Regulating the land application of manure from animal production facilities in the USA

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Abstract

Water pollution from the land application of manure has been cited as an issue that needs to be addressed. Judicial challenges have forced the US Environmental Protection Agency (EPA) to adopt additional controls governing concentrated animal feeding operations (CAFOs). State agencies have also been directed to do more to minimize the risk of pollution from animal production. In developing appropriate controls, regulatory agencies have distinguished animal production facilities based on size and on whether they discharge pollutants into waters of the United States. Four categories of animal producers have been identified based on different requirements addressing the land application of manure. The expenses of regulatory requirements for agriculture suggest that other avenues should be explored to enhance sustainable production and reduce water pollution. The identification of polluters, implementation efforts, enforcement issues and educational endeavors could be augmented to address contamination problems. Finding ways for agricultural groups to cooperate with the EPA and for states to implement total maximum daily load requirements might also be effective in improving water quality. To address the land application of manure, the goal should be to eliminate substandard land application practices that cause too many pollutants to enter surface waters rather than simply imposing additional regulations.

Keywords: CAFO; Land application; Manure; Permit; Regulation; Water pollution

1. Introduction

One of the controversies accompanying the production of food animals is the environmentally sound use of animal waste (Burton, 2009). The US Environmental Protection Agency (EPA) estimates that animals produce three times as much raw sewage as humans by weight (EPA, 2003: 7080). Proper disposal of manure costs money. Due to the costs of hauling manure further distances, a producer may apply more nutrients than needed for plant growth on nearby fields (Paudel et al., 2009). Another possibility is that a producer improperly applies manure to fields causing pollutants to leach into surface waters. The land application of manure is considered an important contributor of pollutants entering


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surface waters in the United States (EPA, 2003: 7081). Concerns about over-application of nutrients in manure are also an issue in Europe (Ondersteijn et al., 2002; Milne, 2005; Humphreys, 2008; Helming & Reinhard, 2009).

Agricultural groups and producers are aware that land application of manure may lead to water pollution, and considerable efforts have been expended to change practices to reduce pollution (EPA, 2003). In this paper, US federal and state regulations that govern different categories of animal producers are delineated to show how governments regulate manure applications to fields. Yet the deployment of regulations may not be the best way to approach contamination from animal production. Through a discussion of five issues, other options for improving water quality are identified. To address pollution from animal production, regulators could augment existing provisions on reducing discharges of pollutants rather than regulating categories of animal producers.

2. Regulations governing land application discharges

Legislative and regulatory directives from US federal and state governments establish requirements governing the land application of manure by producers of animals. While the importance of these directives is generally acknowledged, legal challenges suggest that some people have difficulties in comprehending their provisions (Waterkeeper Alliance, Inc. vs EPA, 2005; Sierra Club Mackinac Chapter vs Department of Environmental Quality, 2008). First, the regulations define a category of animal operations as concentrated animal feeding operations (CAFOs). Despite years of employing this definition, some people feel that any confined animal operation is a CAFO (Gurian-Sherman, 2008). When persons and groups use the term CAFO to address confined animal feeding operations that include non-CAFOs, their comments and observations create confusion and may lead to inaccurate conclusions.

Under federal law, CAFOs are point sources of water pollutants and the EPA has enacted regulations known as the CAFO Rule to oversee the discharge of their pollutants into federal waters (US CFR, 2010). A majority of the requirements are set forth in parts 122 and 412 of title 40 of the Code of Federal Regulations, with section 122.23 addressing the application of manure on fields as fertilizer for plant growth (US CFR, 2010).

Another misconception is that the requirements in Part 412 of the CAFO Rule concerning Large CAFOs apply to all CAFOs (Paudel & McIntosh, 2005; Sato, 2005). Requirements set forth in Part 412 do not apply to unpermitted CAFOs and to CAFOs that do not meet the delineated size requirements; rather, these requirements only apply to a subset of the largest CAFOs (US CFR, 2010).

Farms can be divided into four categories to distinguish the additional regulations that apply to their manure disposal practices (see Figure 1 which also lists the regulations pertaining to each category). The first category consists of farms that do not confine animals, while the second consists of confined animals at farms that do not meet the definition of a CAFO. The remaining two categories involve CAFOs and are distinguished by whether or not they need a National Pollutant Discharge Elimination System (NPDES) permit and by numbers of animals.

2.1. Regulations governing all farms with confined and non-confined animals

All producers of animals that apply manure to fields in the US are governed by nonpoint-source pollution regulations. Although the federal Clean Water Act declines to outline any direct federal regulation
over nonpoint-source pollution (Murchison, 2005), it provides grant programs to encourage states to develop nonpoint-source pollution abatement programs (US Code, 2006; Hardy & Koontz, 2008). Moreover, the Act requires states to establish water quality standards (US Code, 2006). States have adopted nonpoint-source pollution controls to meet their water quality objectives in the form of best management practices (BMPs) (Shepard, 2006). These controls are schedules of activities, prohibitions of practices, maintenance procedures and other management practices to prevent or reduce the pollution of surface waters (US CFR, 2010: section 122.2).

In the absence of federal nonpoint-source water pollution controls, state BMPs serve as controls over pollution from animal production. States have had difficulties in establishing appropriate controls for nonpoint-source pollution, and federal law contains no effective way to enforce BMPs (Craig, 2000; Centner, 2011). Given the latitude in regulating nonpoint-source pollutants, states have proceeded differently. A few states have imposed requirements beyond BMPs in an attempt to reach water quality goals. The most frequent requirements involve the preparation of nutrient management plans (NMPs). Summaries of these efforts highlight proactive regulations to reduce nutrient discharges to minimize pollution of surface waters (US CFR, 2010: section 122.2).

In Pennsylvania, the state decided to use animal density as a determinant for which farms need NMPs. Any farm where the animal density exceeds two animal-equivalent units per acre of land suitable for the application of animal manure needs a nutrient management plan (Pennsylvania Consolidated Statutes,
Pennsylvania defines an animal-equivalent unit as 1,000 lb (454 kg) live weight (Pennsylvania Consolidated Statutes, 2010: section 503). All livestock and poultry, including recreational animals such as horses, are included in the calculation of an animal-equivalent unit. Through the specialized provisions, Pennsylvania has taken steps to assure the proper utilization and management of nutrients from animal production, including situations where manure is exported offsite (Pennsylvania Code, 2006: section 83.203).

Turning to the state of Washington, all dairy producers licensed under Washington law are regulated (Washington Revised Code, 2011). Persons owning a dairy farm must prepare a nutrient management plan. The state Department of Agriculture inspects these farms once every 22 months (Washington State Department of Agriculture, 2008). If a plan fails to prevent the discharge of pollutants into surface waters, it must be updated. These provisions show that Washington is particularly concerned about pollutants from dairy farms and has a regular inspection schedule.

Some states have declined to adopt special regulations for the application of manure by farms that are not animal feeding operations (Alabama Department of Environmental Management, 1999; Alabama Department of Environmental Management Administrative Code, 2010). Other states require all producers to follow BMPs that limit manure applications to those amounts estimated to be needed for crop production (Illinois Administrative Code, 2011; Minnesota Rules, 2011). All states need to adopt total maximum daily load (TMDL) requirements to address nonpoint-source pollution, but TMDLs have not been adopted for all watersheds and nutrients (EPA, 2009a).

States may have specialized provisions addressing nutrient loading from manure application with respect to nitrogen (Illinois Administrative Code, 2011). Due to variables in amounts of nutrients in manure, chemical analysis may be required or advocated (Illinois Administrative Code, 2011; Minnesota Rules, 2011). Minnesota requires the testing of nitrogen and phosphorus content for all manure from operations with 100 animal units (Minnesota Rules, 2011).

2.2. Animal feeding operations

Animal feeding operations, as defined by US state and federal regulations, confine animals and often spread manure on fields for crop production. Most states recognize that requirements are necessary to oversee the disposal of manure from these operations to preclude unnecessary water pollution. Generally, the requirements for manure disposal include the preparation of NMPs so that manure nutrients above those utilized for plant growth are not deposited on fields. However, distinctions exist as to the degree of planning, implementation of plans and oversight of manure application practices.

In Alabama, the definition of BMPs includes the removal of ‘pollutants to the maximum extent practicable’ prior to discharge (Alabama Department of Environmental Management Administrative Code, 2010). Although all animal feeding operations need to implement BMPs, only CAFO owners and operators need to implement and maintain waste management system plans (Alabama Department of Environmental Management Administrative Code, 2010: section 335-6-7-.04). Since provisions preventing the over-application of nutrients are addressed in waste management system plans, the state does not impose meaningful nutrient management requirements for animal feeding operations; non-CAFOs may not have plans.

Minnesota has adopted rules that contain explicit provisions for animal feedlots with more than 50, 100, and 300 animal units (Minnesota Rules, 2011). Feedlots with 50 units must register, and feedlots with 100 animal units are limited in applying manure to frozen ground so store manure. The manure
must be tested, and records must contain information on the expected plant-available amounts of nitrogen in manure and fertilizers applied to fields (Minnesota Rules, 2011). For feedlots with more than 300 animal units that store manure, soil tests are required for phosphorus and they need to meet certain conditions set forth in NMPs.

2.3. CAFOs not needing permits

An animal operation is a CAFO if it meets the definition enunciated in the federal CAFO Rule. Furthermore, an animal feeding operation may be designated as a CAFO if it is a significant contributor of pollutants to waters of the United States (US CFR, 2010). The rule enumerates three categories of CAFOs: small, medium and large (Table 1). CAFOs that do not have a discharge do not need NPDES permits so are governed by state rules for animal feeding operations. This may include a requirement to prepare NMPs.

In determining whether a CAFO has a discharge, a special exception applies to agricultural stormwater discharges accompanying the application of manure (including poultry litter) on fields. Federal law says that point sources do not include agricultural stormwater discharges, meaning these discharges are allowed (US Code, 2006). Thus, CAFOs with agricultural stormwater discharges do not need NPDES permits, but CAFOs with point-source discharges do. Federal law does not define agricultural stormwater. Under state law, some of these unpermitted CAFOs may need NMPs due to more exacting state regulations (Michigan Farm Bureau vs Department of Environmental Quality, 2011).

The CAFO Rule contains a special provision defining agricultural stormwater discharges for unpermitted Large CAFOs (US CFR, 2010: section 122.23(e)). Under the rule, agricultural stormwater discharges are precipitation-related discharges of manure from land areas under the control of a CAFO where the manure has otherwise been applied following site-specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients. The EPA enumerated four factors to determine these discharges (US CFR, 2010). First, an agricultural stormwater discharge needs to be the result of a precipitation-related event. Second, the CAFO owner or operator must adopt specific conservation practices, including buffers or equivalent practices, to control runoff from manure. Third, protocols for the land application of manure must be established so that site-specific nutrient management practices ensure appropriate agricultural utilization of manure nutrients. Fourth, a CAFO needs to maintain records that document the implementation of plans to manage nutrients.

Table 1. CAFO sizes for dairy cows, cattle, veal calves, swine and poultry as set out in the US Code of Federal Regulations, section 122.23 (US CFR, 2010). (Note, a ‘small CAFO’ is an animal feeding operation that is designated as a CAFO because it is a significant contributor of pollutants to waters of the United States).

<table>
<thead>
<tr>
<th>Type of animal</th>
<th>Medium CAFOs</th>
<th>Large CAFOs</th>
</tr>
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<tbody>
<tr>
<td>Dairy cows</td>
<td>200–699</td>
<td>700</td>
</tr>
<tr>
<td>Cattle—heifers, bulls, steers, cow-calf pairs</td>
<td>300–999</td>
<td>1,000</td>
</tr>
<tr>
<td>Veal calves</td>
<td>300–999</td>
<td>1,000</td>
</tr>
<tr>
<td>Swine, 55 lb (24.95 kg) or more</td>
<td>750–2,499</td>
<td>2,500</td>
</tr>
<tr>
<td>Swine, less than 55 lb (24.95 kg)</td>
<td>3,000–9,999</td>
<td>10,000</td>
</tr>
<tr>
<td>Poultry (non-liquid manure system)</td>
<td>37,500–124,999</td>
<td>125,000</td>
</tr>
</tbody>
</table>
The EPA’s definition of agricultural stormwater discharges was upheld in the Waterkeeper lawsuit (Waterkeeper Alliance, Inc. vs EPA, 2005). The court felt that ‘discharges from land areas under the control of a CAFO can and should generally be regulated’, but CAFOs taking steps to ensure appropriate agricultural utilization of the nutrients in manure are not accountable for agricultural stormwater discharges. Thus, the Waterkeeper decision recognized the bifurcation of discharges involving manure application. Discharges that qualify as agricultural stormwater discharges are permitted while nonqualifying discharges from land application are point-source discharges. The CAFO Rule maintains that Large CAFOs need NMPs to determine whether discharges accompanying applications of manure to fields qualify as agricultural stormwater discharges. Large CAFOs without discharges do not need to apply for an NPDES permit (McAfee, 2009).

Despite the Waterkeeper opinion, agricultural petitioners again challenged the EPA’s interpretation of agricultural stormwater discharges in National Pork Producers Council vs EPA (2011). The petitioners argued that land application areas are statutorily exempt from regulation so Large CAFOs do not need permits (National Pork Producers Council Petitioners’ Brief, 2009). However, no federal statute addresses land application areas. Furthermore, the CAFO Rule does not require CAFOs without a discharge to secure a permit. Instead, discharges from land application areas can be either point-source discharges subject to regulation or agricultural stormwater discharges that are not subject to regulation (Waterkeeper Alliance, Inc. vs EPA, 2005). The issue is whether Large CAFOs need to prepare a nutrient management plan to discern whether they have point-source discharges, or whether the CAFO Rule is improperly regulating potential pollutants.

2.4. CAFOs needing permits: Part 122

Under Part 122 of the CAFO Rule, a CAFO that discharges or proposes to discharge needs to apply for and secure an NPDES permit or corresponding authorized state permit (US CFR, 2010). In May 2010, the EPA issued a document to explain this term (EPA, 2010). The new documentation attempted to clarify how a CAFO can determine if it proposes to discharge based on an objective assessment. This involved evaluation of whether the CAFO is designed, constructed, operated or maintained such that a discharge will occur, and not simply that it might occur. Several factors were enumerated as relevant to this assessment of a discharge. In addition, an animal feeding operation may be designated as a ‘Small’ CAFO if it is determined to be a significant contributor of pollutants to waters of the United States. Approximately 14,000 CAFOs are believed to need NPDES permits (EPA, 2009b).

Agricultural groups argued that the regulatory coverage of operators who ‘propose to discharge’ fails to articulate meaningful criteria for the requirement (National Pork Producers Council Petitioners’ Brief, 2009). In National Pork Producers Council vs EPA (2011), a federal court found that there was no statutory authority to regulate CAFOs that propose to discharge. The court interpreted the EPA’s definition of ‘proposes to discharge’ as requiring persons to apply for a permit even though they were not discharging. Since only CAFOs with discharges may be required to apply for NPDES permits under federal law, the provision exceeded the EPA’s authority. The position taken by the National Pork Producers Council court is very helpful for CAFO owners who are governed by the federal CAFO Rule in five states: Idaho, Massachusetts, New Hampshire, New Mexico and Oklahoma. Other states are governed by state law so the court’s holding may not apply, as decided by a Michigan court (Michigan Farm Bureau vs Department of Environmental Quality, 2011).
Producers with permits have NMPs with site-specific nutrient management practices to ensure the utilization of nutrients in the manure (US CFR, 2010). This requires the development of a nutrient management plan that addresses nine factors enumerated in the federal regulations. Permittees must also prevent direct contact of confined animals with waters of the United States and implement appropriate buffers or practices to control runoff of pollutants (US CFR, 2010). Furthermore, the CAFO Rule requires that the public have an opportunity to participate in the development of effluent limitations in individual permits and in notices of intent under general permits (US CFR, 2010).

The provisions of Part 412 impose additional requirements only on Large CAFOs. Large CAFOs are divided into four subcategories (A, B, C and D) dependent upon the species of animals (Figure 1). Most water contamination concerns involve the requirements for dairy, cattle, swine and poultry, so the discussion of Large CAFOs is limited to these. Large CAFOs are prohibited from having any discharges of manure, litter or process wastewater from their production areas (US CFR, 2010). This means that no stormwater or lagoon discharges are allowed. Large CAFOs also have additional setback requirements for the application of manure to fields to prevent leaching into open tiles, sinkholes, well heads or other conduits to surface waters (US CFR, 2010). These requirements suggest that Large CAFOs with permits should not be significantly contributing to the impairment of surface waters.

In addressing discharges from storm events, Part 412 says that Large CAFO facilities should be designed to contain the runoff and direct precipitation of a 25-year, 24-hour rainfall event. CAFOs adopting this standard have a defense if a storm event causes a discharge into surface waters (US CFR, 2010).

For land application areas, Part 412 delineates additional specific BMPs that must be implemented by Large CAFOs (US CFR, 2010). Large CAFOs must analyze manure annually for nitrogen and phosphorus. Another requirement directs these CAFOs to provide recipients of manure with a nutrient analysis, and Large CAFOs must also keep additional records. While other CAFOs are free to adopt these requirements, they are only required of Large CAFOs.

3. Discussion

The analysis of the regulations governing land application discharges in the US shows a progression of requirements to control discharges of pollutants into surface waters. Congress and state legislatures have decided that, as animal production units have more animals, they should be subjected to more regulatory controls. The justification for these controls is that larger operations present greater risks of environmental damage. While the risks may be greater, this does not mean that larger facilities have more pollutants entering surface waters. One research study concluded that large swine operations were not necessarily any worse polluters than small operators due to being more aware of how to use nutrients effectively (Hassinger et al., 2000). The study’s data suggested that larger operations incorporated manure in the soil within 24 hours of surface application and used environmentally sound strategies (Hassinger et al., 2000).

Another research study found that the adoption of BMPs was positively correlated with number of acres (Prokopy et al., 2008). The study’s assessment of the impact of acres based on BMP type showed acres as a positively-significant determinant of the adoption of BMP practices (Prokopy et al., 2008). While this suggests that owners of large acreages are less likely to be significant contributors to water pollution, the authors declined to make such a conclusion. Animal numbers at a single
operation may form a starting point for evaluating risk of nutrient pollution, but may not be an accurate predictor of environmental degradation.

The analysis of the regulations applying to size categories of animal producers shows that more might be done to augment environmental quality by imposing additional requirements. Although environmental controls involve costs that are difficult to balance against their anticipated benefits, the EPA considered costs in the development of the 2003 CAFO Rule (EPA, 2003). The US Department of Agriculture (USDA) estimated that the development of a comprehensive nutrient management plan would cost a farm more than US$8,100 (USDA, 2003). A more recent study suggested that nutrient management planning for nitrogen may involve financial losses ranging from 12 to 19% (Baerenklau et al., 2008).

Given the reluctance of state legislators to enact environmental controls beyond what are required by federal law (Organ, 1995), other mechanisms might be explored for addressing pollution from animal production. Five issues may be addressed: identifying pollution sources, implementation and enforcement issues, educational efforts and attitudes, cooperation and total maximum daily loads.

3.1. Identifying sources of pollution

To more effectively reduce the impairment of waters from animal pollutants, learning more about the sources of pollution might be helpful, as EPA claimed to lack ‘information on the extent to which water pollutants are actually being discharged by CAFOs’ (US Government Accountability Office, 2008). Since the Clean Water Act only regulates point sources, is there evidence that these operations are major contributors to water pollution rather than simply posing a greater risk for pollution? Alternatively, can credible information about attributes or specifics of non-CAFOs be discerned that might support additional state nonpoint-source regulations for restricted sets of polluters?

The problem of reliable data plagued the EPA as it developed regulations for CAFOs. In revising the CAFO Rule in 2003, the EPA employed data collected in the early and mid 1990s (EPA, 2000). Yet more than 100,000 farms had stopped producing animals since that time (Centner, 2002). Simultaneously, state regulations addressing pollutants from animal production are markedly different from those applicable when the EPA’s data were gathered in the 1990s (Metcalfe, 2000). With revised regulations, state governments may have already responded to much of the reported pollution observed in the 1990s (Centner, 2002).

Reported data employed by the EPA also have difficulties sorting pollution from animals from other agricultural sources. The data used for the 2003 regulations reported miles of rivers impaired by different polluting sources. They showed that non-irrigated crop production, irrigated agriculture, and range and pasture grazing each contributed to more impaired river miles than animal feeding operations (EPA, 2000). From reported data, the EPA concluded that animal feeding operations may have contributed to about 3.3% of the reported impaired river miles (EPA, 2000; 62–65; Centner, 2002). In the latest data reported by the EPA, animal feeding operations are part of agricultural nonpoint-source pollution so no evidence is presented as to the significance of animal nutrient pollution (EPA, 2009c).

More recent data support a finding that nonpoint-sources are the major cause of water pollution (EPA, 2009c), suggesting that CAFO production areas regulated as point sources are not a problem. The most recent section 305(b) report from the EPA shows that agricultural nonpoint-source pollution is the largest category of water pollutants (EPA, 2009c). New York and Vermont reported that nonpoint sources contributed 90% of the water quality impacts on rivers and streams (New York Department of
Environmental Conservation, 2008; Vermont Department of Environmental Conservation, 2008). Minnesota reported that 86% of its water pollution comes from nonpoint sources (Minnesota Pollution Control Agency, 2003). Because these data suggest that nonpoint-source pollution is the problem, solutions should be sought that address non-CAFOs.

3.2. Implementation and enforcement issues

Discussions of the adoption of BMPs by poultry producers suggest that significant numbers of animal producers have not implemented BMPs to stop pollutants from entering surface waters (Sharpley et al., 2007). Governmental reports (Copeland, 2010a, b; Stubbs, 2011; US General Accounting Office, 2003) and citizen enforcement lawsuits against producers also suggest considerable noncompliance (see Table 2). In 2010, the Congressional Research Service cited an earlier report to suggest that regulatory agencies have not ‘previously given much priority to regulating feedlot wastes’ (Copeland, 2010b: 20). What might be done to convince more producers to take appropriate actions to reduce pollution?

One obvious action is to increase penalties and governmental oversight to deter wrongful conduct. A response concerning penalties may be divided into two groups: (1) penalties for point-source water quality controls; and (2) penalties for nonpoint-source pollution. Penalties for violating point-source water quality controls seem adequate. Under the CAFO Rule, violators may be fined US$37,500 per day (US CFR, 2010). State water quality programs can also have penalties for state permit violations. Regulatory agencies often prefer other efforts to achieve compliance, such as warning letters, notices of violation, administrative orders and civil penalties (Washington State Department of Agriculture, 2008; EPA, 2011). Yet, the threat of substantial penalties serves as a deterrent to point-source pollution.

However, few enforcement mechanisms are available for nonpoint-source pollution. Best management practices, including the implementation of NMPs, are offered by state legislatures to address nonpoint-source pollution. Producers voluntarily adopt these practices, with many forgoing adoption due to several reasons. While governments have made funding available for conservation programs, producers are hesitant to become involved due to the time needed to participate in the program and concerns about limitations on the use of their property (Hua et al., 2004).

Documenting a departure by a producer from a required BMP that is contrary to state law is difficult and time consuming (EPA 2003: 7253). It requires personnel to inspect the producer’s practices and gather evidence of a violation. Given governmental budgets, states are unlikely to fund additional personnel to oversee nonpoint-source pollution. Moreover, an action against a single producer only addresses a small amount of pollution. This makes enforcement actions against nonpoint-source polluters impractical due to costs. State regulatory agencies do not have the resources to penalize producers who fail to follow BMPs.

With these obstacles, some other mechanism might be advantageous to convince producers to do more to safeguard water quality. Borrowing from the Farm Security Act of 1985 (Public Law 99-198, 1985), a conservation compliance mechanism could be adopted to encourage nutrient management planning (Centner et al., 2009). The mechanism would be modeled after the swampbuster provision enacted to curb the loss of wetlands. Swampbuster provided a governmental response to an environmental problem without imposing mandatory restrictions. Producers who fail to preserve wetlands are precluded from eligibility for federal farm subsidy programs. A similar sodbuster provision
discourages the cultivation of highly erodible virgin land. Although the swampbuster provision does not enunciate a prohibition against draining wetlands, farmers have desisted from the activity given the potential loss of participation in federal farm programs.

Table 2. Major CAFO water pollution cases.

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<thead>
<tr>
<th>Case</th>
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<tbody>
<tr>
<td>National Pork Producers Council vs EPA</td>
<td>2011 US App. LEXIS 5018 (5th Cir. 2011)</td>
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<tr>
<td>United States vs Vierstra</td>
<td>2011 US Dist. LEXIS 28517 (D. Idaho 2011)</td>
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<tr>
<td>Humane Society of the United States vs HVFG, LLC</td>
<td>2010 US Dist LEXIS 85422 (May. 6, 2010)</td>
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<tr>
<td>Assateague Coastkeeper vs Hudson Farm</td>
<td>727 F. Supp. 2d 433 (D. Md. 2010)</td>
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<tr>
<td>Idaho Dairymen’s Association vs Gooding County</td>
<td>227 P.3d 907 (Idaho 2010)</td>
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<tr>
<td>Holdner vs Oregon Department of Agriculture</td>
<td>676 F. Supp. 2d 1141 (D. Or. 2009)</td>
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<tr>
<td>Coon vs Willet Dairy, LP</td>
<td>2007 US Dist. LEXIS 51718 (N.D. N.Y. July 17, 2007)</td>
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<tr>
<td>Waterkeeper Alliance, Inc. vs EPA</td>
<td>399 F.3d 486 (2d Cir. 2005)</td>
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<tr>
<td>Community Association for Restoration of the Environment vs Henry Bosma Dairy</td>
<td>305 F.3d 943 (9th Cir. 2002)</td>
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<tr>
<td>Johnson County Citizen Comm. vs EPA</td>
<td>No. 3L05-0222, 2005 US Dist. LEXIS 33190 (M.D. Tenn. Sept. 9, 2005)</td>
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<tr>
<td>Save the Valley vs EPA</td>
<td>223 F. Supp. 2d 997 (S.D. Ind. 2002)</td>
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<tr>
<td>Idaho Rural Council vs Bosma</td>
<td>143 F. Supp. 2d 1169 (D. Idaho 2001)</td>
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<tr>
<td>Community Association for Restoration of the Environment vs Sid Koopman Dairy</td>
<td>54 F. Supp. 2d 976 (E.D. Wash. 1999)</td>
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<tr>
<td>Breitweiser vs Indiana Office of Environmental Adjudication</td>
<td>775 N.E.2d 1175 (Ind. Ct. App. 2002)</td>
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<tr>
<td>Tennessee Environmental Council vs Tennessee Water Quality Control Board</td>
<td>254 S.W.3d 396 (Tenn. Ct. App. 2007)</td>
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<tr>
<td>Maple Leaf Farms, Inc. vs State</td>
<td>633 N.W.2d 720 (Wis. Ct. App. 2001)</td>
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The significance of the swampbuster provision is that Congress bypassed the mandatory controls of the Clean Water Act to encourage an environmental stewardship practice: refraining from draining wetlands. In a similar manner, Congress might enact a law that animal producers who fail to adopt NMPs are precluded from eligibility for federal farm subsidy programs. The legislation would cover small operations that are not regulated under the CAFO Rule. In this manner, animal producers would not be subjected to mandatory controls or paperwork, but would be encouraged to engage in appropriate manure management practices.

3.3. Educational efforts and attitudes

Another idea to address water pollution is to engage in more educational efforts. More highly educated producers, including producers who have received training, are generally more likely to adopt BMPs (Prokopy et al., 2008). Therefore, educational efforts might be fruitful in helping producers reduce pollution. In a study of farmer attitudes, it was concluded that ‘past education efforts evidently have convinced producers that their practices do affect water quality but have not fully convinced them that a water quality ‘problem’ exists’ (Smith et al., 2007). Cooperative extension service programs and other educational activities can play a role in supporting the adoption of conservation practices to reduce pollution (Greiner et al., 2009).

Access to information may lead to greater adoption of BMPs (Prokopy et al., 2008). Most states already employ cooperative extension personnel to help with nutrient management planning. These efforts have been instrumental in helping producers develop NMPs to comply with NPDES permitting requirements for CAFOs. Moreover, the ability of producers to network with extension personnel and other producers tends to augment the adoption of nutrient management practices (Prokopy et al., 2008). Given that many smaller producers still lack NMPs, further educational efforts might be beneficial. Cooperative extension staff should be encouraged to reach out to smaller producers and assist them with developing voluntary NMPs.

Research on BMPs and environmental quality also suggests that there is a perception gap between producers and regulatory officials over the severity of water quality problems (Smith et al., 2007). Many producers do not have the same perceptions of water quality as are expressed in federal environmental legislation (Smith et al., 2007). Producers tend to be ambivalent about adopting conservation measures (Cable et al., 1999) and water quality (Smith et al., 2007). Many just do not see ‘what all the fuss is about’ (Smith et al., 2007).

This perception gap raises questions about the role of agricultural interest groups and the farm press. To offer support to their agricultural clientele, they could institute educational programs that include sharing ideas, thoughts and the social goals of the public. With respect to water quality, agricultural groups could acknowledge that agriculture is a major contributor to water impairment and address ways to respond to pollution problems. Another idea that has been implemented in some areas is treating manure as a resource to be marketed rather than a waste to be disposed of on nearby fields (Kang et al., 2008). Manure can be used in place of commercial fertilizer to achieve production goals at a cheaper cost (Park et al., 2010).

What type of information and programs are agricultural groups offering to producers regarding the sustainable use of manure for crop production? Due to distinctions between states and regions, national agricultural groups do not offer environmental stewardship programs. Yet, agricultural groups are in a position to be leaders and facilitators of environmental stewardship. Their publications and actions can
help encourage producers to adopt technology and practices that are beneficial to the industry and the country. American agriculture played an important part in the agricultural revolution of the 18th and 19th centuries and led the green revolution of the 20th century. Agricultural groups have major opportunities to help American agriculture become the leader in a sustainable revolution. They could work with land-grant university researchers, cooperative extension specialists and private corporations to implement new technology and management practices to augment sustainable agricultural production and environmental quality.

3.4. Cooperation in addressing the issue

Another significant issue involves the lack of cooperation of producers, producer groups, regulatory agencies and others in addressing nonpoint-source pollution. In the development of the 2003 CAFO Rule, the USDA worked with the EPA in developing regulations that would meet legal requirements, respond to unacceptable pollutants and not burden producers with too many regulations. However, both agricultural and environmental groups were unhappy with the regulations and petitioned for review in the Waterkeeper lawsuit. A court also responded to agricultural petitioners in the National Pork Producers Council lawsuit (National Pork Producers Council vs EPA, 2011). The litigation shows a perception gap over what is required by the Clean Water Act. This is similar but distinct from the gap over the severity of water quality problems that exists between producers and regulatory officials (Smith et al., 2007). Agricultural groups are declining to acknowledge regulatory and judicial conclusions that the application of manure may lead to point-source discharges (National Pork Producers Council vs EPA, 2011; Michigan Farm Bureau vs Department of Environmental Quality, 2011). Environmentalists are having difficulty accepting the fact that potential discharges and non-CAFOs cannot be regulated under the Clean Water Act.

So what can be done to address this gap and the lawsuits that are consuming too much time? Since the EPA is in charge of developing and administrating the CAFO Rule, it needs to be even more proactive with involving the USDA and agricultural groups in the development of its regulations. The EPA has delineated adequate responses to comments made about its proposed rules and lengthy descriptions in support of its regulations. However, the agency has not connected with the concerns of agricultural groups, as they remain unconvinced that addressing the impairment of the nation’s waters needs more controls over agricultural pollution. Perhaps the EPA could be even more proactive in organizing meetings with agricultural groups to develop further strategies to address impaired water quality segments.

Agricultural groups could also do more to help producers in implementing BMPs. While some efforts at helping and educating producers have been made, environmental education programs have not been a prominent aspect of these organizations’ activities. In opposing governmental pollution regulations, agricultural groups have trivialized the problem of impaired waters. One of the best defenses against more regulations may be a good offensive involving helping producers reduce pollutants entering surface waters. By directing educational programs for producers, agricultural groups could assist more producers in implementing voluntary BMPs leading to reductions in water pollution. It is especially important that the efforts reach those producers who may be contributing to water impairment.

Environmentalists could do the same. A greater focus on helping producers implement BMPs might be more fruitful than opposition to current regulations. Alternatively, environmental and agricultural groups could direct efforts at determining the origins of water pollutants. It is not clear that all federal
and state regulatory provisions are needed to address water pollution. Through the identification of pollution sources, more specific efforts could be directed at those sources. Congress has charged the EPA with meeting water quality goals, and agricultural and environmental interest groups could do more to assist the EPA in meeting its regulatory mandates.

3.5. Total maximum daily load requirements

Another avenue to address nonpoint-source pollution for waters that do not meet state water quality standards involves the Clean Water Act’s TMDL requirements (US Code, 2006; US CFR, 2010). The act employs technology-based effluent limitations to reduce water pollution from point sources. Every two years, states report a section 303(d) list of impaired waters to the EPA identifying those waters where required pollution controls are not sufficient to attain applicable water quality standards (US CFR, 2010). States must develop TMDLs for the water quality-limited segments.

Under the TMDL regulations, the state develops waste load allocations for pollutants to achieve water quality standards and submits the TMDLs to the EPA for approval. The TMDL calculates the maximum amount of a pollutant allowed to enter a waterbody so that the water meets quality standards for the particular pollutant, and allocates pollutant loads among point and nonpoint sources. If a state declines to adopt TMDLs, or the EPA declines to approve a TMDL, the EPA develops TMDLs for the state’s waters. In response to judicial challenges, states and the EPA have been directed to develop numerous TMDLs (Sierra Club vs Hankinson, 2003).

To implement TMDLs, permitting agencies adopt more stringent permit limits for point sources when permits are renewed, and apply for section 319 grants to fund projects and programs to reduce nonpoint-source pollution. This means that limits on nonpoint sources may be set forth in TMDLs but no mechanism exists to require their implementation (Byrne, 2007). TMDLs remain as possibilities to regulate nonpoint-source pollution and states are actively involved in developing TMDLs. However, although states must act to establish pollutant limits, they have not chosen to implement limits for all nonpoint-source pollutants.

A report from EPA Region 5 (Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin) contained positive results that 80% of the identified TMDLs for the region has been partially to fully implemented (EPA, 2009a). However, full implementation for every practice related to a given TMDL had been achieved in less than 3% (EPA, 2009a). States are still working to implement required TMDLs.

4. Conclusion

Addressing pollution from the application of manure on fields is challenging. Best management practices and NMPs are available to reduce water contamination, and many farms have adopted these practices. In the European Union, the Nitrate Directive (European Commission, 1991) and the Water Framework Directive (European Commission, 2000) address water pollution from agricultural sources (Fassio et al., 2005; Ondersteijn et al., 2002; Humphreys, 2008). In the United States, rulings from the judiciary have forced the EPA to revise its CAFO Rule. The more detailed provisions should lead to reductions of pollutants entering surface waters. However, these regulations do not address more than one million farms raising livestock. Without meaningful controls over nonpoint-source pollution, those areas where there are a large number of CAFOs localized with insufficient acreages for land
applications of animal waste may not be able to meet the water quality objectives delineated in the Clean Water Act.

By describing US regulations applying to four categories of farms producing animals, ideas for more forceful regulatory controls become apparent. Yet more controls may not be the best response to agricultural water pollution problems. In developing revised regulations in 2003, the EPA evaluated costs and took steps to minimize impacts on small producers (EPA, 2003). Because more regulations are accompanied by costs to producers and costs to governments in overseeing and enforcing pollution-control programs, other ideas should be explored, although alternatives may also be costly.

Five issues are prominent. First, the identification of sources of pollutants can facilitate more specific responses. Second, a new mechanism might be adopted to preclude producers who decline to implement NMPs from participating in governmental support programs. Third, new efforts in educational programs and sharing more information about public objectives for enhancing environmental quality might help producers recognize how their operations affect the water quality of their communities and state. Fourth, greater cooperation of groups, regulators and producers in addressing pollution problems might lead to reductions in nutrient pollution. Finally, a state might address pollutant loadings through TMDL requirements.

American agriculture has been very successful in meeting numerous challenges over the past two centuries. Given Congressional and judicial directives, it is time for the agricultural community to come together and more meaningfully address water pollution. To more fully serve their clientele, agricultural groups could work with regulatory agencies and states to use manure as resources for sustainable crop production. The Clean Water Act does not preclude the land application of manure. Rather, it delineates directives under which permittees and others should adopt BMPs to use nutrients for crop production and minimize pollution. The employment of one or more of the above-mentioned mechanisms offers ways to augment efficient and sustainable agricultural production while reducing water contamination.

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