recently permitted CAFO (producing waste equivalent to 150,000 people) will not treat its waste and will be a significant source of ammonia volatilization (Lewis, 2002).

The actual threat of contamination is likely between the extremes argued by proponents and opponents of the NPD USA CAFO. Some argued that a sand, clay, shale, and rock barrier would likely protect groundwater supplies (Blaney, 2002). Nevertheless, there is overwhelming scientific evidence that the threat is real. A 2003 USGS study of irrigated agriculture's effects on groundwater in the High Plains found that 70% of the well samples exhibited correlations between nitrate, pesticides, and tritium concentrations; these relationships were indicative of contamination from above-ground agricultural activities (Bruce et al., 2003). In the High Plains, where residents take 93% of their water from the ground, a threat to groundwater is not easily dismissed. Whether the growing presence of CAFOs in the area will affect the Ogallala aquifer remains to be seen. Lewis cites a study showing that seepage from the CAFO should occur at about 11 ft/year; this estimate gives the residents about 12-15 years before groundwater monitoring will show whether the Ogallala is contaminated (Lewis, 2002). Even if the groundwater below Pampa, Texas is geologically shielded from CAFO waste, the growing presence of CAFOs in the region is a threat. Excess nutrients do not disappear; they are distributed in the environment through decaying plants, soil ecosystems, and aqueous compounds (Jackson et al., 2000).

A group of citizens that had actively opposed the CAFO said that rather than challenge the permit, they will concentrate on changing state laws in order to slow further CAFOs (Storm, 2002d). It is this involvement by citizens – bringing debate into the public arena and creating compromise and resolution from struggle – that suggests improvement may come, albeit slowly. Indeed, the prospects for citizen involvement are promising, for two separate polls found 88 and 75% opposition to the new pig facilities (Lewis, 2002). It is to be hoped that the citizens make their case convincingly and aggressively, for regulation of CAFOs has generally been in

response to proven negative effects, rather than as preventative measures (Mallin and Cahoon, 2003).

Fortunately, there is evidence that citizens understand the value of being cautious with natural resources: a resident of nearby Sunray, Texas, said, "I know that we have economic problems, but a development that will in the long run damage, hurt our water and the health of our people is a detriment to our area, not a development … Keeping the aquifer safe, I would prefer to err on the side of too much regulation and keeping it clean rather than the possibility of contamination. It is the lifeblood of all of us" (Blaney, 2002).

References:

Amarillo Globe-News (2002a). "Who decides who brings home the bacon?" The Amarillo Globe-News, Editorial Page. 12 January 2002.

Amarillo Globe-News (2002b). "TNRCC allows pig farm near Pampa." The Amarillo Globe-News. 05 June 2002.

Blaney, Betsey (2002). "Smell of money raises concerns: Environmental issues arise over proposed Panhandle pig farms." The Amarillo Globe-News. 5 January 2002.

Bruce, B.W., Becker, M.F., Pope, L.M., and Gurdak, J.J. (2003). Ground-Water Quality Beneath Irrigated Agriculture in the Central High Plains Aquifer, 1999-2000. Water-Resources Investigations Report 03-4219. U.S. Geological Survey, Reston, VA.

Centner, T. J. (2000). "Animal feeding operations: encouraging sustainable nutrient usage rather than restraining and proscribing activities." *Land Use Policy*, Volume 17, Issue 3, July 2000, Pages 233-240.

Centner, T.J. and Mullen, J.D. (2002). "Enforce Existing Animal Feeding Operations Regulations to Reduce Pollutants." *Water Resources Management* (16): 133-144.

Centner, T.J. (2004). "New regulations to minimize water impairment from animals rely on management practices." *Environment International* (30): 539-545.

Hanselman, Travis A., Donald A. Graetz, and Ann C. Wilkie (2003) "Maure-Borne Estrogens as Potential Environmental Contaminants: A Review." *Environmental Science & Technology*, Vol. 37, No. 24, pp. 5471-5478.

Haydon, Edna L. (2002a) "Raising a stink against Panhandle pig farms." The Amarillo Globe-News, Letters to the Editor. 12 January 2002.

Haydon, Edna L. (2002b) "Pig farms hog water supply." The Amarillo Globe-News, Letters to the Editor. 19 January 2002.

Jackson, L.L., Keeney, D.R., and Gilbert, E.M. (2000). "Swine Manure Management Plans in North-Central Iowa: Nutrient Loading and Policy Implications." *Journal of Soil and Water Conservation*, Vol. 55, No. 2.

Lewis, Tonya. (2002). "CAFOs hog market on Panhandle pollution." The Amarillo Globe-News, Opinion Page. 2 November 2002.

Mallin, M.A., Cahoon, L.B. (2003). "Industrialized Animal Pollution – A Major Source of Nutrient and Microbial Pollution to Aquatic Ecosystems." *Population and Environment*, Vol 24, No. 5: pp. 369-385.

Pampa, Texas Water Department (2003). "2003 Annual Drinking Water Quality Report." www.pan-tex.net/pampa/Pampa_04_16569.pdf (accessed 13 October 2004).

Purcell, Doyle (2002). "Maybe we should work with hog businesses." The Amarillo Globe-News, Letters to the Editor. 30 January 2002.

Sierra Club (2002). "Low plains drifter." http://www.sierraclub.org/roadtrip/lowplainsdrifter/ (accessed 13 October 2004).

Smithfield Foods, Inc. (2000). "Smithfield Foods, Inc. Announces The Expansion Of Its Genetic Development Program" http://www.smithfieldfoods.com/Investor/Press/press_view.asp?ID=19 (accessed 18 November 2004).

Storm, Rick (2002a). "Pig proposal prompts debate in Pampa." The Amarillo Globe-News. 9 January 2002.

Storm, Rick (2002b). "Dirt work begins on swine facility near Pampa." The Amarillo Globe-News. 12 February 2002.

Storm, Rick (2002c). "Pig protesters plan petition." The Amarillo Globe-News. 20 June 2002.

Storm, Rick (2002d). "Official: Pampa ACCORD group won't go to court." The Amarillo Globe-News. 25 September 2002.

Texas Administrative Code (2004). Title 30, Part 1, Chapter 321, Subchapter B: Concentrated Animal Feeding Operations.

Texas Commission on Environmental Quality (2004). "Implementing Total Maximum Daily Loads in Texas: A Status Report." http://www.tnrcc.state.tx.us/water/quality/tmdl/TMDLStatus03.pdf (accessed 22 November 2004).

Texas Farm Bureau (2001). "The Cornerpost: An Update for Texas Farm Bureau Leaders." http://www.txfb.org/Cornerpost/CP2001/cornerpost081001.htm (accessed 19 November 2004).

United Food and Commercial Workers (2002). "Press Release: The Verdict Is In: Smithfield's Use of Intimidation, Violence and False Arrests Violates Civil Rights Laws." http://www.ufcw.org/press_room/press_releases_2002/smithfieldlawsuit.cfm (accessed 19 November 2004).

United States Code (2003). Title 33, Chapter 26, Subchapter V, Section 1362.

United States Code of Federal Regulations (2004). Title 40, Section 122.23.

United States Department of Justice (2003a). United States v. Smithfield Foods, Inc., Civil Action No.1:03-CV-00434. http://www.usdoj.gov/atr/cases/f200900/200947.htm#1 (accessed 19 November 2004).

United States Department of Justice (2003b). Exhibit T: United States v. Smithfield Foods, Inc., Civil Action No.1:03-CV-00434. http://www.usdoj.gov/atr/cases/f200900/200947.htm#1 (accessed 19 November 2004).

United States Department of Justice (2004). United States v. Smithfield Foods, Inc., Civil Action No.: 2:04cv526. http://www.usdoj.gov/atr/cases/f206300/206374.htm (accessed 19 November 2004).

U.S. Environmental Protection Agency (2001). National pollutant discharge elimination system permit regulation and effluent limitations guidelines and standards for concentrated animal feeding operatirons; proposed rule. Federal Register, Vol. 66, pp. 2960-3145.

U.S. Environmental Protection Agency (2002). "List of Drinking Water Contaminants & MCLs." http://www.epa.gov/safewater/mcl.html#mcls (accessed 19 November 2004).

U.S. Environmental Protection Agency (2003). "Overview of Current Total Maximum Daily Load - TMDL - Program and Regulations." http://www.epa.gov/owow/tmdl/overviewfs.html (accessed 19 November 2004).

U.S. Environmental Protection Agency (2004a). "Risk Assessment Evaluation for Concentrated Animal Feeding Operations." Document #: EPA/600/R-04/042. http://www.epa.gov/ORD/NRMRL/pubs/ (accessed 19 November 2004).

U.S. Environmental Protection Agency (2004b). "The Nonpoint Source Management Program." http://www.epa.gov/owow/nps/facts/point4.htm (accessed 19 November 2004).

United States Senate Committee on Government Affairs (2002). "Testimony of Richard J. Dove, Waterkeeper Alliance." http://www.senate.gov/~gov_affairs/031302dove.htm (accessed 19 November 2004).

Weinheimer, Benjamin T. (2002). "Being a good neighbor: livestock feeders, EPA offer solutions for a changing rural landscape." *Engineering & Technology for a Sustainable World*, Vol. 9, No. 8.

Wolfshohl, K. (2002). "A Big Stink: Small communities take on big farms." http://www.progressivefarmer.com/farmer/business/article/0,19846,458888,00.html (accessed 13 October 2004).

Young, Joe (2002). "Getting to the meat of the pork matter." The Amarillo Globe-News. Letters to the Editor. 02 March 2002.