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*Animal Waste Management and the Environment:
Background for Current Issues*

Claudia Copeland and Jeffrey Zinn, Resources, Science, and Industry Division

Updated April 26, 1999

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Animal Waste Management and the Environment: Background for Current Issues

Updated April 26, 1999

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ABSTRACT

Waste from animal agriculture is an increasingly prominent environmental quality issue. This background report describes the livestock production industry today along with public health and environmental concerns related to the industry. It summarizes policies and programs of the Department of Agriculture and the Environmental Protection Agency and recent Clinton Administration initiatives; state laws and programs concerning animal waste management; and dialogues on problems and solutions initiated by some segments of this industry. The report reviews congressional responses to the issues and outlines policy questions likely to shape congressional action. It will be updated if there is major congressional action or if significant new information becomes available.

Animal Waste Management and the Environment: Background for Current Issues

Summary

Waste from animal agriculture is an increasingly prominent environmental quality issue. Animal waste, especially excessive nutrient concentrations, is being linked to some environmental problems, especially water pollution. The growing number of sites where degradation related to animal waste has been reported has focused attention on this problem and led to discussions of possible responses. Three dimensions make this a complicated challenge for policy makers.

One dimension revolves around both the prevalence of concentrating very large numbers of animals at farm sites (rather than out in pastures) with greater concentration of wastes, and industrialization where producers raise animals under contract. These changes contribute to a perception by many that such large scale agriculture is increasingly like any other business, and should be regulated in similar ways to protect public health, especially at the larger facilities. The environmental quality questions also include what to do with waste from smaller farm operations that are not regulated under current federal law, and how to address other waste problems, such as air emissions and odor, that are not currently regulated under federal laws.

A second dimension is the role of government, if any, in responding to the animal waste management problem. One aspect of these choices is whether the federal government should build on the regulatory approach of the Clean Water Act and other environmental protection laws, or rely on agriculture programs that are based on voluntary participation and incentives to attract participation with local delivery systems providing technical assistance, cost-sharing, and education. Ongoing efforts by the Environmental Protection Agency and Department of Agriculture are merging aspects of both approaches, but many stakeholders remain cautious about these efforts. A second aspect is determining the federal role as states (and localities) continue to enact legislation and implement an expanding array of laws and programs.

A third dimension is the role of information about many aspects of animal waste. On the one hand, a lack of technical information about these complicated problems and relationships limits discussions of effective responses. At the same time, forces that oppose agricultural concentration and industrialization for social, philosophical, or other reasons are using the environmental debates as an avenue for raising their concerns.

Numerous responses are underway and others are being considered. Environmental protection advocates who cite possible threats to water quality and human health have been joined by others with rural social and economic concerns in pressing for action. Supporters of large-scale commercial agriculture caution that actions should proceed carefully to avoid needless regulations, higher food costs, and other adverse effects on individual agricultural enterprises. Congress has held hearings, briefings, and information sessions on this topic. In the 105th Congress, two legislative proposals were introduced, but neither bill was enacted. Congressional attention to these issues in the 106th Congress is possible, especially in connection with recent Clinton Administration initiatives.

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Animal Waste Management and the Environment: Background for Current Issues

Introduction

Managing the environmental effects of intensive animal rearing and feeding operations has long been a problem confronting the livestock industry. These facilities, which include confined feeding operations and feedlots, are a specialized part of the livestock production process, largely separate from cropland agriculture. In recent years, manure and waste-handling and disposal problems from intensive animal production have begun to receive attention as these facilities increase in size and the effects of these problems reach beyond the industry to affect others.

A number of forces are at work on this segment of agriculture. These include changes in the livestock industries themselves -- especially concentration of animals in larger facilities, because of cost and production quality advantages. The presence of these types of facilities has led, in some cases, to conflicts between farm operators and their neighbors over such issues as corporate farming, odors, and air and water quality.

The U.S. population of animals in livestock production being raised to feed Americans and other consumers worldwide is very large. The inventory in the most recently published agricultural census, collected in 1992, included over 77 million cattle and calves, about 60 million swine, and almost 1 billion broilers. Waste produced by these animals is a valuable soil amendment and source of nitrogen, phosphorus, and other crop nutrients, when applied to land in proper amounts (the traditional waste management approach). But, if not properly used or disposed, or if applied in amounts that exceed plant needs, animal waste or its residuals can leach through soil to contaminate ground water or can be transported by runoff to pollute lakes and streams. Thus, as animal production has intensified and concentrated more animals on individual farms, a growing challenge for agriculture is finding sufficient land to dispose of manure, or finding economic alternatives, especially if the supply of land for disposal is insufficient. The parallel challenge for policymakers is determining if the environmental impacts of animal waste management are significant enough to require new remedies and, if so, what strategies are appropriate.

In particular, crop and animal agricultural contributions to water quality problems are receiving more focused attention from some groups and from policymakers. For 25 years, the nation has been implementing federal law, the Clean Water Act, to improve the quality of streams, lakes, and estuaries. Throughout that time, considerable progress has been made in controlling pollution from the largest, identifiable industrial and municipal sources. Nevertheless, recent reports by state environmental agencies indicate that 40% of the nation's rivers and streams assessed by states (which are only a small portion of all waters) fail to meet applicable water

quality standards. The largest category of sources now degrading water quality is crop and animal pollution which contributes to the degradation of 60% of the assessed waterways that are impaired.¹

Most segments of agriculture have been exempt from Clean Water Act regulation. Concentrated animal feeding operations (CAFOs) are not exempt, but regulating them and enforcing compliance was not a high priority for federal or state environmental officials until recently. While there is growing recognition of the need to implement current law more effectively and perhaps develop new strategies concerning agriculture's impact on water quality, such policies are resisted by those who object to expanding environmental regulations and potential costs.

Some interests of agricultural and environmental policy have been coming together for over a decade, but the process has been a bumpy one. Agricultural and environmental groups can have trouble communicating with each other because of differing perceptions about what the problems are and how to view them, differing concepts of environmental quality and responsibilities to maintain that quality, as well as differing institutional perspectives.² The agendas of these groups do not often coincide. Environmentalists have focused on the various ways that agriculture affects environmental quality, beyond soil erosion, while agriculturalists worry about how much response to expanding environmental concerns is enough and whether responding to environmental concerns threatens the ability of producers to maintain earnings. However, representatives of both sides now find more common ground than they did a decade ago.

This report provides background for the current policy debate about animal waste management. It describes the livestock production industry today and public health and environmental concerns related to the industry. It summarizes policies and programs of the Department of Agriculture and the Environmental Protection Agency and recent Clinton Administration initiatives; state programs concerning animal waste management and recent state legislative activity; and dialogues on problems and solutions initiated by some segments of this industry. Finally, it discusses congressional responses to the issues and outlines policy questions likely to shape congressional action.

Three points are important themes that emerge from the discussion in this report. First, the bulk of current policy debate on animal waste issues, both legislative and regulatory, is occurring in states, and that activity is vigorous and multi-faceted. Federal attention followed more recently. Second, dimensions of animal waste problems and solutions (technical and policy) are highly site-specific, which leads to many questions about balancing roles of government, where broad policies are set, and the importance of flexibility in policies and programs. Third, recent national attention to these issues reflects some increase in cooperation between agricultural

¹U.S. Environmental Protection Agency. Office of Water. National Water Quality Inventory: 1996 Report to Congress. April 1998. EPA841-R-97-008. 570 p. For information, see: [<http://www.epa.gov/305b/>].

²Zinn, Jeffrey and John Blodgett. "Agriculture meets the environment: communicating perspectives." *Journal of Soil and Water Conservation*, v. 49, no. 2 (1994): 136-143.

interests and others outside of it concerning agricultural and environmental issues, compared with relations of these groups in the recent past.

Besides waste management, several other issues related to animal agriculture currently are of interest to the public and policymakers. These include meat and poultry inspection requirements; animal health and welfare concerns ranging from animal diseases to humane treatment of farm animals (such as production practices that animal rights activists consider cruel or dangerous to animals) to animal testing for medical research to human health impacts of hormones and antibiotics in livestock; and social issues (such as impacts of corporate farming and industrialization on traditional family farms and demographic changes in rural areas where residential development becomes a neighbor to agriculture).³ Discussion of these topics is beyond the scope of this report, but their outcomes, like decisions that address waste management issues, could affect animal agriculture operations in the future.

Animal Agriculture and Its Waste

Overview of Animal Agriculture: Status and Trends

Livestock includes cattle (beef, dairy and veal), swine (hogs and pigs), poultry (chicken and turkeys), and sheep and lambs. Livestock is a large component of the farm economy; cash receipts to the livestock sector in 1997 and 1998 were \$93 billion each year, nearly half of the slightly more than \$200 billion for all of agriculture.⁴ The populations of animals are very large. The 1992 *Census of Agriculture* counted over 77 million cattle and calves, about 60 million swine, and almost 1 billion broilers, for example.⁵ The inventory of each type of animal gradually shifts in response to changing market conditions and consumer preferences. Changes in geographic location of these animals and how they are raised reflect economic considerations, business relationships, and changing technology. These changes have contributed to low food protein prices and led to increasing concerns about several topics, including environmental effects.

Concentration and geographic location. Livestock production continues to have fewer producers operating at fewer sites. Such concentration offers economies of scale, and depends increasingly on modern technologies and better information. This increasing concentration started first in the poultry industry about 40 years ago,

³See: "Animal Agriculture: Issues for the 106th Congress," CRS Issue Brief IB10021.

⁴USDA, Economic Research Service. "Key statistical indicators of the food and fiber sector." *Agricultural Outlook*. March 1999: 33.

⁵Two sets of numbers are used to describe herd size. The numbers cited above are examples of the inventory, the number of animals at any one time. The Census of Agriculture measures the inventory every 5 years, and USDA's National Agriculture Statistics Service uses different techniques to measure it four times each year. A second way to show herd size is to list the number of animals marketed annually. When the animal's life cycle is less than a year, the numbers are larger than the total number of animals. In each year recently, using this measure, about 100 million swine and about 7.5 billion broilers were marketed.

and more recently has been occurring at different rates for all other types of livestock. However, these changes are not uniform across the country; growth is occurring in some states while decline is evident in others.⁶ Geographic changes in the swine industry are the most dramatic and are in the limelight today. During the 5-year period between 1989 and 1994, swine production grew by 111% in North Carolina, while it declined by 31% in Ohio and by between 10% and 14% in Michigan, Kansas, and Wisconsin.⁷ Since 1994, significant changes reportedly have continued.

The swine inventory stands at around 60 million, and this figure has climbed about 18% over the past decade.⁸ During the same period, the number of swine farms dropped by 72%. The largest farms have grown larger, so that now, less than 1% of farms (with at least 2,000 animals) account for 43% of the inventory. All farms with an inventory of at least 1,000 head are less than 3% of the farms, but 60% of the swine are produced on them. The remaining 97% of the farms (raising fewer than 1,000 head) produce only 40% of the inventory. Perhaps more important, states with rapid growth in overall herd size have higher portions of their herds in very large operations. For example, almost 80% of swine sales in North Carolina, South Carolina, and Virginia are from operations with at least 5,000 head, compared to only 16% of sales in traditional producing areas.⁹

The concentration process has been similar for cattle feed operations, which are now centered in the Great Plains. In the top 13 producing states, the number of feedlots has declined by 75% during the past two decades, and the remaining ones have grown larger. The largest feedlots, which number about 70, each have at least 32,000 head. About 90% of the marketed cattle come from only 5% of the feedlots. Very large feedlots have become more common in Kansas, Nebraska, and Texas.

Dairy has undergone a similar shift, although the numbers are less dramatic. Production has grown fastest in the southern and western states, where larger herds with more than 200 animals are common. In these states, herds with more than 200 cows account for about 90% of all milk production and about one-third of the total dairy cow inventory. In more traditional producing areas, such as the upper Midwest, herds with more than 200 cows account for less than 10% of production. Overall, the

⁶See: U.S. General Accounting Office. *Animal Agriculture: Information on Waste Management and Water Quality Issues*. GAO/RCED-95-200BR. June 1995. This GAO report contains a series of maps and brief narratives which show changes in the top 10 producing states, and the percent of the national inventory, for types of livestock in differing time spans between the mid 1970s and early 1990s.

⁷Charles Mahtesian. "Battling boss hog." *Governing*. Vol. 9, April 1996: 32.

⁸USDA, Economic Research Service. "Livestock manure: foe or fertilizer?" *Agricultural Outlook*. June 1996: 31. Unless otherwise noted, the data on changes in the components of the livestock sector are taken from this overview.

⁹In his testimony before the Senate Agriculture Committee on April 2, 1998, EPA Assistant Administrator Robert Perciasepe cited Census of Agriculture data showing that between 1982 and 1992 the average number of swine per swine farm increased by 578% in North Carolina, by 271% in Arkansas, and by 202% in California and Virginia, while the number of swine farms in those states declined by 62%, 50%, 54%, and 71% respectively.

number of dairy farms has dropped over the past decade by 100,000 (to 150,000 total), while the average herd size has increased by more than 50%.

Concentration of livestock production occurred first with poultry, and it is now the most concentrated segment. Broiler production nearly tripled between 1969 and 1992, while the number of farms with broiler houses dropped by 35%, according to data compiled by the Senate Agriculture Committee minority staff.¹⁰ Firms with more than 100,000 broilers accounted for 70% of all sales in 1975, but now account for more than 97% of all sales.

Vertical integration and market change. Growing concentration is an important part of broader changes in business relationships and marketing in the livestock sector, which are often referred to as industrialization. Another important part of industrialization is vertical integration, as farmers enter contracts with processors, or integrators. Under these contracts, which can vary widely, producers raise the livestock while integrators actually own the animals, assume marketing risks, and usually provide medicine, feed and technical expertise, as well. In these relationships, the producer usually owns the waste. Generally, vertical integration has increased the volume and certainty of supply and improved the market characteristics of the livestock. Producers forgo the risks and uncertainties of the marketplace by becoming contract growers, and as more production comes within these types of relationships, marketing opportunities may decline for those who do not choose or are unable to participate. In economic terms, efficiencies are gained for both producers and integrators at the expense of non-participants.

The degree of integration varies within the livestock sector. Poultry has been fully integrated, and poultry producers have no real options to being contractors. Swine gets much of the attention in discussions of industrialization, but it is widely believed that about 20% of the production currently is under a contract. However, a recent survey by the National Pork Producers Council found that almost 65% of all hogs slaughtered in January 1999 were sold through contracts or some other type of prearranged marketing agreement rather than for a cash price.¹¹ The portion sold under contract for swine, as for all livestock sectors, is growing. At the same time, the number of processors that producers can contract with has been shrinking. In the swine sector, the four largest packers share of the hog slaughter grew to 54% in 1997, up from 32% in 1980. Change is occurring even more rapidly in the cattle sector, where the four largest beef packers accounted for 80% of all cattle slaughtered in 1997, which was more than double the 37% in 1980.

Critics and some experts say that these changes have broader community and social costs that are undesirable. This vigorous debate is explored in animal agriculture, as well as many other agricultural topics. For example, larger and newer animal operations are typically characterized as more efficient and less labor intensive. A University of Missouri Extension Service study was reported to have concluded

¹⁰Senate Committee on Agriculture, Nutrition and Forestry Minority Staff. *Animal Waste Pollution in America: An Emerging National Problem*. Dec. 1997.

¹¹Results of survey reported in *The Food and Fiber Letter*, Sparks Companies, Inc. March 29, 1999: 4.

that traditional independent swine producers create three times as many local jobs as the larger corporate operations. A study from Virginia Polytechnic Institute compared the economic impact of raising 5,000 swine in two types of enterprises and found that independent farmers produce 10% more jobs, 20% more local retail spending, and 37% more local per capita income.¹² Many opponents of industrialization worry that, when these changes occur, even greater problems may be associated with social disruptions than with local economic losses.

Markets are changing as well. Total meat consumption per capita (excluding fish, veal, and lamb) has declined during the past two decades, from more than 189 pounds in 1975 to more than 174 pounds in 1997. But the mix has changed considerably, with a decline in beef being countered by an increase in poultry, as shown in the table below.

Table 1. Per Capita Annual Consumption of Meat, By Major Type
(in pounds)

Category	1975	1997
Beef	88.9	63.8
Pork	50.9	45.6
Chicken	40.3	50.9
Turkey	8.6	13.9

Source: USDA, Economic Research Service, *National Food Situation*, March 1977, and *Agricultural Outlook*, March 1999.

The overall livestock sector has grown in this decade, in part to serve expanding demand for protein in a more affluent world. For example, the U.S. has become the largest beef-exporting nation in the world, with between 16% and 20% of world trade in recent years. A decade ago, in 1988, the United States exported under 3% of the domestic beef production, but by 1998, that portion had risen to 7.5%, and is forecast to rise to 8.3% in 1999. Swine trade is similar, growing by an annual average of 4% between 1989 and 1997; the United States now accounts for almost 20% of the world's pork exports. In FY1998, meat exports were valued at just over \$7 billion, with poultry accounting for more than \$3 billion of that total. But meat exports were only about one-eighth of the \$55 billion in agricultural exports in FY1997.¹³

Waste from Animal Agriculture

Animal wastes are predominately solid and liquid manures, although they also include used bedding, spilled feed, dead animals, and a variety of other substances.

¹²Both studies are cited in: American Planning Association. *Zoning News*. Oct. 1996: 1-4.

¹³These data are from: Congressional Research Service. *U.S. Agricultural Trade: Trends, Composition, Direction, and Policy*. [by Charles Hanrahan and Mary Dunkley], March 1998. CRS Report 98-253. 73 p.

Manure production is estimated to be almost 112 million tons (dry matter) annually.¹⁴ Production varies not only with the animal type, but also with such factors as feed ration, health, animal age, and climate. Trends in the livestock sector such as increased animal confinement (rather than pasturing) and improved feeds have increased the amount of manure produced per animal and changed the composition. The larger volume per animal combined with concentration of more animals at a site compounds storage and disposal difficulties for the farmer. Retention and disposal of manure is the basis of many animal agriculture conflicts.

Animal waste contains nutrients, including nitrogen, phosphorus, and potassium. Nutrients can be valuable for crops, but they can cause water quality problems because of their oxygen-demanding characteristics. Waste can also contain organic solids, trace heavy metals, salts, bacteria, viruses, other microorganisms, and sediments. While effects on water quality have received most of the attention, there is growing interest in airborne transportation and deposition of pollutants as well. Nutrients have been the focus of interest, as interested parties argue about the benefits they can provide and the environmental problems they can cause.

Animal types, equalized by weight, yield different volumes of manure and different amounts of nutrients. The NRCS has estimated the amount of manure produced on an animal unit equivalent basis for various livestock sectors, as well as the nutrient content of that manure (see Table 2). This comparison shows that the waste management challenges are not the same for all types of livestock.

Table 2. Manure Produced by Livestock (lbs per day/1000 lb animal unit)

Livestock type	Total Manure	Nitrogen	Phosphorus
Beef	59.1	0.31	0.11
Dairy	80.0	0.45	0.07
Swine	63.1	0.42	0.16
Chickens (layers)	60.5	0.83	0.31
Chickens (broilers)	80.0	1.10	0.34
Turkeys	43.6	0.74	0.28

Source: NRCS/RCA Issue Brief 7. *Animal Manure Management*. Dec. 1995.

Volumes of animal waste are substantial. Estimates indicate that U.S. animal waste production in 1992 was 13 times greater (on a dry-weight basis) than human

¹⁴Council for Agricultural Science and Technology. *Integrated Animal Waste Management*. Task Force Report no. 128, Nov. 1996: 17.

sanitary waste production.¹⁵ Comparisons of human community equivalents with the waste that herds or flocks of animals produce are illustrative. For example, the manure produced by a dairy milking 200 cows contains as much nitrogen as the sewage of a community with 5,000 to 10,000 residents, or the litter removed annually from a broiler house with 22,000 birds contains as much phosphorus as the sewage from a community of 6,000 people, according to the USDA's Natural Resources Conservation Service (NRCS).¹⁶

Considerable disagreement exists over how to characterize the volume of animal waste in human terms. For example, in congressional testimony in 1998, the National Pork Producers Council stated that cattle, swine, and poultry feeding operations produce the equivalent of about 700 pounds of collectable manure per person per year, and contrasted that figure with other estimates of up to 10,000 pounds per person. For every pound of nitrogen produced by pigs, the Council said, 2 pounds are piped into surface waters by public and industrial waste water treatment facilities, and 4 pounds are released into the atmosphere, primarily by internal combustion engines.¹⁷ This is one of many areas in the animal waste management debate where various interests use different data to measure conditions.

From origin to disposal, farmers may manage manure and related wastes in many different ways, depending on the characteristics of the farm operation and the physical conditions of the farm. Waste management systems usually include several components. Manure may be collected at temporary storage facilities until it can be treated or utilized. Common storage facilities include stacks, ponds, and tanks. Waste may be treated in many ways to convert it to a more useful resource, usually by concentrating the beneficial constituents and decreasing the total volume.

Lagoons are the most common holding facility. In an open lagoon, the manure undergoes continuous anaerobic decomposition and nitrogen is released into the air while most of the phosphorous settles to the bottom. Operational failure of lagoons and the resulting waste spills have brought much of the recent critical attention to animal agriculture, and some have called for phasing out lagoons. In addition, the waste collected in lagoons has limited value as fertilizer if the cost to apply it exceeds the value of the nutrients.

Other types of holding and treatment facilities include composters, solid separators, and settling basins. Holding capacities of storage and treatment facilities are recommended based on the estimated time period the anticipated volume of waste may have to be retained. For example, waste should not be spread while the ground is frozen, or it will be washed into surface waters, so farms in locations where winters are long need a greater storage capacity. The management process ends when the

¹⁵U.S. Environmental Protection Agency. "Executive Summary, Feedlots Point Source Category Study, Preliminary Data Summary." Dec. 31, 1998: 14.

¹⁶Natural Resources Conservation Service. *Animal Manure Management*. NRCS/RCA Issue Brief 7, Dec. 1995. No pagination.

¹⁷Testimony of Jim Moseley, Representing the National Pork Producers Council before the Senate Committee on Agriculture, Nutrition, and Forestry, April 2, 1998: 7.

waste is transferred and used. The most common use, by far, is to spread it across the farm fields as a soil amendment and a nutrient supplement. How it is spread may have important environmental implications; for example, spray irrigation has been associated with environmental problems in some situations, while cultivation into the soil generally minimizes the potential for such problems.

Not all the manure produced by livestock can be collected so that its disposal can be managed. The 1996 Council for Agricultural Science and Technology (CAST) study estimates that almost 62 million tons, 55% of the total, can be collected. Much of the remainder is directly deposited in range and pastures. In discussing possible environmental harm from livestock wastes, whether the magnitude of the problem should be based on the total amount produced, or just the amount that is collectable, is subject to dispute. Some in industry say that collectable amounts are most important, since waste at confined feeding operations is collectable, and farmers can manage the disposal of these wastes to lessen environmental impact. Others say that all waste, including that which is deposited on pastureland, has potential for environmental harm.

Manure as an agricultural asset. Manure can be a valuable asset for agriculture, generally as a supplement to or partial substitute for commercial fertilizers. This value can best be determined when manure is considered in the broader context of overall nutrient management. Manure nutrient values, however, vary considerably and any supply of manure must be assessed for determining application rates. Commercial chemical fertilizer, by contrast, has consistent content, with that information supplied by the manufacturer. Also, nutrients from manure are not all immediately available. Guidelines on the rate of release have been developed for nitrogen, based on the source and form of the manure. NRCS (and probably others) has developed national design standards for many aspects of managing manure, and state regulations are being developed and implemented in a growing number of locations as well (see discussion below of State Programs and Legislative Activities).

A better way to view manure is as a soil amendment that improves many of the physical and chemical properties, as well as the nutrient values, of soil by adding organic material and improving soil structure and the ability to hold water and retain nutrients. These benefits are of considerable value. CAST reported in 1996 that animal waste can supply an average of 15% of the nitrogen and 42% of the phosphorus needed by crops. The study states that the total potential value of manure as fertilizer approaches \$3.4 billion annually. This figure does not include the economic benefits of improved soil quality, decreased runoff and soil erosion potential, and improved soil moisture, or offsetting costs associated with processing, transportation, and management.

Waste disposal options. Many options exist for disposing of animal waste, but spreading has always been and remains the preferred option throughout the farm community. If all the collectable animal waste could be added evenly to all farmland to help meet crop nutrient requirements, there would be no waste disposal problem. An analogy is rainfall--if the total volume of rain fell equally across the country and evenly throughout the year, supplies would exceed demand. Because it does not, the

country has developed extensive public works projects to hold and distribute water in a volume and pattern that meets various demands.

Animal waste also accumulates unequally across the country, probably far more unequally than rainfall. The NRCS explored this disparity in a recent study that used simulations to examine “the degree to which nutrients in manure from confined livestock operations could potentially satisfy crop nutrient requirements” if all manure was used on crops. The study, which assumed that nutrients were spread in acceptable manner on available land, compared crop nutrient uptake and removal with nutrients available from manure in each of the 3,056 counties in the contiguous United States for three crop systems. Results are shown in Table 3.

Table 3: Number of Counties where Nutrients Available from Manure Exceed 100% of Crop System Need

Crop System	Nitrogen	Phosphorus
Non legume crops and hay	266	485
Non legume crops and hay, and pasture	50	134
Non legume and legume crops and hay, and pasture	35	107

Source: NRCS. *Nutrients Available from Livestock Manure Relative to Crop Growth Requirements*. February, 1998, 8 p. plus maps and appendices. Resource Assessment and Strategic Planning Working Paper 98-1.

Alternatives for disposing of manure other than by land application are receiving increased attention. Many of these options have some promise in some situations, but none can be viewed as a “silver bullet” that can solve most problems in most locations. Many have large initial investment costs. The constituents and moisture content of the manure are important qualities in determining which disposal techniques to use. Shipping costs constrain many options because manure is of low economic value on a volume or weight basis, so it is uneconomic to ship it long distances unless it can be concentrated so as to decrease the volume or increase the value. Scientists have looked at ways to increase the value, while economists have prepared scenarios of the maximum shipping distances, given more specific characteristics.¹⁸

Options under study include composting, burning, and biotech changes to feed that alter the characteristics of the waste.¹⁹ Composting uses microorganisms to turn

¹⁸On February 25, 1999 Purdue, the largest poultry producer in Maryland, announced that it would be developing a facility to turn as much as 120,000 tons of poultry litter into fertilizer pellets annually. The project, which will cost between \$5 and \$6 million, was characterized by Purdue as an effort to give farmers an alternative means of disposal. *Washington Post*, February 25, 1999, p. B1 and B5.

¹⁹Information in this paragraph is taken largely from presentations at a forum on phosphorus and water quality in November 1997, convened by Representatives Wayne Gilchrest and Charlie Stenholm. These options were discussed in the context of poultry waste, and its
(continued...)

wastes into relatively stable and odorless material that can be used or sold as a soil amendment. Burning can be used to generate energy, but there are limitations. For example, one ton of poultry litter contains about the same amount of energy as 80 gallons of home heating oil, but has the same volume as about 500 gallons. The residue of burned manure is about 10% of the original volume, and contains little of the original nitrogen and sulfur but most of the phosphorus that was initially present. A biochemical change that has received considerable attention is adding phytase (an enzyme) to feed. Some, but not all studies have shown that it removes 25% to 40% of the phosphorus and 10% of the nitrogen excreted by causing the animals to use nutrients more efficiently. Further, the nitrogen is volatilized and lost to the atmosphere, but it may be redeposited elsewhere. (See discussion of atmospheric deposition on page 15.) Phytase does have a cost and must be added to feed. Still other options include converting the waste to fuel and energy, using industrial processes to convert the waste to other useful products, and using it as a feed supplement.

There are some significant success stories of manure management on farms for many of the options to using manure as a soil amendment. Ideas that go beyond these successes for managing animal wastes abound; examples that have been publicized recently are based on using duck weed or zebra mussels. But each approach is hard to apply widely because of some combination of physical limitations, high costs, lack of knowledge or management skills by the producer, unfamiliar or untested technologies, and a host of other factors. The costs and difficulties of storing and handling may be the most common constraints for these options.

Disposal problems. Even when farmers control adequate land, proper disposal in ways that will benefit crops and not harm the environment can still be a problem. The manure must be assessed for its nutrient value, then transported to the site, and spread at the proper amounts and at the proper time; each of these steps is an expense for farmers. (If these steps are not taken, any harm that results to the environment has costs, but mainly for the affected public and not necessarily for the individual farmers.) Inherent in these activities is a proper understanding of the value of manure. This understanding can reduce the risk of contaminating surface and ground water.

Producers usually determine application rates based on crop needs for nitrogen. But if application rates supply the needed nitrogen, in some instances the amount of phosphorus or potassium will be excessive for crop needs, especially after several successive years of application. Phosphorus can build up over time in soil, and this buildup is thought by some scientists to be a source of conditions that led to the *Pfiesteria* problems in Chesapeake Bay. (See Box 5, page 36). The National Research Council has stated that “the use of phosphorus as the criterion for determining manure loading rates may be appropriate, particularly in regions containing surface waters where accelerated eutrophication can occur.”²⁰ This

¹⁹(...continued)

possible contribution to *Pfiesteria* problems in some drainage areas along the eastern shore of Chesapeake Bay.

²⁰National Research Council, Board on Agriculture. *Soil and Water Quality: An Agenda for* (continued...)

criterion is recommended because phosphorus is the limiting nutrient in most fresh water bodies.

The data from the NRCS study shown in Table 3 indicate there is the potential for excessive nutrients in some locations. This report includes maps showing the counties for each simulation. However, the analysis does not convey a precise picture since county boundaries are not barriers to moving nutrients, nor is all cropland available for manure disposal, nor are any of the separate crop systems used on all cropland in any county. The definition of what is in excess will depend on the actual crops grown. Also, this data set is a snapshot that does not indicate change over time. An important conclusion of this study is that counties with a nitrogen excess have excess phosphorus as well, while the reverse is not necessarily true. While these data are about potential rather than actual nutrient amounts, and do not account for the ways that nutrients might be managed or used in alternative ways, the analysis does indicate where problems are most likely to arise. Those counties are largely concentrated in the southern tier of states from the Carolinas to California, with a few counties with excess phosphorus in the upper Midwest, western Nebraska, and eastern Colorado -- a pattern that is similar to the distribution of animal inventories and the largest farms.

Disposal has become more difficult for producers because of two converging trends within the livestock industry: (1) operations are larger which means that there is more waste at a single site; and (2) less land is under the control of these operators. For example, the largest 1% of the beef feedlots produce 71% of the fed beef, but control only 2% of the cropland on fed beef farms, while the smallest 92% of feedlots produce only 10% of the total but control 75% of the cropland.²¹ These relationships between herd size and available land suggest that many of the largest farms lack the capacity to manage their manure on the land under their direct control. These difficulties have been compounded by increased concerns about water quality and other problems that may originate with intense and concentrated livestock farms.

Livestock waste problems have led to some stricter state environmental regulations and the threat of more to come. Agricultural interests argue that these should be unnecessary because it is in the farmers' own interest to maintain a healthy environment. They also argue that the largest farms should have the capital and knowledge to effectively adopt appropriate waste management technologies. But operators of smaller farms, though likely to pose smaller problems individually (but not necessarily cumulatively), may be less likely to have the knowledge and the capital, and at least one analyst has argued that federal farm program assistance should be targeted to help this segment of the farm population. According to a recent review of the livestock sector in *Agricultural Outlook*, evidence suggests livestock producers have improved their environmental protection efforts. Based on experiences in North Carolina, where concentration has occurred rapidly, a large

²⁰(...continued)

Agriculture. (1993): 407.

²¹Letson, David and Noel Gollehon. "Confined animal production and the manure problem." *Choices*. Third Quarter, 1996: 19.

portion of violations were found to occur on smaller livestock operations.²² An explanation for such a pattern of violations is probably tied to some combination of economic opportunities, management skills, knowledge and training, and age and condition of facilities.

Manure management problems appear less substantial in this country than in some parts of Europe, especially the low countries. The process of recognition and response there merits review for possible lessons as the United States tries to explore options for addressing this problem. For example, the Netherlands has taken aggressive action to address manure management.²³ Phosphorus saturation is generally believed to be the most serious problem. Programs to stabilize manure production and application started in 1987, and since 1991, manure application rates have been declining. The Dutch policy goal is to reach an equilibrium fertilization rate by 2010, when the supply of nutrients from manure plus fertilizer are to be in balance with crop utilization and other losses. Programs designed for the characteristics of each region are important to this effort. Legislation that would impose fines on farmers for excess nutrient levels in the soil was being considered as this article was being prepared, and the authors of the article concluded that most producers would rather pay the fines for small exceedances rather than risk lowering their crop production.

Public Health and Environmental Concerns: Water Quality

According to limited data submitted by states and compiled by the Environmental Protection Agency (EPA), agriculture is now the leading source of water quality impairments in United States rivers and lakes, affecting 70% of impaired river miles and 48% of impaired lake acres. In estuaries, agriculture affects nearly 30% of impaired acres.²⁴ In 22 states that specifically assessed impacts of agricultural activities on rivers and streams, animal operations (feedlots and animal holding areas) were estimated to be the principal pollutant source in 20% of waters impaired by agricultural practices, impacting 35,000 river miles; overall, they were the third leading agricultural source affecting water quality, after nonirrigated crop production and irrigated crop production.²⁵

²²USDA, Economic Research Service. "Livestock manure: foe or fertilizer." *Agricultural Outlook*. June 1996: 35.

²³Information in this paragraph is summarized from: Van der Molen, Diederik T., Auke Breeuwsma and Paul C. Boers. "Agricultural nutrient losses to surface waters in the Netherlands: impact, strategies, and perspectives." *Journal of Environmental Quality*. Vol 27 (1998): 4-11.

²⁴*National Water Quality Inventory: 1996 Report to Congress*. These water quality data are limited, because they represent only conditions in waters assessed by states but do not include all water bodies. For this report, states surveyed 19% of river miles, 40% of lake acres, and 72% of estuaries. Nevertheless, EPA believes that the data point to a major, continuing water pollution problem coming from agricultural sources of all types — crop and pastureland, rangeland and concentrated animal operations. The data should be used with caution.

²⁵Statement of Michael Cook, U.S. EPA. In: U.S. Congress. Committee on Agriculture. (continued...)

Animal feeding operations have been shown to cause significant environmental and public health problems, including nutrient enrichment of surface and ground waters, contamination of drinking water supplies, fish kills, and odors. Animal waste, if not properly managed, can be transported by water over the surface of agricultural land to nearby lakes and streams. There, the nutrients in animal waste can reduce the oxygen content of the water, leading to algae blooms, fish kills, and threats to other wildlife. Solids deposited in water bodies can accelerate eutrophication by releasing nutrients over extended periods. Leaching from manure storage lagoons and percolation through the soil of fields when animal waste is applied has resulted in nutrient contamination of groundwater resources, and also can contribute to surface water pollution through subsurface groundwater recharge of lakes and streams.

Box 1. Farm Runoff in California

In California, a 50-square-mile area of western San Bernardino and Riverside counties is home to 300,000 dairy cows. At 6,000 cows per square mile, the area has the nation's densest concentration of dairy cows. During severe rain storms, manure and water flow off the farms and travel down the Santa Ana River. Higher than normal runoff from *El Niño* storms in 1998 (estimated to be the worst in 25 years) reportedly resulted in fish kills in lakes fed by the Santa Ana River, as well as elevated nitrate levels both in surface and ground waters. Officials in nearby Orange County were concerned that farm runoff would elevate nitrate levels in ground water above federal health standards. (Source: McCarthy, Jack. "Manure Flow Raises Worry." *The Press-Enterprise*, Riverside, CA. Apr. 18, 1998: B3.)

Although animal waste is not the only source of pathogens in surface waters, it has been responsible for shellfish contamination in some coastal waters. Closure of shellfish beds and recreational beaches can be necessitated by high fecal coliform counts, both from animal waste runoff and discharge of improperly treated sewage. Some animal diseases also can be transmitted to humans through contact with animal feces. Concern about the health effects of growing antibiotic resistance, fostered in part by widespread use of drugs in animal agriculture, is starting to attract more attention.²⁶

Catastrophic events, such as spills from livestock waste lagoons, have occurred in nearly every state; one of the most famous was in North Carolina in 1995. (See Box 4, page 34) An incident of fish kills that occurred in Maryland coastal waters in 1997 was attributed by some scientists, at least in part, to nutrients in poultry

²⁵(...continued)

Subcommittee on Forestry, Resource Conservation, and Research and Subcommittee on Livestock, Dairy, and Poultry. "Activities of the Environmental Protection Agency Related to Livestock Feeding Operations." Joint Hearing, 105th Congress, 2d Session. May 13, 1998: 60. Serial No. 105-50.

²⁶Committee on Drug Use in Food Animals, Board on Agriculture and Food and Nutrition Board. *The Use of Drugs in Food Animals: Benefits and Risks*. Washington, D.C., National Research Council, 1999. 210 p.

wastes discharged into the affected waters that stimulated a toxic microbe, *Pfiesteria piscicida*. (See Box 5, page 36).²⁷

Atmospheric deposition of nitrogen from animal operations is also an environmental concern. This occurs when nitrogen in liquid waste is volatilized as ammonia nitrogen (NH₃) from anaerobic (oxygen-deprived) lagoons, causing ammonia to evaporate. Volatilization also occurs after land application. Once in the atmosphere, it is converted to forms which are redeposited within 50-100 miles on land or in surface waters. These forms of nitrogen are water-soluble, meaning the nitrogen can adversely affect water quality much like nitrogen fertilizer if it enters a stream as direct surface runoff. Data from some locations is beginning to demonstrate the dimensions of this problem. For example, in North Carolina, where concentration and numbers of livestock have increased dramatically, data indicate that ammonia emissions in 1995 from swine operations, mainly in the southeast portion of the state, were 50% of the state total of nitrogen oxides-nitrogen emissions from either point sources or highway mobile sources.²⁸

Box 2. Animal Agriculture and Odor Problems

Odor is the most controversial nuisance problem associated with feedlots. Complaints about odor come from downwind neighbors, for the most part. Odors emanating from livestock production are generally related to manure handling, but other potential odor sources include wet feed and the decomposition of dead animals. The odors consist of gases, such as ammonia, hydrogen sulfide, methane, and organic compounds produced during decomposition of manure. Although some of the gases are known to be harmful or toxic in large amounts, the principal effect upon humans is annoyance or nuisance. The rules and regulations controlling livestock odors and air emissions are based primarily on the concept of nuisance, not the regulation of pollution *per se* under the Clean Air Act or other federal environmental laws. Solutions to odor problems generally involve setbacks, buffers, and other land use planning tools which are applied at state and local levels. The pork industry, in particular, appears to be working aggressively to address odor concerns.

Agricultural interests, when discussing public health and environmental concerns, emphasize that most farmers are diligent stewards of the environment, since they, like their neighbors, directly experience adverse impacts on water and air quality. Part of the problem is perception. For example, odor that may bother neighbors who are not involved in livestock agriculture may be viewed as an acceptable side effect (if recognized at all) by livestock producers. Like their non-farming neighbors and critics of animal agriculture operations, farm groups claim they are concerned with

²⁷For additional information, see CRS Report 97-1047, *Pfiesteria and Related Harmful Blooms: Natural Resource and Human Health Concerns*.

²⁸Aneja, Viney P., George C. Murray, James Southerland. "Atmospheric nitrogen compounds: emissions, transport, transformation, deposition, and assessment." *EM*, vol. 4, April 1998: 22-25.

identifying operators — whether big or small — whose activities do not fully protect existing resources. However, for many farmers, the loss of agricultural nutrients in runoff (beyond nutrient amounts needed for crop production) is not a consideration that they typically take into account in their operations. In part, this may occur if they lack information about what amounts of nutrients (manure and fertilizer) are needed by plants and thus may assume that using more is preferable to using less. Farmers become concerned with off-site impacts which affect them economically, *i.e.*, if the farmer is fined for a spill or is forced to purchase equipment to manage manure.

Federal Programs and Activities

Programs for Animal Waste at USDA

Agriculture resource conservation programs are voluntary and rely on the combination of education, technical assistance, and cost sharing payments to attract participation. Little information is available, however, on the cost-effectiveness of this approach -- whether owners of the lands and resources that could benefit most are participating in these programs. This question of who participates was less of an issue when conservation programs revolved around helping landowners to protect their soil and water resources so that they could increase their productivity and profits. But as these programs have expanded to address resource degradation and off-site environmental problems, as well, non-agricultural interests have raised more questions about program effectiveness in reaching the right land (and landowners) and addressing the most pressing problems.

Agricultural interests contend that much is being accomplished, especially with the shifts in policy in the 1996 farm bill (P.L. 104-127, the Federal Agricultural Improvement and Reform Act of 1996; the FAIR Act), which have led to active State Technical Committees and “locally led conservation” to help ensure that the most pressing problems are identified locally and receive priority attention at a state level. Decisions that were largely made in Washington about priority problems and priority areas in which to concentrate program efforts are now being made at the state level, based on local involvement and input from a wide range of agricultural and other interests. But this system is less than 3 years old, and there are few results to report.

Until the 1996 farm bill was enacted, no conservation programs dealt explicitly with animal waste management issues, although many were used to address some kinds of problems that might originate with animal waste, especially water quality problems. It is difficult to discern what portion of the extensive USDA water quality protection effort can be tied back to addressing animal waste management questions, or what those programs have accomplished. However, one review of conservation spending for selected programs between FY92 and FY94 shows that \$89 million (out of more than \$525 million) was provided in cost sharing assistance to farmers for manure management, primarily to build animal waste containment structures.²⁹

²⁹ U.S. General Accounting Office. “Briefing section 5: USDA conservation programs providing cost sharing assistance for animal waste management.” *Animal Agriculture*: (continued...)

The 1996 farm bill created the Environmental Quality Incentive Program (EQIP). EQIP is a mandatory spending program authorized to receive \$200 million a year. It is the only conservation program to explicitly identify meeting the needs of animal agriculture as a stated program purpose. Half the EQIP funds are to address problems associated with livestock production. The law directs the program to maximize environmental benefits in the installation of structural and land management practices per dollar expended. The funds provide assistance through a combination of cost sharing (up to 75% of project costs), technical assistance, and education. A plan is required to participate. Payments per contract are limited to \$10,000 annually and to \$50,000 over the life of a contract (5 to 10 years). However, exceptions to the annual limit may be granted. A majority of the funds (70% to 80%) are to be spent in priority areas, which are identified by each state based on an assessment of their most pressing conservation needs. This is a major change from older conservation programs, where funds and technical assistance were made available more uniformly across the country.

EQIP funds to be spent on livestock production favor smaller operations, as the law prohibits cost share funds from being used for construction of animal waste management facilities on "large farms." Congress left the definition of large farms to USDA, which chose to use the EPA definition of CAFOs (see pages 19-20), with some flexibility for adjustment at the state level. The Department has estimated that half the \$100 million for animal issues annually (\$50 million) will be spent on animal waste management facilities, so this limitation applies to a significant component of the program.

Final regulations for EQIP were released in May 1997. Initial contracts were signed during the early fall of 1997. There is a very limited record of accomplishment as yet based on an evaluation of activities in 12 states and 35 counties. However, the program is meeting a demand; according to USDA, as producers sought almost three times the available funds during FY1997, and in FY1998, only 36% of the applications could be funded. The Clinton Administration has proposed increasing annual funding to \$300 million in its FY1999 and FY2000 budget submissions, but the request has not included a statement about how specifically additional funds would be spent. Congress rejected this increase in FY1999, instead reducing funding to \$174 million.

The Conservation Reserve Program (CRP) is less directly tied to animal waste management, but can be important in several ways. It is used to retire highly erodible and environmentally sensitive lands from production for 10 years (or longer under certain circumstances). Successful bidders receive annual rental payments, and also cost sharing and technical assistance to plant conserving vegetation. The program has an enrollment cap of 36.4 million acres (almost 10% of the country's cropland) and currently has more than 30 million acres enrolled. In general, producers bid to enter the program during enrollment periods. Bids are compared using an environmental benefits index that includes six variables to ensure the maximum environmental

²⁹(...continued)

Information on Waste Management and Water Quality Issues. GAO/RCED-95-200BR June 1995: 72-81.

benefits for the funds expended. One of those is water quality, so animal waste concerns may be addressed indirectly, for a few bidders, through the credit given under this factor.

CRP has two sub-programs, or initiatives, that may be more helpful in addressing animal waste issues. One is the Conservation Reserve Enhancement Program (CREP) where states can supplement the federal program with a more focused state effort that provides more money per acre to participants. Maryland was the first state to have a CREP approved, in the fall of 1997, to address *Pfiesteria*-related issues on the state's eastern shore of Chesapeake Bay. CREPs have now been approved for Minnesota, Illinois, New York, Oregon, Washington, and North Carolina. These states are using this program to address a number of water quality concerns, including restoration of fish habitat and reduction of nutrients and sediment inputs in watersheds. Agreements also are being developed in several other states. The second initiative would protect 2 million miles of water bodies using buffers by 2002. The most recent data show that a total of about 765,000 acres has been enrolled under both initiatives. These initiatives are intended to protect water quality from numerous problem sources, including animal wastes.

USDA initiated a Water Quality Program in 1990, with three other federal agencies (EPA and the Departments of the Interior and of Commerce), to promote sound farm production practices and protect waters from contamination originating with agriculture. Farm chemicals and waste products, which can include animal wastes, have been the focus of this effort. Through 1996, an annual average of about \$100 million was being spent by several agencies at USDA on this initiative. It has been implemented through demonstration and watershed projects that include research, information, and assistance components. This is a recent effort that builds on a long history of interest in water quality. In this and earlier efforts, animal waste has not been a focus, but the nutrients from animal waste sometimes have been considered. Some observations on this initiative, which generally supports the traditional approaches for assisting farmers, were offered by the Economic Research Service after examining these water quality programs.³⁰

- Voluntary programs are most likely to succeed where farmers recognize that agriculture contributes to local water quality problems.
- Voluntary programs are more likely to succeed where recommended alternative practices are likely to produce economic benefits.
- Cost-effectiveness is enhanced by targeting to and within watersheds.
- Flexible cost share programs to support conservation practices are more efficient than those with fixed rates or limited to few practices.
- Better local information on economic and physical performance of recommended practices increases acceptance and participation.
- More attention to monitoring and project evaluation could help to improve these programs.

³⁰USDA, Economic Research Service. "Chapter 6.2: water quality programs." *Agricultural Resources and Environmental Indicators, 1996-97*. (1997): 281-83.

USDA also has undertaken a number of activities to more specifically address the animal waste issue. They build on past water quality initiatives, but do not appear to reorient them. Many of these activities, such as reviewing nutrient management policies and technical standards, working with EPA to develop a unified national strategy for CAFOs, and participating in the National Environmental Dialogue on Pork Production convened by America's Clean Water Foundation have been completed or have moved forward during the past year (see discussion on page 37)

USDA also established an Air Quality Task Force (as required by the 1996 farm bill) and in 1998 signed a Memorandum of Understanding (MOU) with EPA to coordinate efforts to address air quality issues. While animal agriculture is not specifically mentioned in the MOU, several broad areas of cooperation are identified in which animal agriculture is likely to play a role.

Animal Feeding Operations and the Clean Water Act

Much of agriculture is not directly subject to the Clean Water Act (CWA), the federal law that governs the quality of United States rivers, lakes, estuaries, and coastal waters. The Act's traditional focus has been on controlling wastewater from manufacturing and other industrial facilities, termed point sources. Most agricultural activities are considered to be nonpoint sources of pollution, since they do not discharge wastes from clearly identifiable pipes, outfalls, or similar conveyances. Nonpoint pollution occurs as surface erosion of soil by water and as surface runoff of rainfall or snowmelt from diffuse areas such as farm and ranch land, construction sites, and mining and timber operations. Nonpoint sources are not required to obtain discharge permits. Consequently, agricultural and other nonpoint sources are not subject to the compliance and enforcement regime that applies to point sources.

Agricultural and other nonpoint sources have become increasingly prominent in debates over water quality policy, however, because these types of diffuse sources are believed to represent the largest remaining water pollution problem affecting United States waters. To begin to address these issues, the 1987 CWA amendments directed states to implement programs for managing nonpoint sources. Consequently, under federal law, agricultural sources could be subject to state-developed plans requiring operators to use management measures to limit pollutant runoff from their lands. There is anecdotal information that state nonpoint pollution programs are addressing agricultural runoff in various ways, including technical and financial assistance.³¹

Large animal feeding operations are an exception to the general approach to agriculture in the CWA. Since 1972 (P.L. 92-500), the CWA has defined CAFOs as point rather than nonpoint sources. They are subject to the Act's prohibition against discharging pollutants into waters of the United States without a permit. Thus, CAFOs are treated in a similar manner to other industrial sources of pollution, such as factories and municipal sewage treatment plants. The Act is administered by EPA, and in 1974 and 1976, EPA issued regulations defining the term CAFO for purposes

³¹U.S. Environmental Protection Agency. *Section 319 Success Stories: Volume II. Highlights of State and Tribal Nonpoint Source Programs*. EPA 841-R-97-001. Oct. 1997. 213 p.

of permit requirements (40 CFR §122.23) and effluent limitation guidelines specifying limits on pollutant discharges from feedlots (40 CFR Part 412). Discharge permits, issued by EPA or qualified states (43 states have been delegated this responsibility), implement the Part 412 requirements for individual facilities. Under the permit rules, an AFO is a CAFO, and thus subject to EPA rules, if it meets all of the following criteria:

- Animals are stabled or confined and fed for 45 days or more in a 12-month period;
- Vegetation is not sustained during the normal growing season on any portion of the lot or facility (*i.e.*, animals are not maintained in a pasture or on rangeland);
- Feedlots hold more than 1,000 animal units³² (or between 300 and 1,000 animal units if pollutants are discharged from a manmade conveyance or are discharged directly into waters passing over, across, or through the facility). Also, animal feeding operations that include fewer than 300 animal units may be designated as CAFOs if they pose a threat to water quality or use. Based on the USDA 1992 Census of Agriculture, EPA estimates that 6,600 feeding operations qualify as CAFOs, considering the number of animal units alone -- only 1.5% of the 450,000 operations nationwide that confine or concentrate animals.³³

EPA's effluent limitation regulations apply to operations that raise beef and dairy cattle, poultry, swine, sheep, and horses. The rules essentially prohibit discharge of wastewater from CAFOs into navigable waters, except those caused by the worst 24-hour storm that would occur in a 25-year period. These regulations do not specifically address discharges that may occur from wastewaters or solid manure mixtures which are applied to soil, nor do they address odor control or groundwater impacts from animal agriculture operations. These topics, if regulated at all, are subject to varied state and local authority, not federal law or regulation.

In addition to the CWA, the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) imposed waste management requirements on most livestock producers in the coastal zone of the 29 states that participate in the Coastal Zone Management Act. CZARA is the first federal program to require specific measures to address agricultural erosion and runoff and other major sources of coastal nonpoint

³²As defined by USDA, an animal unit is 1,000 pounds of live weight of any given livestock species or combination of livestock species. This term varies according to animal type; one animal is not always equal to one animal unit. EPA's regulations cover AFOs consisting of: 1,000 beef cattle; 700 mature dairy cattle; 2,500 swine weighing over 55 pounds; 500 horses; 10,000 sheep; 55,000 turkeys; or 30,000 laying hens or broilers (with a liquid manure handling system).

³³Illustrating the concentration that has occurred in the animal agriculture sector are changes over time in the number of CAFOs. When EPA's current CAFO regulations were proposed in 1975, USDA analyzed the potential impacts. It reported that 95,000, or 13.6%, of the 700,000 animal feeding operations in the country would be subject to those rules. (Source: U.S. Department of Agriculture. "Implications of EPA Proposed Regulations of November 20, 1975 for the Animal Feeding Operations." Washington, DC, Jan. 30, 1976. 26 p.) The smaller number of total operations and smaller number of CAFOs today suggest that those that are regulated currently are, on average, much larger than 20 years ago.

pollution. Its requirements are implemented by states through plans that they develop under CZARA. Federal CZARA guidance for agricultural sources specifies minimum management measures including retention ponds, solids separation basins, and vegetative practices such as filter strips between production facilities and nearby surface waters. CAFOs with as few as 50 animal units may be subject to these and other requirements. Federal agencies have conditionally approved CZARA programs in all 29 coastal states, and livestock and poultry producers there will begin to see actual requirements in the near future. The law and the implementing regulations do not specify a timeline for implementation.

Problems with CAFO regulation. A number of problems with the current CAFO regulatory system under the CWA have limited its effectiveness in preventing environmental problems from livestock production.

- Fewer than 30% of the CAFOs with over 1,000 animal units had or have CWA permits today (*i.e.*, 2,000 out of 6,600). One explanation is the historic emphasis by federal and state regulators on other large industrial and municipal dischargers over agricultural sources, since most of agriculture is not subject to the Act. EPA estimated that only 760 permits were current at the end of 1995.³⁴ Another factor is disputes between regulators and agricultural operators on whether particular facilities meet the regulatory threshold, such as whether the regulations apply to feedlots that claim to have no discharge. Many states treat animal feeding operations as non-discharging facilities (thus not requiring permits or water quality monitoring) on the premise that lagoons do not leak and that nutrients in land-sprayed waste are fully taken up by crops.
- Disputes also arose and some sources went unregulated because the EPA rules, now more than 20 years old, do not reflect more recent changes in animal waste management technology. In particular, EPA defines feeding operations with 100,000 laying hens or broilers that use continuous flow watering systems and facilities with 30,000 laying hens or broilers that use liquid manure systems as CAFOs. However, the poultry industry has moved away from such wet systems since the 1970s. Many broiler producers now use dry litter waste systems where water is not applied and there is no discharge; they have argued that they are not subject to the rules. Producers of layers generally still have liquid waste systems.
- Federal regulations and guidelines contain no requirement for nutrient or manure management plans. Most experts hold that plans which concern applying manure at rates necessary for crops to utilize nutrients efficiently, without excess runoff or leaching, can minimize damage to groundwater and surface water. The federal CAFO rules cover manure spreading on-site, through the "no-discharge" standard, but do not regulate spreading once the manure leaves the property where it was generated.

³⁴Parry, Roberta. "Agricultural phosphorus and water quality: a U.S. Environmental Protection Agency perspective." *Journal of Environmental Quality*. Vol. 27, no. 2 (1998): 258.

- CAFO inspections by federal and state regulators and compliance enforcement activities have been limited, often occurring only after citizen complaints or accidental releases following large rainfall events or equipment or facility failures.

Recent Initiatives under the Clean Water Action Plan: The National Animal Feeding Operations (AFO) Strategy

EPA has not lacked authority to address water quality problems associated with animal feeding operations, but doing so was not an apparent priority.³⁵ For several years, Agency officials discussed the need to revise the CAFO regulations, and in 1997, plans were announced for two initiatives -- one dealing with CWA enforcement against livestock producers and one dealing comprehensively with all sources of nonpoint source pollution, including farm operations, but with few implementation details.

Several events combined to raise the priority of these topics. One was increasing attention to pollution incidents resulting from or believed associated with animal waste spills. Another was the growing number of lawsuits filed by environmentalists against states and EPA (involving nearly 2 dozen states), seeking to compel action against remaining sources of water pollution, including agriculture.³⁶ A third came in October 1997, the 25th anniversary of the Clean Water Act, when Vice President Gore announced an initiative to address the nation's remaining water quality problems. He directed EPA and other federal agencies to develop an Action Plan to improve and strengthen water pollution control efforts across the country. That plan, released in February 1998, identified controlling polluted runoff as one of the biggest remaining water quality challenges and focused on agriculture's contributions.³⁷

In September 1998 EPA and USDA jointly proposed a major program to implement the Clean Water Action Plan: a draft unified national strategy for animal feeding operations to minimize the water quality and public health impacts of AFOs. Following a 120-day public comment period that included 11 "listening sessions" around the country, the two agencies issued a final AFO strategy March 9, 1999.³⁸

³⁵CWA section 304(b) requires EPA to review and, if appropriate, revise effluent limitation guidelines at least annually. The CAFO standards have not been revised since they were promulgated in the mid-1970s.

³⁶The lawsuits address federal and state implementation of CWA §303(d), which requires states to identify and list waters not meeting water quality standards, then establish total maximum daily loads (TMDLs) to allocate loadings of pollutants in those waters. For information, see CRS Report 97-831, *Clean Water Act and Total Maximum Daily Loads (TMDLs) of Pollutants*.

³⁷U.S. Environmental Protection Agency, U.S. Department of Agriculture. *Clean Water Action Plan: Restoring and Protecting America's Waters*. Feb. 14, 1998. 1 vol. See: <http://www.cleanwater.gov>. For additional information, see CRS Report 98-150, *The Clean Water Action Plan: Background and Early Implementation*.

³⁸U.S. Department of Agriculture, U.S. Environmental Protection Agency. "Unified National (continued...)"

The strategy itself is not a new regulation or substitute for existing regulations, nor does it impose binding requirements on federal agencies, states, tribes, localities, or the regulated community. It presents an overall approach and timetable for curbing pollution from livestock operations. However, many of the details — and, hence, many of the specific impacts on operators, states, and others — will only become clear with the issuance of guidance and regulatory changes in the coming months.³⁹

The strategy consists of multiple elements and is based on a national performance expectation that all AFO owners and operators — regardless of the size of their operations — will develop and implement site-specific Comprehensive Nutrient Management Plans (CNMPs) by 2009. With the exception of large AFO operations which are considered to be CAFOs and thus are subject to CWA requirements (about 5% of total AFOs nationwide), the agencies expect that the vast majority of CNMPs will be developed and implemented voluntarily. In general terms, a CNMP will identify actions or priorities to meet clearly identified nutrient management goals at an agricultural operation and typically will address manure handling and storage, land application of manure, land management (such as tillage, crop residue management, and other conservation practices), recordkeeping, and other utilization options (for example, when manure is sold to other farmers). Plans will be developed by qualified specialists. NRCS estimates that at least 330,000 AFOs need to develop CNMPs or revise existing nutrient management plans to meet the performance expectation of the strategy. The strategy recognizes that technical and financial assistance will be needed both to develop and to implement CNMPs, and it discusses additional resources in the Administration's FY2000 budget to be directed at such assistance.⁴⁰

The strategy views regulatory programs as complementary to voluntary approaches that will apply to 95% of AFOs. Under existing CWA authority, the strategy says that the NPDES permit program will be used to address the relatively small number of AFOs that cause water quality or public health problems or that pose a significant risk to water quality or public health. It identifies the following priorities for permitting and enforcement:

³⁸(...continued)

Strategy for Animal Feeding Operations." March 9, 1999. 46 p. Text of the strategy is available at [<http://www.epa.gov/owm/afo.htm>].

³⁹Prior to issuance of the national AFO strategy in March 1998, EPA released a compliance assurance implementation plan for CAFOs to enhance compliance with existing CAFO requirements. It includes elements to increase compliance assistance to operators, strengthen federal-state enforcement partnerships, and strengthen federal and state compliance monitoring programs. Text is available at: [<http://es.epa.gov/oeca/strategy.html>]. This plan is incorporated in the March 1999 national strategy. Ibid.: 36-37.

⁴⁰The President's FY2000 budget requests an additional \$126 million (for \$300 million total) for the EQIP program and \$20 million in USDA assistance to existing AFOs for development or revision of CNMPs. In FY1999 EPA received an additional \$95 million (for \$200 million total) for the Section 319 nonpoint source management grant program, with the increase directed to priority watersheds under the Clean Water Action Plan. The President's budget asks for \$200 million for this grant program for FY2000 and also proposes to allow states to use up to \$160 million of clean water State Revolving Fund monies (generally limited to municipal wastewater treatment projects) as grants for nonpoint source projects.

- Large facilities (those with greater than 1,000 animal units) which produce quantities of manure than can be a risk to water quality and public health. These already are considered to be CAFOS and therefore are "point sources" already subject to NPDES permit requirements.
- Some facilities with fewer than 1,000 animal units which can pose a risk of water pollution or public health problems, because the facilities have a manmade conveyance to discharge manure and wastewaters into streams.
- Other individual facilities or collection of facilities with fewer than 1,000 animal units that, based on water quality monitoring, are contributing significantly to impairment of a water body or watershed; such facilities will be designated as CAFOs and will be a priority for permit issuance and enforcement.

EPA expects that the total number of CAFOs meeting at least one of three priority conditions for NPDES permits will be 15,000 - 20,000 facilities. These facilities will be required to develop and implement CNMPs, and their permits will include specific performance measures, monitoring, and reporting. Under the strategy, states and EPA should identify the universe of CAFOs and inspect all CAFOs in watersheds with vulnerable waters by 2001 and all other CAFOs by 2003. Permitting will occur in two phases. First, between 2000 and 2005, EPA and authorized states will issue NPDES permits under existing regulations to priority facilities. EPA expects that this will occur mainly through general permits (either issued on a statewide basis or for specific geographic areas, such as watersheds), but that individual permits will be issued to exceptionally large operations, new operations or those undergoing significant expansion, operations with historical compliance problems, or operations with significant environmental concerns. By August 1999, EPA will issue permitting guidance and model permits as assistance to states.

EPA also will initiate revisions to the existing CAFO permitting regulations and effluent guidelines, using input from USDA, states, tribes, other federal agencies, and the public. EPA currently is under a court-ordered schedule to revise the effluent guidelines for poultry and swine by December 2001 and for beef and dairy cattle by December 2002. In the second phase of NPDES permitting, from 2005 to 2010, EPA and states will reissue permits from the first round and will incorporate any new requirements that could result from regulatory revisions completed in the interim.

The final strategy vs. the draft. The final AFO national strategy is similar to the September 1998 draft, but has two key additions. First, it differs from the draft in how it addresses corporate integrators, owners of livestock that contract out to farmers to raise the animals or poultry. The final strategy recommends a co-permitting system, in which permits would cover not just the grower or farmer, but also the corporate owner. In such a system, liability for handling the animal waste and for any environmental violations would extend to the corporate owner that exercises substantial operational control over a CAFO, as well as the farmer. Such co-permitting would be new in the field of federal environmental regulation. Environmental groups in particular have urged such co-permitting, arguing that it could go a long way to improving waste management by involving integrators in ensuring that their contract growers are environmentally responsible. While some states already recognize that corporate owners share responsibility with farmers, industry groups have generally opposed including formal requirements in permit

programs. In their view, it is inappropriate to hold the corporate entity responsible for an environmental violation when that entity does not own the farm, its buildings, the land, or the waste produced by the animals.

In another change from the draft, the final strategy allows states that can show they meet the requirements of the NPDES program to be recognized by EPA as functionally equivalent to requirements of the federal program. This part of the strategy recognizes that some states are implementing permitting programs under state law that meet or exceed the requirements of the NPDES program (see the following section of this report, State Programs and Legislative Activity). States will have to go through a review and public notice in order to have their programs recognized as NPDES equivalent. EPA promises in the strategy to act on program proposals within 45 days so that states can meet the goal of issuing permits for large CAFOs by January 2000. The early reaction of state officials to this part of the strategy was positive, although they said that the details of demonstrating functional equivalency, when issued by EPA, will require careful review.

Reactions and response to the strategy. EPA and USDA received more than 1,800 public comments on the draft strategy. The strongest reactions, both to the draft and final form, have come, not surprisingly, from farmers and farm groups. During the public comment period on the draft strategy, they raised concerns about regulations that drive up the cost of production and whether financial assistance will be available to lessen costly impacts, especially on small operations. The expense of compliance could increase the cost of food, make U.S. farming less competitive, and put farmers out of business, they say. A number of farm groups and individuals have expressed a fear that a national AFO strategy will enable EPA, through clean water rules, to control economic activity and land-use decisions of farmers.⁴¹ Most would prefer that any animal waste program focus on voluntary approaches that encourage owners and operators to utilize good environmental practices, with regulation and enforcement limited to only known problems of poor resource management.

At the same time, some operators consider a more pronounced federal role as an opportunity to harmonize conflicting federal, state, and local policies — a view of the pork producers' industry, for example, which believes that minimum nationwide standards could bring stability to livestock industries and level the playing field where states and counties are adopting a patchwork of requirements. However, support by livestock groups for federal efforts is likely to hinge on whether federal rules are viewed as unduly restrictive or impose unrealistic deadlines, and whether they include incentives such as financial and technical assistance.

Farm groups argue that the water quality data on which EPA bases the need for regulatory action are flawed. Because the data reflect monitoring and assessment of only a small portion of all waters, they should not be used to assert that agriculture and feedlots are linked to a water quality crisis, these groups contend. EPA believes that while it is difficult to determine the exact contribution of any particular category of pollution source on a national basis (e.g., agriculture or municipal point sources), it is widely recognized that AFOs can pose a number of risks to water quality and

⁴¹"Farm Groups Fear Regulatory Intrusion." *Land Letter*, Jan. 28, 1999: 2.

public health, mainly because of the amount of animal manure and wastewater they generate.⁴² (See footnote 24, which discusses data on waterbodies monitored and assessed by states.)

From the states' perspective, many have questioned the need for a national program. States agree that animal feeding operations have a significant impact on water quality, yet because many have acted legislatively and administratively to address animal waste problems (see discussion in the next section), they fear (as do farm groups) that a national program would attempt to impose a "one size fits all" approach to a problem that is diverse and complex. However, supporters of federal regulation point out that there is great variability among state programs and say that a national approach is necessary to provide a more even economic playing field by requiring minimum national standards. For states, a key concern has been that many already have difficulty providing resources for feedlot inspections and enforcement; thus, they are wary of new regulatory requirements that could impose additional resource burdens. States also say that they need flexibility to coordinate and prioritize implementation of the federal strategy with other equally important state environmental quality programs. EPA's concern is to balance the states' desire for flexibility with the federal agency's desire to have state programs be accountable by meeting minimum federal standards and provide an opportunity, if needed, for federal enforceability.

Environmentalists' reactions to the final strategy were mixed. While applauding the fact that the strategy addresses the waste management responsibility of corporate owners, some have said that the proposed timeline to implement the strategy (7 years to issue permits for all CAFOs) is too slow. Many are critical that EPA failed to act on this problem sooner. Environmentalists often are skeptical of voluntary approaches to managing animal waste, particularly where there is no requirement for water quality monitoring or reporting, and little or no public involvement in siting, permitting, or similar decisionmaking. Variability among existing state programs has been a concern to environmental groups. Some have favored a federal moratorium on new or expanded feedlots (for 2 years, for example) to give EPA and states time to develop and implement new programs and, thus, were disappointed that a moratorium was not included in the final strategy.⁴³

⁴²"Unified National Strategy for Animal Feeding Operations:" 5.

⁴³"Farmers, Environmentalists Blast EPA Plan to Control Polluted Runoff," Inside E.P.A., March 12, 1999: 13.

State Programs and Legislative Activity

State Laws and Programs⁴⁴

While most states have some form of livestock waste regulation, state laws and programs vary widely in approach and implementation. For example, nearly 30 state departments of agriculture administer some type of program to regulate animal waste and manure, and 43 states are responsible for administering Clean Water Act permit requirements for CAFOs, usually through an environmental agency. No single model encompasses the approaches of all states. Which state agency is in charge, or whether responsibility is shared, varies. In many states, regulatory programs are limited to some livestock sectors but not others.

Requirements of state programs differ. For example, in Minnesota, permits are required for facilities with as few as 50 animal units, while many states only require permits for facilities with more than 1,000 animal units (the EPA threshold). In Nebraska, operations of any size require a permit if they have potential to discharge. As noted previously, many states do not issue CWA permits to CAFOs, on the premise that the facilities do not discharge wastes. Several states use letters of approval to authorize livestock operations; others use general permits or licenses. Critics fault these systems, concerned that they typically do not afford public involvement or provide for enforceability, compared with permits. General permits take a "one size fits all" approach which does not consider site-specific requirements for individual facilities, critics say.

Some states (Iowa, for example) require permits for construction of waste lagoons and other facilities, but not for operation. Others such as Nebraska require permits for both, but only in areas where operations are believed to pose environmental risk. Some states (California, Georgia, Idaho, Indiana, and Oklahoma, for example) require operators to follow design standards, including use of liners for waste lagoons, but many have no such standards. A small but growing number of states require training and certification of operators for manure application and management.

In March 1999, Maryland became the first state to require that corporate poultry producers take responsibility under their own NPDES clean water permits for the waste generated by the operations of farmers who raise the poultry. As NPDES permits for the corporations come up for renewal, they will be modified to require producers to buy poultry only from those growers who have an approved comprehensive nutrient management plan. State officials see this as a way to require companies to take responsibility for the way their contract growers dispose of waste. Poultry industry representatives oppose the Maryland plan and question the state's authority to impose such restrictions in NPDES permits.

⁴⁴This section is based on information from a number of sources, including: National Association of State Departments of Agriculture. *State Survey on Waste & Manure Management Regulations (draft)*. December 1998. 29 p.

Some states currently require some or all CAFOs to develop a nutrient management plan or waste utilization plan, as contemplated in the national AFO strategy (e.g., California, Hawaii, Illinois, Iowa, and Maryland). But like other aspects of state programs, they too vary widely, for example in whether state approval of the plan is required. Elsewhere, such plans are voluntary (e.g., Connecticut, Delaware, Michigan, Minnesota, Ohio).

Few states have air quality regulations related to CAFOs; New Jersey does have regulations, and Oklahoma requires an odor abatement plan, but most states either have no requirements or specifically exempt agriculture sources. In 1998, Missouri's Air Conservation Commission created a task force to study farm odor pollution issues and to close a loophole in state law that exempts very large farms from odor emission rules. Also in 1998, Colorado voters approved a constitutional amendment which, among other things, will require odor control measures at swine operations. State laws and programs also vary in the amount of public notice or participation that is required or allowed in connection with permitting. Many states do not require inspection before permit issuance or waste management plan approval or routinely thereafter. In such cases, violators are identified only upon citizen complaints. Only a few require groundwater or other monitoring to determine if lagoons leak and contaminate water resources.

According to a review of state regulation of agricultural nutrients, in most cases, state authorities closely follow or only modestly expand upon federal requirements. Where they do vary, enforceable state laws relating to CAFOs may expand on federal requirements in at least three ways.⁴⁵ First, some impose siting requirements and limitations (North Carolina, South Dakota, and Iowa, for example). Second, a number of states require enforceable nutrient management plans and/or best management practices (such states as Pennsylvania, West Virginia, Vermont, Ohio and Florida). Third, some states expand on federal rules by regulating CAFOs that are smaller than the EPA definition (Mississippi, Kansas, and Connecticut, for example). More generally, several states have laws with enforceable requirements concerning nonpoint source pollution from agricultural nutrients (both manure and fertilizers), particularly if such material threatens ground or surface water pollution (such as Nebraska, Michigan, Montana, and Arizona).⁴⁶

In some areas, management of animal waste is market-driven, as much as it is regulated by government. For example, in Pennsylvania, banks that faced large liability costs for manure spills into waterways, have taken steps to protect their investments by requiring agricultural loan applicants to supply nutrient management plans.⁴⁷ At the same time, Pennsylvania is now implementing a law passed in 1993 that requires farms with more than 1,000 pounds of animal (i.e., 1 cow) per acre to prepare a plan with Best Management Practices to prevent nutrient releases to the

⁴⁵McElfish, James M., Jr. "State Enforcement Authorities for Polluted Runoff." *The Environment Law Reporter News & Analysis*. Vol. 28, no. 4 (April 1998): 10181-10201.

⁴⁶Ibid.: 10196-10197.

⁴⁷"States Tackle Animal Waste Problem to Improve Water Quality." *Environmental Science & Technology*, vol. 30, no. 12 (1996): 529A-530A.

environment. About 8,000-10,000 existing beef, dairy, swine, poultry, and horse farms in Pennsylvania meet the law's animal density criteria. The plans must meet a performance requirement that limits application of nutrients to plant uptake levels.⁴⁸

Many states have so-called "right to farm" laws that protect agricultural activities by creating a presumption that, unless explicitly addressed through local zoning, farming activities are deemed permitted if they are conducted in accordance with accepted practices and all applicable laws and regulations. These state laws often exempt agricultural activities from nuisance laws, thus preventing or limiting nuisance action lawsuits against odors and noise of normal farming operations. (See Box 3, page 30)

Despite "right-to-farm" laws and others that bar local governments from adopting zoning or similar restrictions on agriculture, there is a growing trend to use local zoning, land use, and health department controls that are more stringent than state and federal rules. For example, in South Dakota, Colorado, Utah, Georgia, Michigan, and Kentucky, counties may adopt zoning regulations to restrict agriculture. In Indiana, counties may impose CAFO requirements more stringent than state rules. In North Carolina, counties may issue special use restrictions. Groups representing livestock interests have generally opposed the proliferation of rules that can result from locally-imposed controls.

A key limitation for many state programs, regardless of their statutory requirements, is oversight and enforcement. How diligent a state is in enforcing laws and rules (federal and state) may be reflected in the resources it provides for such activities. Typical of many states, in 1998 Minnesota had a staff of 22 inspectors to regulate 45,000 animal feeding operations that require permits, meaning that with that level of staff, it would take 20 years to inspect every feedlot in the state once, according to an official.⁴⁹ Oklahoma had six inspectors to enforce state laws that regulate more than 200 licensed swine farms and 1.7 million swine. Washington state had three inspectors responsible for more than 800 dairy farms. At the same time, one response by a number of state legislatures that addressed animal waste issues in 1998 (see following section) was approval of additional staff and resources for feedlot regulatory and enforcement activity. For example, the Washington legislature approved a budget to increase inspectors for the state's dairies to eight persons. In California, the state water quality control board quadrupled the number of inspectors for the Central Valley's 1,600 dairies — from one inspector to four. Nebraska enacted legislation with an industry fee provision that is expected to provide resources to increase the number of livestock inspectors from four to 16.

⁴⁸Critics of this law point out that it contains substantial loopholes. One is that it requires a large swine farm to submit a manure management plan, but does not require a similar plan for farms that import manure. Also, plans do not need to disclose all of the interested parties in the farm, only the local operator; thus, there is no way to know whether the corporate owners have a history of environmental violations. DeKok, David. "Laws Largely Friendly to Industry; State Rules on Manure Were Delayed, Modified." *Harrisburg Patriot-News*. Nov. 22, 1998: D-3.

⁴⁹Ison, Chris. "Agency Lags in Policing Feedlots; Regulatory Board Accused of Favoring Hog-Farm Owners." *Minneapolis Star-Tribune*. March 8, 1998: 1A.

As a general matter, states vary in their commitment to protecting the natural environment, depending on a number of variables, including severity of environmental problems, economic resources, and political pressure from interest groups. Reportedly, one reason for the variation in state animal agriculture programs is that some have aggressively sought to attract animal agriculture companies into their jurisdictions, and used state policies and laws to do so, hoping that the companies would bring significant economic benefits to the state. Some offered tax abatement for new livestock operations or associated job creation. Some promoted the fact that their environmental laws and enforcement on livestock operations were less stringent than their neighbors. In the early 1990s, for example, Oklahoma, Texas, and Missouri were among the states that lobbied successfully for livestock expansion. North Carolina's swine population grew from 2.5 million animals in 1990 (seventh place, nationally) to 9.7 million in 1998 (second place, nationally). Other states where taxes on agriculture were perceived to be high saw livestock producers relocate elsewhere; this occurred in Wisconsin, for example, where the dairy industry began losing its share in 1991 (taxes were one of several variables, in this case), while California has become the nation's leading milk producer.⁵⁰

Box 3. Swine Operations in Iowa

Iowa is the most intensely farmed state in the nation. Iowa's human population is 2.8 million persons, while its swine population is about 14 million. Almost 95% of land in the state is considered to be rural, and more than 75% is considered cropland. The state has 16,000 cattle and swine farms of all sizes, including 1,300 cattle and swine operations bigger than 2,000 animals. Iowa is the leading swine-producing state, producing nearly one-quarter of the nation's total. In part to develop and protect its leadership status, the state passed a law which made it difficult for people to bring nuisance lawsuits against swine operations that move into their neighborhood. Critics said that no other Iowa business is protected from lawsuits brought by people when a newly arrived enterprise creates problems for existing residents. In September 1998, the Iowa Supreme Court ruled this law unconstitutional, saying that by creating areas with a grant of immunity from nuisance suits, the law created an easement over neighbors' property without compensation - a taking that violates the U.S. and Iowa constitutions. This was the first ruling in the nation that has been upheld against an agricultural immunity law, and legal analysts are debating possible broader implications. (Source: "Iowa Supreme Court Invalidates Law Immunizing Farms from Nuisance Suits." Daily Environment Reporter, no. 194, Oct. 7, 1998: A-1)

At the same time, some states that are not necessarily unfriendly to agriculture have enacted anti-corporate farming statutes, primarily in order to prevent certain corporate legal structures from engaging in farming within state borders. Often, these

⁵⁰Freese, Betsy, and Rod Fee. "Livestock-Hungry States." *Successful Farming*, Jan. 1994: 19-30, 33-35.

restrictions arise from concern that large corporate-style operations owned by out-of-state entities will squeeze out small family farm operations and disrupt the economic infrastructure that supports agriculture in the state, as well as altering the character of the social and economic framework that supports large numbers of operators and residents across the landscape in rural areas. Anti-corporate farm laws do not develop out of concern for environmental issues in a state. Rather, they are part of a set of pressures that confront concentrated agriculture operations. It is unclear at this point whether or how anti-corporate farm issues will come together with animal waste management issues in policy debates.

Anti-corporate farm restrictions do arise from concern that large corporate-style operations owned by out-of-state entities will squeeze out small family farm operations and disrupt the economic infrastructure that supports agriculture in the state. Nine states currently have such prohibitions. Several have done so by statute (Iowa, Kansas, Minnesota, Missouri, North Dakota, South Dakota, and Wisconsin). Nebraska has done so by a constitutional provision, and Oklahoma has both constitutional and statutory provisions. In 1998, South Dakota voters amended the state constitution to prohibit corporations from owning or controlling farmland or engaging in agriculture in the state. Supporters say this will effectively prohibit the practice of companies contracting with farmers to raise crops or livestock.

However, most of these state restrictions or limitations on corporate farming contain numerous exceptions to the general rule. For example, many of them do not prevent the operation of very large corporate-style farms managed by domestic (in-state) entities under a "family farm corporation," "authorized farm corporation," "cooperative," and other legal structures provided for in the statutory exceptions. Some states distinguish U.S. domestic and foreign (non-U.S.) ownership, as well. Several states provide exceptions in the form of grandfathering farms owned prior to certain dates. Some states also provide exceptions for certain types of livestock operations. For example, while Kansas law limits corporate farming, it also permits a county option to approve use of land for swine production facilities. Under Nebraska's constitutional provision, agricultural land operated by a corporation for the purposes of raising poultry is exempt from corporate farming restrictions. Missouri law provides an exception to anti-corporate farming limitations which applies to swine production facilities in three particular counties.⁵¹ The South Dakota constitutional amendment adopted in 1998 allows family farm corporations and some types of cooperatives.

⁵¹Hipp, Janie Simms, "Sustaining the Family Farm: Old and New Tools for Survival in a World of Contracts and Corporations," Thesis submitted in partial fulfillment of the requirements for the degree of Master of Laws, University of Arkansas School of Law, Aug. 1996. Stout, Jan, "The Missouri Anti-Corporate Farming Act: Reconciling the Interests of the Independent Farmer and the Corporate Farm," 64 *University of Missouri in Kansas City (UMKC) Law Review*. Summer 1996: 835.

State Legislative Activity on Animal Waste Issues⁵²

While many states have rules and laws for regulating livestock production, public pressure for additional restrictions is strong in many locations. During their 1998 legislative sessions, a number of state legislatures (at least 20) considered bills on the topic. Proposals fit in three broad categories: bills to establish moratoria on siting and licensing of large-scale animal operations in the state; bills concerned with which level of government shall control the siting of livestock operations; and regulatory bills. The swine industry was a dominant, but not exclusive, focus of state legislation. Issues debated in the states may presage issues that could arise at the federal level, as well.

In most states where these issues were active in 1998, there were competing proposals under consideration, representing alternative views of key interest groups. In some cases, strict state legislation was proposed by the Governor (in Maryland and Kentucky, for example), but elsewhere, the Governor's office opposed proposals for new regulations that were advocated by lawmakers and some interest groups (Minnesota and Wisconsin).

In many of these debates, environmentalists and small farm operators formed alliances and urged legislators to regulate the entrance and operation of large-scale farming operations which these groups believe pose great environmental risks and great economic threats to the viability of established small, family farming operations. In many states, these two groups have argued that wastes, discharges, and air emissions from large livestock operations are manifestations of changes that not only threaten environmental quality, but also tourism, recreation, fishing, boating, property values, and economic development.

Moratorium proposals. North Carolina enacted bills in 1995 and 1996 to strengthen permit and regulatory requirements but went further when it adopted a statewide 2-year moratorium on new and expanding swine farms (larger than 250 swine) in 1997 and later extended it through October 1999. Its purpose was to prevent expansion or start-up of new operations until new regulations are developed. (See Box 4, page 34) In 1998, other states where large-scale farms are attempting to move in and expand also considered moratorium bills to allow time to identify waste management policies, options, and rules.

Oklahoma also enacted a 1-year moratorium on the expansion of large swine-farming operations in 1998, based on support by the Governor and legislative leaders. It prohibited the state Agriculture Department from authorizing or even processing an application for a new or expanded large swine-feeding operation during the moratorium. Mississippi enacted a 2-year moratorium until January 2000 on new swine farm applications. Minnesota enacted a 2-year ban on new open-air waste lagoons, but stopped short of enacting a comprehensive moratorium, as the Minnesota House had approved previously. Moratorium bills also were proposed in 1998 in

⁵²This section is based on information from a wide variety of resources, including regional and national newspapers, personal conversations, and State Capital Strategies Alert Services, Issue Analyses (Environment), Feb. 4-Apr. 29, 1998.

Alabama, Illinois, Kansas, Maine, South Dakota, and Wisconsin. Industry groups in all of the involved states have actively opposed moratorium bills.

State versus local control. One of the most controversial issues in several states has been the question of who will control the location and zoning of large animal production operations -- the question of state versus local control. Localities desire to impose their own requirements for permits, zoning, monitoring and inspections, and pollution prevention, while industry groups generally argue that, if such requirements are called for, they should be uniform and statewide, to minimize potential confusion and burdens that could result from a patchwork of differing county-by-county rules. Bills that favor local decision-making would either expressly give county governments some control over where, and if, swine farms can be located (Illinois and Nebraska debated but did not enact such bills) or require a county referendum to approve siting of large-scale swine operations (enacted in Kansas in 1998).

A bill enacted in Mississippi which established a 2-year moratorium also allowed counties that acted by June 1, 1998, to impose their own regulations on farms. Other states considered bills to pre-empt local zoning of large-scale farming operations (Indiana, for example, where such a bill was enacted, and Colorado, where legislation was debated but not enacted) or a hybrid approach (Iowa, which enacted a bill giving county officials the right to appeal state permits for livestock operations, but prohibit local regulation).

A related issue is whether the lead responsibility should lie with the state agency charged with environmental management (departments of environmental quality or public health), as environmentalists favor, or with the one likely to provide advice and technical assistance to farmers, but not regulate them (departments of agriculture), as industry generally favors. Legislators in several states debated this issue, including Colorado, Tennessee, Vermont, Virginia, and Ohio. In Maryland, the legislature approved a bill in 1998 that requires poultry producers to use a phosphorus-reducing enzyme called phytase in chicken feed as a way to limit phosphorus discharges from agricultural operations. One contentious issue was resolved when legislators agreed to let the state agriculture secretary, not the department of environmental quality, monitor compliance with the mandate.

Regulatory proposals. Bills to regulate, or impose stricter regulation on, animal feeding operations were proposed in many states. Proposals varied widely in their coverage and approach, differing in which segment of animal agriculture would be covered by new requirements; size thresholds (covering all operations, those with as few as 50 animal units, or those with no fewer than 3,000, for example); and details of permits, siting, and inspections. They included the following:

- Require implementation of comprehensive manure management plans (bills were enacted in Washington, Maryland, and Virginia).

Box 4. North Carolina's Experience

Since 1990, North Carolina's swine population has quadrupled, from 2.5 million to nearly 10 million animals. Most of the state's animal agriculture production is located in the southeastern third of the state, an area comprised of sandy soils, high water tables, shallow drinking water wells, and extensive networks of rivers and streams. To some observers, it was not surprising when, in mid-1995, spills from swine waste lagoons occurred. The extent was more surprising: one 8-acre lagoon spilled 22 million gallons of waste into the Neuse River, killing 10 million fish and closing nearly 365,000 acres of coastal waters to shellfish harvesting and commercial fishing. Other waste lagoon spills also occurred that year, drawing public attention to some of the environmental and economic consequences of concentrated animal farming operations in the state. But even before those events, the 200-mile long Neuse River had for several years experienced algae blooms and fish kills during summer months due to high levels of nutrients from rural and urban runoff and industrial and municipal discharges. In 1997, the environmental group American Rivers declared the Neuse one of the most 20 threatened rivers in the United States.

In response, the North Carolina legislature enacted bills each year since 1995 to address animal waste problems. A 1995 law mandated buffers between swine houses or lagoons and residential property, public buildings such as schools and hospitals, and streams or rivers. It established a Blue Ribbon Commission which presented recommendations that the legislature addressed in 1996. That year, the state required general permits and fees for all animal feeding operations, mandated annual inspections, increased buffers for residences, and required poultry operations to develop waste management plans. Recognizing that animal wastes were not the sole problem, the legislature also appropriated funds for water quality improvements at sewage treatment plants. The legislature went further in 1997, enacting a 2-year moratorium on new and expanding swine facilities throughout the state (not just coastal counties); further increased buffers for residences, streams, and wells; required the Division of Water Quality to adopt odor control standards; required a plan to phase out anaerobic swine lagoons and sprayfields; called for a plan to bring integrators into the management and liability of animal waste; and restricted most waste management systems from 100-year flood plain areas. In 1998, the moratorium was extended for 6 months, to October 1999.

In 1998, much of the North Carolina policy attention shifted from the state level to counties, because the 1997 law allowed for local zoning of large swine farms (those with 600,000 pounds or more of swine, or about 4,400 animal units). In Randolph, Duplin and Moore counties, for example, opponents and defenders of swine farms pressed their case as county commissioners debated imposing stricter future local regulation of swine farms. ("Randolph Board Sets Stricter Hog Standards," Greensboro News & Record. March 24, 1998: B1)

- Strengthen state inspection, specify design criteria (such as requirements on waste lagoons) and siting restrictions (including setbacks from neighbors and buffers), and tighten permit requirements (bills with some of these elements were enacted in Washington, Nebraska, and Virginia and were debated elsewhere, including South Dakota and Tennessee). A bill to impose mandatory farm-by-farm limits on farmers' use of fertilizer and manure to curb nutrient runoff from animal wastes, together with funding and tax incentives for farmers was approved in Maryland. (See Box 5, page 36).
- Require regulation of farm odor (measures were enacted in 1998 in Kansas, Colorado, and Oklahoma) or study regulation of odor (a Nebraska bill, also enacted in 1998). Proposals to regulate air quality and odor were unsuccessful in Tennessee.
- Laws that make past violation of state rules a factor when facilities want to expand or build (debated but not enacted in Iowa and Ohio).
- Impose legal responsibility and tort liability for environmental damage caused by livestock operations (South Dakota bill, enacted in 1998).
- Impose or increase fees for permits and inspections (measures were enacted in Nebraska, Colorado, and Oklahoma).

In Oklahoma, public concern about both swine and poultry CAFOs has been growing for phosphorus levels, sets standards for poultry waste application to land and mandates annual certification of applicators, requires water quality monitoring, and allows penalties for violations. The second bill, dealing with swine operations, modifies existing state requirements to establish restrictions on location of swine farms (including new setback standards) in relation to drinking water supply and recreation or ecologically significant sites, requires odor control plans for new or expanding farms, and imposes fees to offset the cost of regulation.

The Colorado legislature considered competing bills to impose more stringent controls on animal operations. At issue were two bills, one to regulate swine only, the second to regulate all livestock operations, including swine. The swine-only bill, which was endorsed by a coalition of cattle ranchers and environmental groups, also would give localities authority over air quality and zoning, issues not addressed in the latter bill, which was endorsed by swine farmer groups. The legislature did not pass either bill, and proponents subsequently managed to put both proposals on the ballot for voters' consideration in November 1998. In the fall election, voters adopted by a wide margin the proposal to regulate swine operations and rejected the competing proposal. The measure passed by voters amends the state constitution and requires permits, groundwater monitoring, and soil testing for large-scale swine operations (those with about 3,500 or more animals), as well as control of odor. Supporters of the defeated measure said it is unfair to give advantage to some livestock industries in the state (i.e., cattle) that would not have to comply with expensive rules, as the swine industry must now do.

Box 5. Maryland Debates Animal Waste Impacts on Its Waters

In the summer of 1997, fish kills occurred in certain tributaries of the Chesapeake Bay in Maryland (primarily in the Pocomoke River drainage basin). These fish kills, like some that occurred previously in North Carolina and other coastal waters, were attributed to the presence of *Pfiesteria piscicida* in the affected waters. Some scientists believe that nutrient enrichment of the waters may play a role in *Pfiesteria* outbreaks, although the mechanisms and linkages are unclear. Because of the large number of poultry facilities adjacent to the affected Maryland waters, animal feeding operations were targeted for research and management of nutrients.

Maryland took a number of actions to address *Pfiesteria*-affected waters and nutrient concerns. Citing human health risks, the Governor closed almost all of the estuaries where fish kills were observed to fishing and recreation. The state surveyed agricultural activities in the affected watersheds, centering on the use of best management practices and agricultural nutrient management plans. The state offered financial assistance to encourage farmers to grow cover crops to reduce soil erosion and catch nutrient runoff. Maryland became the first state approved by USDA for the Conservation Reserve Enhancement Program (CREP). A blue-ribbon panel made recommendations about reducing nutrient loadings from upland sites generally and from agriculture in particular; responding to public health concerns; and conducting future research and monitoring.

Based on the panel's recommendations, the Governor presented legislation to the 1998 legislative session containing both incentives and mandates to address animal waste problems associated with *Pfiesteria*. The Governor's bill sought to require farmers to adopt and implement nutrient management plans and limit nutrient application (fertilizer and manure) to amounts needed for crop uptake, to control the flow of nutrients into state waters. Maryland would be the first state to require such plans for phosphorus, as well as for nitrogen. Farmers would be subject to fines up to \$5,000 for noncompliance. The proposal also contained \$45 million over 3 years in aid to farmers and tax credits to offset program costs.

While environmentalists supported the Governor's bill (and others that would establish liability for integrators/corporate owners), Maryland farmers favored competing legislation that would make controls purely voluntary and would not impose timelines for compliance that they characterized as unreasonable. In April 1998, the legislature agreed to a compromise bill that requires most farmers to implement runoff control plans but gives them additional time to comply and imposes milder penalties for noncompliance.

Not all states have attempted to strengthen controls. In Mississippi, for example, as part of a moratorium bill enacted in 1998, the legislature included a provision that exempts swine farms and other agricultural operations from air pollution permits, despite vigorous lobbying from groups which had sought air pollution control of farms. The Vermont legislature approved a bill that revises requirements and permit

procedures for large farm operations by eliminating public participation in the permitting process. The New Hampshire legislature considered a "right to farm" bill like similar laws in a number of other states.

Recent Livestock Industry Activities

Each segment of the livestock industry is represented by at least one group that promotes its activities, ranging from market promotion, to producer education, to lobbying for favorable legislation and policies. The National Pork Producers Council, one such group, initiated a dialogue to bring together major interests, including opponents of concentration, to address animal waste issues that arise from activities of its members. Working through America's Clean Water Foundation, it organized a national dialogue to promote sound environmental activities by pork producers. The dialogue started in May 1997, and participants met on eight occasions. Both EPA and USDA were involved and have endorsed the process. While two interests, environmental groups and local governments, chose not to participate fully, the dialogue process received positive comment from many who are concerned with the environmental effects of animal agriculture. It resulted in a set of recommendations and proposals issued in December 1997.

One purpose of the dialogue was to develop a nationally-consistent environmental strategy that would replace the patchwork of responses to major new or expanded proposals and actions at state and local levels that could affect them, including moratoria and nuisance lawsuits. At a congressional briefing to describe the recommendations, a representative of the Council stated that the industry wanted to avoid some of the kinds of problems that the timber industry encountered as it attempted to deal with the spotted owl issue in the Pacific Northwest old growth forest areas. It was stated that a major challenge for the Council would be to get the full participation of all producers in this program.⁵³

Implementation of the group's recommendations would not require any congressional action; all of these recommendations, as envisioned in the final report, would be implemented through enactment of state and local legislation, and as a result of initiatives undertaken by individual producers. Implementation would start when states adopt a framework which would apply immediately to new and expanding facilities and would be phased in by existing facilities over 5 years. The Council expects that EPA will make recommendations to states regarding adoption of the recommendations in the strategy. One component that will receive considerable attention is a more sophisticated way to determine setbacks for odor, using a formula that the Council representatives say was developed and is used in Austria.

⁵³Comments of Jim Moseley, National Pork Producers Council, at congressional staff briefing, Dec. 17, 1997.

The pork industry dialogue resulted in a report⁵⁴ with more than 20 recommendations that include the following:

- The framework should apply immediately to all new or expanding commercial operations, and be phased in over 5 years for existing operations.
- All producers should register manure and wastewater facilities with regulatory authorities within 2 years.
- New manure and wastewater facilities at new or expanded farms should be based on an evaluation of cumulative effects of environmental conditions at the site, and the presence of neighboring pork production facilities.
- Setbacks should be used for new facilities, and existing facilities should carry out protective measures but should not have to relocate to meet setback requirements.
- New or expanded manure or wastewater storage facilities should be able to handle 6 months of waste, and accommodate the greater of either a 25-year, 24-hour or 10-year, 10-hour rainstorm.
- Manure should be applied only to lands with adequate soil sampling, nutrient testing, and an approved nutrient utilization plans, and application rates should be based on phosphorus requirements.
- All operations should prepare a current emergency response plan and should keep manure and nutrient management information for at least 3 years.
- Operators and contractors should be certified, and employees should be trained.
- Abandoning earthen basins and lagoons should be prohibited, and a program to finance the costs of closure for new and expanded facilities should be in place in 5 years.

In November 1998, EPA and the pork industry announced agreement on a Clean Water Act Compliance Audit Program (CAP) providing incentives for pork producers to undertake voluntary on-farm assessments by reducing penalties for any Clean Water Act violations promptly disclosed and corrected under the program. Audits are to be conducted by trained and certified independent inspectors at no cost to the farmer. Producers that report and correct violations within a specified timetable and otherwise comply with a CAP agreement are eligible for reduced penalties ranging from \$1,000 to \$10,000 per violation, capped at \$40,000 per facility, and EPA retains the flexibility to waive penalties altogether. The pork industry and EPA see the program as helping to protect public health and water quality by identifying and correcting existing or potential violations, while giving certainty to industry concerning EPA enforcement. Industry officials say the program could cost about \$50 million and that resources to support it could become an issue. Initially, the cost of the program is being supported by grants from EPA and America's Clean Water Foundation and by funds from an industry check-off program.⁵⁵

⁵⁴America's Clean Water Foundation. *Comprehensive Environmental Framework for Pork Production Operations; The Recommendations of the National Environmental Dialogue on Pork Production*. Washington, DC, Dec. 17, 1997. 30 p.

⁵⁵National Pork Producers Council. Briefing for House Agriculture Committee. Dec. 12, 1998.

The pork producers dialogue and followup activities are a significant effort within the livestock community. It demonstrates the willingness of one sector of that community to pro-actively seek solutions that are workable within the industry and acceptable to outsiders. The Council asserts in the dialogue that many of the recommendations are little more than sound business practices that should be adopted, if they are not already followed, by all producers in the swine industry. The dialogue's recommendations provide a baseline of expectations for those who raise pork (and potentially for others who raise other types of livestock). Whether pork producers can meet those expectations, and whether they will be acceptable to critics of pork production, who may have more substantial expectations, are the two questions that will be debated in the future.

Also in 1998, the poultry industry initiated a process similar to the pork producers' dialogue, in hope of avoiding new federal and state rules. In December, the Poultry Industry Environmental Dialogue announced a framework calling for most poultry producers to prepare voluntary litter management plans by January 2001. Plans will be developed in the context of "whole-farm nutrient management," which considers chemical fertilizers, nutrients from other animals on a farm, and nutrient needs of crops planted on a farm. Under the framework, farmers would make annual reports to state agencies on the amount of litter produced, amounts applied to land, and amounts transferred to alternative use. Integrators are expected to ensure that producers have litter management plans and that producers make the annual reports.⁵⁶ The group did not achieve consensus on some issues, such as who will pay for research and educational programs and on the need to control phosphorus runoff, as well as nitrogen.

Environmental groups have criticized the exclusively voluntary nature of the pork and poultry industries' efforts, saying that national standards are needed to address the industries comprehensively, because state standards vary greatly. They are especially critical that the industry groups do not support requiring corporate owners to take responsibility for the waste produced by animals.⁵⁷

Congressional Response

105th Congress. In the 105th Congress, Members of Congress responded to increased attention to animal waste management issues. Two bills introduced in 1998 took different approaches. No action was taken on either bill, although they generated considerable discussion.

H.R. 3232, introduced by Representative George Miller, proposed to amend the Clean Water Act with CAFO-specific provisions. Currently, feedlots are subject to permit requirements in the law that apply to all industrial facilities. The bill would

⁵⁶"Comprehensive Plan Adopted for Poultry Litter Management," Meat and Poultry Online, Dec. 11, 1998 [<http://neews.meatandpoultryonline.com/industry-news/19981211-6888.html>]

⁵⁷"Poultry Framework to Address Runoff; Others Call for Stronger Standards." *Daily Environment Reporter*, no. 239, Dec. 14, 1998.

define in law which CAFOs are required to obtain discharge permits, tightening EPA's current regulatory threshold by halving the number of animal units triggering regulation. It would require all CAFOs to have CWA permits within 18 months and require EPA to revise existing CAFO regulations within 2 years. Regulated feedlot operators would have to submit comprehensive nutrient management plans to state or federal permitting authorities. The bill would require a CWA permit for land application of animal waste in excess of amounts needed for agronomic uptake of plants. Feedlot operators who cease operations would be required to remove and dispose of all animal waste at the facility.

A second bill in the 105th Congress, S. 1323, introduced by Senator Tom Harkin, took a different approach. The focus of this bill was on USDA, not EPA. It directed USDA to establish minimum required elements and technical standards for animal waste management plans. CAFO owners would submit such plans to USDA in order to operate lawfully, and USDA would conduct on-site inspection as part of its review and approval process. It defined CAFOs in terms of "animal weight capacity," meaning feeding operations with capacity of more than 400,000 pounds for cattle or more than 200,000 pounds for other livestock, rather than number of animal units. This definition would extend regulatory coverage to many additional facilities (for example, animal feeding operations with about 400 beef cattle, compared with 1,000 under current EPA rules).

S. 1323 called for USDA, in consultation with EPA, to establish maximum permitted levels for application of animal waste to land, based on quantities necessary for efficient crop nutrient requirements (taking into account all sources of nutrients) and quantities which do not pose a risk of increased soil toxicity or surface or ground water pollution. It would be unlawful to apply wastes in excess of such quantities. If more waste were produced, it would have to be treated (for example, at an off-site wastewater treatment plant). Finally, S. 1323 proposed to make development and implementation of waste management plans eligible for EQIP funding and to increase total EQIP funding from \$200 million to \$600 million annually through 2002.

Both bills specified minimum elements for waste containment systems, as well as minimum distance standards for aerial spraying of wastes. Both bills proposed to hold owners of animals (integrators) jointly liable with the feedlot operator for application of animal waste in violation of a management plan or CAFO discharge permit.

The Senate Agriculture, Nutrition and Forestry Committee held a hearing on S. 1323 on April 2, 1998.⁵⁸ In May, the House Agriculture Committee held an oversight hearing on recent EPA activities affecting animal agriculture.⁵⁹

⁵⁸See: <http://www.senate.gov/~agriculture/hea98402.htm>

⁵⁹U.S. Congress. House. Committee on Agriculture. Subcommittee on Forestry, Resource Conservation, and Research, and Subcommittee on Livestock, Dairy, and Poultry. "Activities of the Environmental Protection Agency Related to Livestock Feeding Operations." Joint Hearing, May 13, 1998. 105th Congress, 2d Session. 121 p. Serial No. 105-50.

Administration and interest group views. In recent months, interest groups have presented their views on animal waste management topics in connection with the EPA-USDA national strategy (discussed above) and federal legislation.

Administration views. At the April 1998 Senate Agriculture Committee hearing on S. 1323, witnesses from EPA and USDA said the Administration opposed the bill because it would lead to regulatory duplication and overlap by their two agencies. At this hearing, held before proposal or issuance of the national strategy, USDA said it prefers working with farmers on a voluntary, cooperative basis (through implementation of EQIP, for example) and does not have the resources to take on a new regulatory role. Under the bill's expanded coverage, USDA said, the department would be responsible for inspecting 40,000 animal feeding operations nationwide. (Under the March 1999 final national strategy, EPA and states jointly have responsibility for inspecting AFOs, beginning with CAFOs in priority watersheds which are part of the estimated 15,000 to 20,000 that will eventually be required to obtain clean water permits.)

Interest group views. In commenting on federal legislative proposals, interest groups have repeated many of the points also made in connection with the Administration's unified national strategy for AFOs. For example, several industry groups said that federal legislation is not needed at this time, in view of the Administration's initiatives, together with ongoing state and local activities and voluntary measures that the industry itself is implementing. Industry groups say that they do not need regulation, but could use technical and financial assistance.

Many state officials have argued that, with the extent and range of legislative and regulatory activity occurring in states, there is little need for federal legislation that could prove disruptive and duplicative of state efforts. As on issues related to the national AFO strategy, state environmental and agricultural officials do not necessarily object to minimal national uniformity, but strongly believe that states and localities should not be preempted from imposing tighter controls, where they choose to do so.

Environmental and conservation groups support strong national baseline standards for permitting of waste storage facilities and operations and waste application. A strong federal program based in law, they say, would provide for more accountability than programs run by state and local jurisdictions and is more likely to ensure that permitting and decisionmaking includes public participation. Responding to industries' emphasis on using voluntary measures, these groups often say that voluntary measures are not enough to prevent harmful nutrient runoff. Moreover, they say, while many voluntary manure management plans are being developed and implemented--and comprehensive nutrient management plans will be developed under the EPA-USDA national strategy, there is little information on how they are working.

106th Congress issues. In the 106th Congress, legislative attention to animal waste issues could occur in connection with reauthorization of the Clean Water Act. Representative Miller has introduced legislation (H.R. 684) similar to the bill he sponsored in the 105th Congress, H.R. 3232. Like that bill, H.R. 684 would amend the CWA to tighten EPA's regulatory programs for AFOs. Other specific proposals may be introduced, as well. Moreover, reviewing the Act's current provisions that deal with management of nonpoint source pollution (including contributions from

agriculture) is likely to be a closely related prominent issue if and when reauthorization occurs. However, no comprehensive reauthorization bills have been introduced in the 106th Congress, and congressional committees have not scheduled hearings or other legislative activity.

The March 1999 release of the national AFO strategy by EPA and USDA could prompt a variety of congressional activities, such as oversight hearings or specific proposals to modify the Clean Water Act or other existing laws.

Legislative attention also could occur in connection with the Administration's request for funding to implement the Clean Water Action Plan. The President's FY2000 budget request includes a total of \$458 million in additional funds to implement this water quality initiative, including \$126 million more for USDA's EQIP. How the President's priorities will fare in Congress depends both on support for the funding requests themselves and on whether the requests are viewed as taking funds away from other programs or projects having congressional priority. In 1998, the President's FY1999 budget sought \$568 million in increases to fund the Plan, but Congress passed appropriations bills that provided less than 15% of the increased funds requested.⁶⁰

Conclusion: Policy Questions

Social and political pressure to address the environmental impacts of livestock production has grown to the point that many federal policymakers today are asking *what* to do, not *whether* to do something. The setting is one where agricultural policy and environmental policy, which traditionally have separate agendas and priorities, come together on some points. A major direction of inquiry is what strategies will be effective and attainable, who should be responsible for developing and implementing strategies to address known and future problems, and who should bear the burdens of new strategies. Animal waste management issues are one set of concerns, along with a number of others, that currently face animal agriculture generally. Underlying the current discussion is a broader debate, as well: should evolving policies deal primarily with residues of livestock production, or should policies also seek to influence the ongoing trends in the industry towards concentration of animals among smaller numbers of producers? Consideration of the following questions is likely to shape policies that are developed to address the waste management issues, irrespective of how other societal concerns also are addressed.

What is the federal role today? Federal, state, and local governments currently have numerous programs and policies in place that address animal waste issues. At the federal level, policies include EPA's existing regulatory programs implementing water quality requirements and USDA's technical assistance and incentive payment programs to farmers, especially through the new EQIP. With release of the national AFO strategy, both will be coordinating their activities to implement that plan. Both also will be coordinating activities to address agricultural pollution generally under the

⁶⁰For additional information, see CRS Report 98-745, *Clean Water Action Plan: Budgetary Initiatives*.

Administration's Clean Water Action Plan. One question, in terms of EPA program changes resulting from the national AFO strategy, is whether and, if so, how it will propose to modify the current regulatory threshold of 1,000 animal units and possibly bring more animal feeding operations clearly under EPA's rules. Many other questions will be raised as EPA develops revised feedlot rules, including what type of water quality monitoring requirements and land application standards should be set at the federal level, versus, by state and local governments. One issue to watch over time is the availability of funding and staff for both EPA and USDA, as they implement new programs and initiatives.

What should the federal role be vis a vis state and local roles? State and local governments implement a variety of regulatory, siting and zoning, technical assistance, and cost share programs. A key question, especially in view of the varied state and local policies that also now exist, is what degree of federal leadership and national consistency is appropriate and how federal policies will blend with those of states and localities. As discussed previously, some groups and individuals favor a strengthened federal role that holds states to minimum national consistency. For example, the National Pork Producers Council advocates minimum national standards, which it has recommended through its dialogue. Others would prefer that states have the lead role in policy formulation, based on their knowledge of geographic, climatic, economic or other unique factors, while limiting the federal role to providing guidance and financial assistance. A related question is how the federal role might change over time, because of legislative and administrative actions by a growing number of states.

Further, there are questions about additional aspects of the federal role generally in addressing animal waste issues. For example, is there a role for government in supporting efforts to facilitate exchange or transfer of manure to lessen imbalances between areas with intense animal production and areas with fewer livestock farms where the nutritive value of manure can be used? Is there need for government to encourage certain manure management practices with potential for increasing the nutrient value while reducing off-site damages?⁶¹ What levels of financial assistance can and should the federal government provide to farm operators and/or states for implementation of waste management planning? How should federal funds to operators be provided — directly from federal agencies, routed through states which determine high-priority needs, or some other system? Also, because current federal environmental programs do not deal with animal waste impacts on groundwater or air quality, there is a question of whether federal policy should address these concerns, which are beyond the Clean Water Act regime.

A related question concerns how to balance the roles of EPA and USDA, in terms of federal responsibility and policy direction. This split was reflected by the two legislative proposals introduced in the 105th Congress, one emphasizing EPA's role under the Clean Water Act (H.R. 3232, reintroduced in the 106th Congress as H.R. 684), the other focusing on enhanced responsibility for USDA (S. 1323). Implicitly, this question asks whether animal waste is viewed primarily as an environmental

⁶¹ For example, commercially available amendments such as slaked lime or alum can reduce ammonia nitrogen volatilization and phosphorus solubility of poultry waste but may not be considered affordable or economically justified by farm operators.

pollution problem, or primarily as an agricultural resource management problem. Answers may not represent either-or policy choices, but could involve better coordination of the agencies' differing roles, which is a key goal of the Administration's Clean Water Action Plan.

What balance of federal regulation and voluntary approaches is needed?

This question is closely related to those concerning the appropriate federal role and the way in which animal waste management is viewed as a policy matter. If it is viewed as a point source pollution problem, EPA's traditional regulatory tools of standard setting, permitting, compliance deadlines, and enforcement are the key available tools. Alternatively, if viewed as an agricultural resource issue, the desired policy tools might be those most familiar to the agriculture community: non-regulatory, incentive-based approaches.

Here, too, solutions are unlikely to be exclusive either-or determinations. Solutions are more likely to be broad-based, along the lines and consistent with evolving policies which view resource management problems, especially those involving water resources, at the scale of watersheds. Some view watershed management as the next generation of both pollution control and resource management policies, since it is a concept centered on addressing the highest-priority problems within geographic areas that encompass multiple economic and resource activities and multiple ownerships. It seeks to move beyond focusing on individual chemical contaminants or their sources to a broader assessment of all sources of impairment within the watershed, including habitat degradation, air quality impacts, biological factors, or polluted runoff. In many watersheds, agricultural sources (cropland and livestock) will be part of the mix. Solving problems on a watershed basis may involve a mix of policy tools: funding (grants and loans), land use management, regulation, technical assistance and education, market-based approaches (such as trading of effluent reduction requirements by point and nonpoint sources), and coordination among federal, state, and local levels of government. These are the kinds of policy and program tools that EPA, USDA, and other agencies are using today; whether they will be the correct or exclusive tools to address future problems remains to be determined.

What kinds of additional research and evaluation are needed? Experts identify a number of areas of research needed to inform current and new animal waste management policies. First, many believe basic research on using and disposing of manure is crucial. Odor management is a key air quality concern, although this topic may be a higher priority to industry, states, and localities, than to the federal government which has no regulatory interest as of now. Other research needs include improved soil tests to determine nutrient application rates and methods, improved systems to identify water resources at risk from manure and fertilizers (*i.e.*, those where geology, soils, and climate create potential for runoff and erosion), and a better understanding of the possible effects of concentrated animals and their waste on air quality. Broader federal issues in which research on animal agriculture could be a useful component include the role of concentrated animal populations in global warming and patterns of atmospheric deposition, and possible effects on human health.

Two related questions are who should take the lead on research questions (government or industry, for example) and whether some research must precede implementation (for example, studies on crop uptake of nutrients and application of phytase or other nutrient-reducing enzymes in feed). How the results of relevant federally funded research and technology development will be transferred to the public and private sectors and the commercial marketplace also is an issue. Efforts to educate and assist farms in understanding the value of manure as a soil amendment and the use of alternate disposal techniques seem likely to be a priority.

Further, one part of a research agenda is likely to be more complete evaluation and monitoring of programs, both ongoing and new. What programs (*i.e.*, governmental and private sector) are underway and how effective they are in addressing animal waste issues could be examined. Evaluation activities will provide accountability, especially where federal dollars are spent, and will aid in determining what steps are needed to address remaining problems.

Is federal legislation needed? This, finally, is the question of how Congress will choose to address national policies on animal waste management. Legislation has been proposed to guide EPA and/or USDA activities, and thus, influence states and livestock producers. At issue is whether current federal policies, especially the EPA-USDA national AFO strategy, alone will be adequate to address animal waste problems nationally and encourage improved management practices. Congress could likewise guide the agencies' activities through the appropriations process, by either limiting or expanding funding for specific programs and initiatives or, more broadly, for the Administration's Clean Water Action Plan.