Cultivating Clean Water

State-based regulation of agricultural runoff pollution

Environmental Law & Policy Center

Mississippi River Collaborative

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Heritage River in Virginia, protected by buffers, fencing and other agricultural BMPs. Photo by Jeff Vanuga, USDA NRCS.

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Introduction

"Cultivating Clean Water" assesses state-based nonpoint source water pollution regulation and recommends policies to protect water quality. Nonpoint source pollution, generally speaking, refers to polluted runoff. It is called "nonpoint" pollution because the pollution discharge rules of the Clean Water Act apply only to "point sources" - nonpoint pollution therefore describes runoff pollution that is not directly regulated by the federal Clean Water Act.[1]

This report focuses on state-based regulatory solutions to the problem of nonpoint pollution from agriculture in particular. Agricultural runoff can contain a variety of harmful pollutants, including nitrogen, phosphorus, biochemical oxygen demand, sediment, pathogens, pesticides and pharmaceuticals.[2] Nitrogen and phosphorus pollution deserves particular concern, as these pollutants (sometimes referred to as "nutrients") are cited as two of the most significant stressors to water quality nationwide.[3] According to a task group made up of U.S. EPA staff and state regulators, nitrogen and phosphorus pollution has the potential to become "one of the costliest, most difficult environmental problems we face in the 21st century."[4]

> "Nitrogen and phosphorus pollution has the potential to become 'one of the costliest, most difficult environmental problems we face in the 21st century.'"

Animal manure and chemical fertilizers are primary sources of nitrogen and phosphorus. Although nitrogen and phosphorus are important for plant growth, they also cause serious damage to lakes, streams and groundwater. Manure and fertilizer are often over-applied or improperly timed, causing excess nitrogen and phosphorus to run off into surface waters or leach into groundwater. Even when manure and fertilizer are applied at proper agronomic rates for crop growth, nitrogen and phosphorus losses from cropland can create water quality problems. This report will focus on basic management tools that reduce nitrogen and phosphorus pollution.

Elevated levels of nitrogen and phosphorus in surface waters cause excessive algae growth, which robs the water column of dissolved oxygen and degrades aquatic ecosystems.[5] This problem can progress to form hypoxic (containing low oxygen) or even anoxic (containing no oxygen) areas where virtually no life can survive.[6] A giant hypoxic zone (or "dead zone") now occurs every year in the Northern Gulf of Mexico as a result of large amounts of nitrogen and phosphorus pollution contributed by the Mississippi and Atchafalaya River Basins.[7] The area of the Dead Zone fluctuates, but in several years it has exceeded 20,000 square kilometers or about the size of Massachusetts.[8] The lack of oxygen in the Dead Zone poses a serious threat to species diversity in the Gulf and to its $2.8 billion commercial and recreational fishing industry.[9]

The costs of nitrogen and phosphorus pollution are felt in the nation's freshwater systems as well. Toxic effects of nitrogen and phosphorus pollution can negatively impact drinking water, recreational, wildlife and aquatic life uses of the nation's waters. Nitrogen and phosphorus pollution affect human health and wildlife by stimulating the growth of algae and pathogenic and toxin-producing microorganisms, such as cyanobacteria.[10] High concentrations of the nutrients themselves can also cause problems; for example, high levels of nitrate can be directly toxic to humans who drink the water and to aquatic organisms.[11] Further, before water with high algae levels is suitable for drinking it must be treated, and cancer-causing trihalomethanes are produced as an unwanted byproduct of the treatment process.[12] All of these water quality problems endanger public health and impose significant costs on drinking water.[13]

The negative effects of nitrogen and phosphorus pollution on aquatic systems have been documented nationwide. In December 2006, the United States Environmental Protection Agency (U.S. EPA) issued a report from its Wadeable Streams Assessment, which concluded that 42% of the nation's streams are in poor biological condition and 25% are in fair condition.[14] Nitrogen and phosphorus were identified as major stressors contributing to degraded biological conditions: 31% of studied streams had high levels of phosphorus and 32% had high levels of nitrogen.[15] Similarly 64% of assessed lakes were listed as impaired.[16] Of these impaired waters, about 20% were listed as impaired because of nutrient pollution.[17] However these figures are necessarily an underestimate because many states have a policy of not recognizing nutrient impairments.

Although nitrogen and phosphorus pollution comes from several sources, agriculture is by far the largest source. Agricultural contributions of nitrogen and phosphorus to the Gulf of Mexico are 71% and 80%, respectively.[18] Livestock production nationwide generates over a billion tons of manure each year, much of which ends up in our nation's water.[19] For perspective, that is fifty times the amount of human sewage treated annually in this country.[20] Row crop production occurs on over 313 million acres of land.[21] Animal manure and chemical fertilizers are applied to much of this land, yet only a fraction of the nitrogen and phosphorus in those applications is actually used by plants.[22] Excess nitrogen and phosphorus fertilizer runs off the land, degrading water quality locally and far downstream.[23]

Current approaches to protect water quality will not succeed in controlling nitrogen and phosphorus pollution.[24] The Clean Water Act explicitly exempts agricultural stormwater runoff and irrigation return flows from regulatory requirements under the Act and its National Pollutant Discharge Elimination System (NPDES) program.[25] Discharges from Concentrated Animal Feeding Operations (CAFOs) are covered by the NPDES permit program,[26] but under U.S. EPA CAFO rules, many CAFOs may not seek NPDES coverage because they do not "propose to discharge."[27] In practice, this means that manure from these facilities is applied to land, where stormwater runoff is exempt from regulation.[28] Consequently, the largest contributors of nitrogen and phosphorus are scarcely regulated at the federal level and pollution problems continue to worsen.

Photo by Hilde Vanstraelen, courtesy of Stock.xchng.

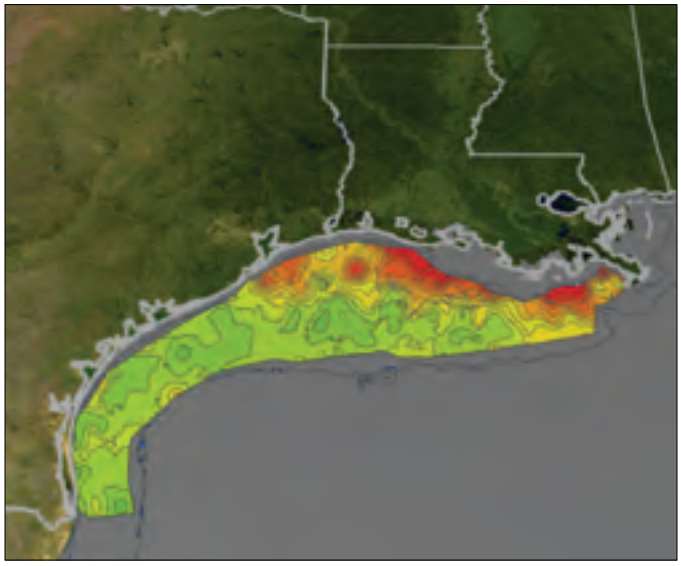
Executive Summary

Nonpoint source pollution is the greatest threat to water quality in the United States,[29] yet neither states nor the federal government has taken adequate steps to defuse that threat. As noted in the introduction, nonpoint source pollution refers generally to polluted runoff, but this report will focus on polluted runoff from agriculture. Nonpoint source pollution is one of the most pervasive forms of water pollution and is not directly regulated by the Clean Water Act.

The damage from nonpoint pollution is felt both locally and downstream from the source, such as in the Gulf of Mexico's Dead Zone, an area the size of Massachusetts that is basically devoid of life. To protect water quality, states must design effective controls for the pollution that flows from farms within their borders. This report recommends several reasonable options to begin the process of regulating agricultural nonpoint pollution at the state level.

The recommendations in this report were developed based on extensive research into existing state regulations that control nonpoint pollution from agriculture. We primarily reviewed existing statutes and regulations, as well as other published documents (e.g. annual reports, implementation policies, etc.). In many cases, we consulted state agency officials or water quality advocates working within a state in order to develop an on-the-ground perspective of the programs' effectiveness.

Though we researched regulations nationwide, the aim was not to capture every single regulation that deals with nonpoint source pollution. This report does not address pollution controls associated with NPDES CAFO permitting, although we note that universally-applicable regulations might borrow language from CAFO program requirements. Neither does this report address voluntary pollution-reduction programs, because the voluntary approaches that have been used so far to reduce nonpoint pollution are not significantly improving water quality.[30]



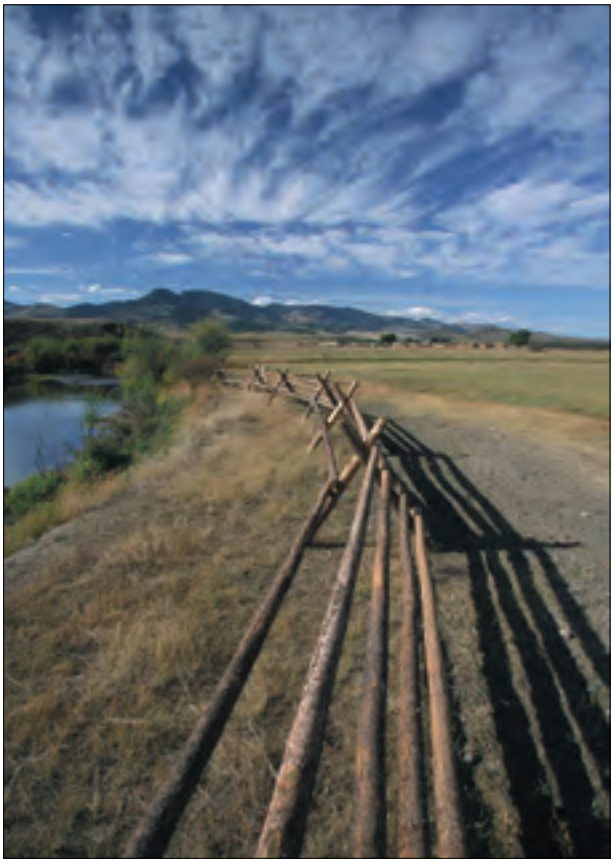
The area of the Dead Zone fluctuates, but for several years it has exceeded 20,000 square kilometers or about the size of Massachusetts. Photo courtesy of NASA.

The purpose of this report, then, is to examine several specific types of state-based agricultural nonpoint regulations by comparing and contrasting existing state regulations and analyzing the effectiveness of those programs.

Part one of this report examines seven existing state programs that comprehensively address agricultural nonpoint pollution at the farm level. We identified these seven programs by soliciting examples of well-developed nonpoint management programs from colleagues throughout the country. These "overarching regulatory programs to control nonpoint pollution" typically involve a tailored pollution management plan and/or implementation of best management practices that minimize the extent to which each farm pollutes surface and groundwater.

Part two of this report focuses on five individual agricultural management practices, each of which is common-sense, widely-applicable, and readily required by state regulation. These practices include:

1) vegetative buffer requirements,
2) land application setbacks,
3) winter manure application restrictions,
4) livestock exclusion requirements and
5) fall fertilizer restrictions.



Livestock exlusion in Montana. Photo by Gary Kramer, USDA NRCS.

Together, these practices address nitrogen, phosphorus and other pollution that comes from both manure and commercial fertilizers. They do not represent a comprehensive list of best management practices for agriculture, but are important first steps toward improving water quality.

We are encouraged to find that a number of states have adopted regulations that require comprehensive pollution management planning and implementation of applicable best management practices. Some states have developed regulations with helpful elements, such as provisions that allow citizens to make official complaints or even bring suit to encourage compliance. However, this progress is tempered by a number of common problems that undermine the effectiveness of the regulations.

All states fall short on enforcement and monitoring, largely as a result of limited financial and staff resources and political resistance to the idea of regulating agriculture. Some states additionally suffer from vague regulatory requirements; others have not created an adequate system of spot-checking compliance; still others are unable to adequately identify operations that must comply with the regulations. A "poison pill" that is almost certain to cripple implementation of the program is the requirement that cost-funds be provided by the state in order to make the terms of the regulation enforceable.

This report provides a snapshot of what is currently a fragmented and poorly-implemented system of state-based regulation of nonpoint pollution. But the story this snapshot tells is not one of failure; rather it is a story of unrealized potential. As states adopt and amend nonpoint pollution regulations, they can build upon lessons learned and develop programs that can be more effectively implemented and enforced.

A few common themes recur throughout our recommendations:

1) To maximize water quality benefits and level the playing field, most of these regulations should apply broadly to all agricultural operations.

2) Implementing agencies must be funded sufficiently to oversee compliance with the regulations.

3) The consequences of noncompliance should include penalties that are significant enough to deter those violations.
4) States should develop monitoring programs that are specifically designed to document water quality improvements resulting from these programs.

For each type of regulation discussed in this report, we begin with a summary section that describes common elements of the regulation and compares different states' approaches to each element. To aid in that comparison, we have included tables that isolate these elements so they may be viewed "at a glance." Based on our analysis of these regulations, we have developed recommendations outlining which components should be incorporated in order to build an effective regulation. These recommendations are presented in the form of a "checklist" at the conclusion of each summary section. For ease of reference, we also have compiled all of these checklists on the next three pages. Finally, the discussion of each type of regulation concludes with a more in-depth state-by-state description of each existing regulation.

For too long, agriculture's effect on water quality has been largely ignored. Our rivers, streams and lakes are polluted and will not improve until agricultural producers become part of the solution. Each state needs to take responsibility for protecting water quality and public health by enacting a set of rules that everyone is expected to follow. We hope that this report helps states to begin that process without delay.

Farm pond in Benton County, Iowa. Photo by Tim McCabe, USDA Natural Resources Conservation Service.

Checklist

Elements of an effective overarching program

- ☐ A requirement that a comprehensive pollution management plan (e.g. nutrient management plan) be tailored to each site
- ☐ A list of what a comprehensive pollution management plan must include
- ☐ A requirement that each agricultural operation implement its pollution management plan
- ☐ Broad, fair application of the pollution planning requirement that allows for easy identification of agricultural operations subject to the requirement
- ☐ A requirement that all operations subject to the planning requirement annually submit implementation reports to the appropriate agency
- ☐ Adequate agency staff and funding to review implementation reports and conduct spot-check inspections of at least 10% of facilities annually
- ☐ Enforcement provisions that establish meaningful penalties (injunctions, substantial monetary fines, and disqualification from state financial assistance) for violations of the planning, implementation and reporting requirements
- ☐ Adequate staff and funding to pursue planning, implementation and reporting violations
- ☐ A provision that allows private citizens to bring an enforcement suit to compel a violator to comply with program requirements
- ☐ Technical and/or cost-share assistance for those subject to the plan(However, program requirements should not be contingent on the availability of cost-share funds)
- ☐ A focused and well-funded plan to monitor water quality and document on-the-ground improvements associated with the program
- ☐ A requirement that the implementing agency prepare a publicly-available annual report detailing 1) the use of program funds by location, 2) statistics on compliance monitoring and enforcement and 3) projected and realized water quality outcomes

Checklist

Elements of an effective livestock exclusion regulation

- ☐ Apply broadly to all livestock operations
- ☐ A prohibition on livestock access to surface water, including rivers, streams lakes and ponds (other than those constructed for the purpose of livestock watering)
- ☐ Minimal exemptions, if any, for pasturing that require vegetative cover to be maintained under all circumstances
- ☐ Enforcement provisions that establish meaningful penalties (injunctions and substantial monetary fines) for violations of the regulation
- ☐ Adequate staff and funding to pursue violations
- ☐ A citizen complaint mechanism to report violations

Elements of an effective winter manure application regulation

- ☐ Apply to all agricultural lands
- ☐ Prohibit manure application "between (two locally-appropriate dates) or when ground is frozen or snow-covered"
- ☐ Apply to both liquid and solid manure applications
- ☐ Require a variance proceeding (in which the applicant must prove that no alternatives to winter application are available) and additional water quality protections if emergency winter application is necessary on a very limited basis. The availability of a variance does not relieve an operator from the responsibility for maintaining adequate manure storage
- ☐ Enforcement provisions that establish meaningful penalties (injunctions and substantial monetary fines) for violations of the regulation
- ☐ Adequate staff and funding to pursue violations
- ☐ A citizen complaint mechanism to report violations

Checklist

Elements of an effective regulation requiring land application setbacks

- ☐ Apply to all manure spreading (better yet, to commercial fertilizer/pesticide application as well)
- ☐ Require land application to be set back at least 100 feet from rivers, streams (including intermittent streams), lakes, ponds, wetlands, and wells
- ☐ Allow the administering agency to require wider setbacks as necessary to protect surface water and groundwater quality
- ☐ Refrain from exemptions and waiver provisions
- ☐ Enforcement provisions that establish meaningful penalties (injunctions and substantial monetary fines) for violations of the regulation
- ☐ Adequate staff and funding to pursue violations
- ☐ A citizen complaint mechanism to report violations

Elements of an effective vegetative buffer regulation

- ☐ Apply to all agricultural operations (or better yet, to all development)
- ☐ Require a specified minimum width of vegetative buffer along all surface water
- ☐ Specify that buffers should consist of perennial, non-pest vegetative species
- ☐ Refrain from exemptions and waiver provisions
- ☐ Enforcement provisions that establish meaningful penalties (injunctions and substantial monetary fines) for violations of the regulation
- ☐ Adequate staff and funding to pursue violations
- ☐ A citizen complaint mechanism to report violations

Elements of an effective fall fertilizer regulation

- ☐ Apply to all agricultural operations
- ☐ Prohibit applications of commercial nitrogen fertilizer and phosphorus fertilizers that contain nitrogen between specified dates
- ☐ Identify locally-appropriate dates for prohibition based on average soil temperatures
- ☐ Allow fall-seeded crops to be fertilized close to time of planting with fertilizers that are less likely to run off into surface water or leach into groundwater

Overarching Regulatory Programs to Control Nonpoint Pollution

1

A number of states have developed regulatory programs that focus on comprehensively managing nonpoint pollution from agriculture on a site-by-site basis. This chapter will focus on seven state programs that we have studied: California, Delaware, Iowa, Kentucky, Maryland, Oregon and Wisconsin. Although these programs represent important strategies to reduce nonpoint pollution, no program has yet been implemented to its full extent. The checklist below recommends elements that should be included in an effective overarching regulatory program to control nonpoint pollution, based on the successes and shortcomings of these existing state programs. A detailed discussion of each state program follows the checklist.

Regulatory Programs

State programs use different strategies (or combinations of strategies) to minimize nonpoint pollution from agriculture, often focusing on nitrogen and phosphorus pollution in particular. These strategies include nonpoint pollution reduction planning for individual agricultural operations, regional or watershed level water quality planning, and comprehensive Best Management Practice (BMP) requirements to be implemented on a site-by-site basis as applicable.

Individualized nonpoint pollution reduction plans frequently take the form of nutrient management plans. Generally speaking, such a plan will assess an agricultural operation comprehensively and identify opportunities to reduce nonpoint pollution contributions from that facility. The strength of this approach is that pollution management practices can be tailored to address many conditions that vary from site to site, and the comprehensive approach to planning frequently leads to increased production yields. Although all CAFOs subject to the Federal NPDES program are required to develop nutrient management plans,[31] California, Delaware, Kentucky, Maryland and Wisconsin all require nutrient management plans (or other nonpoint pollution plans) for agricultural operations beyond those that fit into the Federal CAFO definition.

Regional water quality plans are hallmarks of the California and Oregon programs. These plans identify water quality problems and goals within watersheds and are tied to a requirement that sites within a watershed adhere to that watershed's plan.

A vegetative buffer, like the one shown above, is an example of a BMP that helps reduce the amount of farm fertilizer that reaches lakes, rivers and streams. Photo by Lynn Betts, USDA NRCS.

As noted above, California does this by requiring individual sites to create plans to align operations with the applicable regional plan. Oregon, on the other hand, simply requires that operations do not cause problems that are inconsistent with applicable water quality goals. The advantage of

Checklist

Elements of an effective overarching program

- ☐ A requirement that a comprehensive pollution management plan (e.g. nutrient management plan) be tailored to each site
- ☐ A list of what a comprehensive pollution management plan must include
- ☐ A requirement that each agricultural operation implement its pollution management plan
- ☐ Broad, fair application of the pollution planning requirement that allows for easy identification of agricultural operations subject to the requirement
- ☐ A requirement that all operations subject to the planning requirement annually submit implementation reports to the appropriate agency
- ☐ Adequate agency staff and funding to review implementation reports and conduct spot-check inspections of at least 10% of facilities annually
- ☐ Enforcement provisions that establish meaningful penalties (injunctions, substantial monetary fines, and disqualification from state financial assistance) for violations of the planning, implementation and reporting requirements
- ☐ Adequate staff and funding to pursue planning, implementation and reporting violations
- ☐ A provision that allows private citizens to bring an enforcement suit to compel a violator to comply with program requirements
- ☐ Technical and/or cost-share assistance for those subject to the plan(However, program requirements should not be contingent on the availability of cost-share funds)
- ☐ A focused and well-funded plan to monitor water quality and document on-the-ground improvements associated with the program
- ☐ A requirement that the implementing agency prepare a publicly-available annual report detailing 1) the use of program funds by location, 2) statistics on compliance monitoring and enforcement and 3) projected and realized water quality outcomes

regional planning is that the "big picture" of water quality in that watershed can be assessed, meaning that all causes and sources of pollution can be examined and efforts can be focused where they are most needed.

Practically speaking, any of these strategies comes down to implementing best management practices that reduce pollution contributions from runoff. For example, a nutrient management plan is really a tailored plan detailing which BMPs a facility agrees to implement. A few states have gone a step further by developing lists of BMPs that must be followed. Advantages of this strategy are that states can assure consistency in the quality of management practices implemented under the program and that those who are subject to the program know exactly what is expected of them. Kentucky's program is a bit of a hybrid approach, as it lists mandatory BMPs that are required to be included into individual nutrient management plans. Wisconsin has developed pollution-reducing performance standards that landowners must follow ---but often only if producers are offered public subsidies called "cost-share" money. Oregon uses this strategy in a limited way, in that individual regions can adopt "rules" that mandate practices tailored to that region's water quality goals.

Who Must Comply with Regulation

The regulatory programs discussed in this section vary in application---in other words, the question of who must comply with the regulations. Some programs broadly apply to all landowners (as programs in Oregon and Iowa do) or to all "dischargers," including nonpoint pollution dischargers (as California does). Others are more narrowly targeted toward agriculture. Kentucky's rules are aimed at "agricultural operations" generally. Delaware and Maryland, on the other hand, are both triggered by agricultural operations with 8 or more livestock. Delaware's requirements additionally apply to agricultural operations with 10 or more acres of nutrient-applied land, while Maryland has also applied its requirements to farm operators with $2500 or more in annual farm income.

Compliance Monitoring

Many states engage in little to no compliance monitoring. Some require filing of nutrient management plans (California, Maryland) and/or periodic monitoring/implementation reports (California, Delaware, Maryland) and all conduct limited inspections of facilities to verify compliance (although Iowa, Kentucky and Oregon generally only do so in response to a citizen complaint of a pollution problem).

Enforcement

The studied states have slightly differing approaches to the consequences of noncompliance with their respective programs, but because of non-confrontational philosophies, funding shortfalls and other factors, none is aggressively pursuing enforcement actions against violators. Most states have procedures to help bring the violator into compliance will only resort to penalties (fines and/or injunctions) after informal means fail. California, Iowa, Kentucky, and Oregon focus enforcement efforts on those who are clearly creating water quality problems. Although this seems a rational way to allocate limited enforcement resources, it can be difficult to track water quality problems back to individual polluters. Also, many pollution problems are the cumulative result of many smaller nonpoint discharges, so widespread compliance may be at least as important as addressing the worst offenders. Focusing enforcement only on the worst offenders sends the message that violators causing less severe pollution will not be held accountable.

Measured Results

Thus far, no state has demonstrated that measurable water quality improvements have resulted from its regulatory program, but that does not mean that improvements have not occurred or would not occur with higher compliance rates. States have focused their resources toward statewide awareness of their programs, rather than on enforcement or designing water quality monitoring programs that might help to quantify the benefits of the programs.

California

Summary

The California Nonpoint Source Pollution Control Program (California program) is a system of state-level policy and regional-level administration. The state and regions set water quality goals. Then the regions issue permits to "dischargers" that are designed to achieve water quality goals. The dischargers must abide by the permits and implement plans that help to meet permit limits. These plans are called nonpoint source pollution control implementation programs (NPS Plans). Each discharger's plan must be approved by a regional board. The regional boards are empowered to enforce the permits and the plans through numerous enforcement mechanisms. For all violations, regional boards use "progressive enforcement," but more serious violations are prioritized and have more stringent enforcement options available. The California program has no coordinated system for reporting water quality improvements or evaluating the program's success.

Program Requirements

Under California law, both point and nonpoint sources of water pollution are obligated to comply with state water quality regulations. The Porter-Cologne Water Quality Control Act of 1969 (the California statute regulating water pollution) states, "All discharges of waste into the waters of the State are privileges, not rights."32 The Porter-Cologne Act differs from the Clean Water Act in that it applies to all water pollution, including that which would be considered nonpoint source pollution under the Clean Water Act.[33]

To regulate nonpoint source pollution, the Porter-Cologne Act calls for statewide policy-making administered on the regional level.[34] This is done through a single state board (the State Water Resources Control Board) and nine regional boards (the Regional Water Quality Control Boards).[35]

Although most regulatory interaction occurs between regional boards and dischargers, any regional board action or inaction can be appealed by the discharger and is subject to review by the state board.[36]

The state and regional boards, respectively, create state and regional water quality control plans (also called Basin Plans), which designate beneficial uses and identify water quality objectives.[37] Typical water quality objectives outlined in Basin Plans tend to be narrative prohibitions---for example, a ban on "biostimulatory substances" that "promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses" and a similar objective for sediment that states, "The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses."[38] Any regional water quality plan must be approved by the state board. If regional and state plans conflict, statewide plans supersede regional plans.[39]

At the discharger level, the regional boards develop permits and review discharger plans aimed at achieving regional (and state) water quality control objectives.[40] The regional boards must regulate all current or proposed nonpoint source discharges with permits.[41] Regional boards can use three types of permits: waste discharge requirements, waivers of waste discharge requirements (waivers), and water basin prohibitions (prohibitions).

Waste discharge requirements are permits for a discharge and can specify conditions (e.g. BMPs) or effluent limitations.[42] The state or regional boards can also create general waste discharge requirement permits that apply to a certain category of discharges if they conclude that those discharges "are produced by the same or similar operations," "involve the same or similar types of wastes," "require the same or similar treatment standards" and "are more appropriately regulated under general discharge requirements than individual discharge requirements."[43] Operators discharging under a waste discharge requirement must pay an annual fee to help cover the costs of administering the program.[44]

Waivers are categorical exceptions from the waste discharge requirements that a regional board has found to be in the public interest and consistent with the state and regional water quality plan.[45] Waivers apply to a specific discharge or type of discharge, and regional boards are encouraged to have dischargers apply for coverage under the waiver.[46] The waiver may include enforceable conditions, but must include a requirement to conduct water quality monitoring unless the state or regional board determines the discharge "does not pose a significant threat to water quality."[47] Waivers are valid for five years, but may be renewed.[48]

Prohibitions are provisions within a Basin Plan that disallow discharges of a particular waste or type of waste within the basin.[49] Prohibitions can be conditional, meaning that a type of discharge is prohibited unless certain procedural or substantive conditions are met.[50] Although prohibitions are a strong tool because they are directly and immediately enforceable, they are almost never used in practice.

One challenge the regional boards face is identifying dischargers subject to Porter-Cologne Act requirements. Unless a waiver applies, any person discharging or proposing to discharge in a way that could affect water quality must file a "report of waste discharge" with the appropriate regional board.[51] However, a significant number of dischargers are not yet aware of their obligation to comply with the California program, so regional boards are working to enroll those subject to the requirements. Also, although regional boards consider everyone a potential discharger, whether a person is a discharger is sometimes contested.

Every discharger (under the broad California definition) is required to develop and implement an NPS Plan.52 NPS Plans help dischargers comply with permitting requirements by specifying best management practices the discharger will implement.[53] Regional boards must review NPS Plans and determine that there is a "high likelihood" that the discharger will attain the Regional Board's stated water quality objectives.[54] Importantly, those

Buffers in Sonoma County, CA. Photo by Lynn Betts, USDA NRCS.

"water quality objectives" include both protection of designated beneficial uses and protection of higher quality waters under state antidegradation rules.[55]

As part of its review, a regional board must ensure that an NPS Plan contains the following five elements:

1. Explanation of the purpose of the NPS plan and description of the specific water quality objectives that will be met.

2. Description of the specific management practices that will be used to meet water quality objectives.

3. A timeline for implementing the program.

4. A monitoring program to verify whether management practices are implemented and are effective in meeting water quality objectives.

5. A clear explanation by the board of the consequences of not meeting the stated water quality objectives.[56]

An NPS Plan may be developed for individual dischargers or for groups of dischargers.[57] These group plans, called "third- party plans," are developed and administered by third-party representatives.[58] Third-party plans may be advantageous because they are more efficient to administer, can develop plans tailored to particular types of dischargers and

may be able to get more dischargers to participate than a Regional Board could on its own.[59] Third-party representatives can be non-governmental organizations, citizen groups, watershed coalitions, or government agencies.[60] The only requirement for the third-party representative is that it cannot be a discharger subject to regulation under the regional boards' or state board's jurisdiction.[61] When the third-party is another government agency, a regional board may enter into an agreement giving that agency the lead in implementing the program.[62] However, problems may arise if the third-party agency does not have the same water quality objectives---for instance, if the third-party is an agricultural agency whose primary goal is to increase agricultural production. Nonetheless, the Implementation Policy makes clear that the state and regional boards retain their responsibilities and cannot "indefinitely defer" taking necessary action when water quality problems persist.[63]

Compliance Monitoring

The California program's monitoring efforts are comprised of three elements: self-monitoring, spot-checks, and citizen complaints.[64] However, it appears that none of these enforcement mechanisms is being fully utilized.

Each NPS plan is required to include measures for verification and feedback, designed to help the regional board, the discharger and the public to assess whether the plan is meeting the stated water quality objectives.[65] These self-monitoring measures may include photo monitoring, assessment of healthy in-stream habitat, assessment of riparian and wetland structure, density and cover, bioassessment, and ambient water quality monitoring. Monitoring on a local or watershed level is also explicitly required as a condition of those subject to waste discharge requirement waivers.[66] In addition, dischargers are required to report any actual or likely discharge of a hazardous substance.[67] Self-monitoring is the means by which the regional boards are put on notice of most violations. Sources anecdotally report that regional boards do not review self-monitoring reports, which must certainly limit the effectiveness of enforcement against potential violators.

Spot-checking is another method used by the California program to monitor dischargers for compliance. Regional boards are granted the authority to investigate any discharger for compliance with planning and permitting requirements.[68] However, in-state sources have noted that the agency is insufficiently staffed to do adequate in-person spot-checks of discharges.

Finally, the California program also utilizes citizen complaints as a monitoring tool.[69] However, although a regional board receiving a public complaint is required to document it, it is not required to investigate the complaint.[70] These complaints are not frequently made, but they typically involve nuisance-type issues, such as odors.[71]

Enforcement

The California program's enforcement system seeks to maximize the impact of its limited resources by using enforcement tools in a manner that is proportionate to a violation.[72] Both the state board and the regional boards are authorized to enforce the California program,[73] but as a practical matter, enforcement is mainly the domain of regional boards.

The first step in the California enforcement process is to prioritize violations, evaluating the seriousness of each violation and the potential impact enforcement activity might have.[74] This process involves three steps: determining the seriousness of the violation, identifying repeat violators, and ranking the proclivities of repeat violators.[75] The regional boards are then to focus their efforts on the most highly ranked dischargers, as their resources permit.[76]

"Serious violation" is defined by the California Water Act as a violation that exceeds effluent limitations for different categories of pollutants by specified percentages.[77] For example, an exceedance of nitrogen, phosphorus or total suspended solids effluent limits by 40% would constitute a serious violation.[78] Regional boards are also able to deem a violation serious for other reasons.[79]

Pasture in Sonoma County, CA. Photo by Lynn Betts, USDA NRCS.

The second step requires regional boards to identify dischargers that are repeatedly or continuously in violation of requirements.[80] Those violators are then rated high-, medium- or low-priority in the third step.[81] The Enforcement Policy lists ten factors to be considered when ranking repeat violators, including the magnitude or impacts of the violation; evidence of negligence or recalcitrance; and impact or threat to high-priority waters.[82]

All enforcement actions implement progressive enforcement. Violations receiving a higher priority ranking will receive "formal enforcement," whereas violations ranking lower in the priority process will receive "informal enforcement." While the enforcement policy provides many different options to urge and eventually force compliance, the focus has thus far been on increasing awareness and enrollment in the program rather than on pursuing enforcement actions.

If the regional board uses informal enforcement, the progression of actions is generally 1) verbal notification, 2) written notification of the violation, and then 3) a Notice of Violation.[83] The Notice of Violation must describe specific violations and summarize potential enforcement options, and may request a written response from the violator.[84] The majority of violations are dealt with through informal enforcement.[85] If the Regional Board determines that the violation is serious enough to merit formal enforcement, the Regional Board will still typically start with informal enforcement measures, unless the violation would create serious consequences if compliance is not achieved immediately.[86]

Formal enforcement tools include 1) sending notices to comply, 2) requiring technical reports and investigations, 3) issuing cleanup and abatement orders, 4) issuing time schedule orders, and 5) issuing cease and desist orders.[87] The Regional Board could also urge action by modifying permitting requirements or rescinding a permit waiver.[88]

The state and regional boards can also seek monetary penalties by imposing administrative civil liability.89 These penalties can range from $500 to $20,000 for a violation.[90] The administrative civil liability complaint may also include a compliance project in addition to a monetary fine.[91] Some violations elicit a

mandatory administrative civil liability.[92] To impose administrative civil liability, a regional board must first issue an administrative civil liability complaint explaining the violation and announcing that a hearing will be held regarding the liability within sixty days.[93] The discharger can then pay the liability, negotiate a settlement amount with the regional board, or contest the liability at the hearing.94 If the discharger contests the liability at the hearing, the regional board or state board can affirm, modify, or reject the liability.[95] If the discharger fails to pay the liability, the state board may file for a judgment to collect the liability.[96]

Finally, a regional board can refer a case to the attorney general for civil enforcement or injunctive relief or to the district attorney, city attorney, United States Environmental Protection Agency (USEPA), or United States Attorney for criminal prosecution.[97] Referring a case to the attorney general is appropriate when administrative civil liability would be inadequate to remedy the violation, for instance to maximize penalties for violations with a major water quality or public health impact[98] Criminal prosecution, on the other hand, should be requested when intentional, willful or knowing release of toxic substances or hazardous materials is suspected.[99]

Measured Results

Although the California program is comprehensive, it contains no formal mechanism to evaluate its effectiveness---either in terms of participation or pollution reductions.

Program Assessment

California combines the best concepts of nutrient management planning and pollution discharge permitting to create a strong, widely applicable and enforceable program. However agencies have focused most efforts on promoting participation in the program rather than using their authority to the fullest. There is room for improvement in terms of enforcement and documenting results, neither of which are helped by persistent funding shortfalls.

Delaware

Summary

The Delaware Nutrient Planning Program (Delaware program) seeks to reduce agricultural application of nitrogen and phosphorous through nutrient management plans, but deficient monitoring and enforcement keep the program from reaching its full potential.

Program Requirements

In the Delaware program, agricultural operations that have eight or more livestock or any person who owns or controls ten or more acres of nutrient-applied land must develop and implement a nutrient management plan.[100] The goal of a nutrient management plan is to minimize the amount of nutrients that are applied while continuing to meet agricultural production needs. A nutrient management plan must include maps indicating reference points and soil types, soil and organic waste analyses, current and planned crop rotations, expected yields and importantly, recommended rates, timing and methods of nutrient applications.[101] The nutrient application rates are keyed to production yields.[102] Phosphorus application to high-phosphorus soils is not allowed to exceed a 3-year crop removal rate, and nitrogen application cannot exceed the expected yield.[103] The crop removal rate is the rate at which nutrients applied to fields are removed as crops are harvested. Thus, a crop removal rate of 3 years means it takes three years of harvesting to absorb and remove the nutrients applied in one year of planting.

Every person who is required to develop and implement a nutrient management plan must also update his or her plans at least once every three years.[104] The plan must also be updated if the operator proposes to significantly alter facility operations or increase the operation by 25% or more.[105]

A nutrient management plan may be obtained free of charge by working with the state's public nutrient consultants.[106] Most people, however, pay a private nutrient consultant, the cost of which can be partially reimbursed by the Delaware Nutrient Management Commission.[107] People may prefer hiring a private consultant because comprehensive nutrient management plans can help to maximize production yields, and they may feel the effort is worth the investment.

The nutrient management plan requirement is complemented by requirements that the plans be developed by a person with state nutrient management certification.[108] The certification requirement depends on the characteristics of the agricultural operation. Operations with only eight livestock and no nutrient-applied agriculture may have plans developed by a person with any of the four classes of certifications: nutrient generator, private nutrient handler, public nutrient handler, or nutrient consultant.[109] Those with ten acres or more of nutrient-applied land must obtain a nutrient management plan developed by a certified nutrient consultant.[110]

Compliance Monitoring

The Delaware program requires people implementing nutrient management plans to submit annual reports indicating the amount of animal wastes applied to the land and the quantity of land it was applied to, the amount of animal wastes transferred for alternative uses, and the amount of inorganic fertilizers applied to the land.[111] However, in 2008 the Commission received less than half of the annual reports required of each person with a nutrient management plan.[112] The Commission chooses not to pursue enforcement proceedings against reporting violations.

The Commission has an annual goal of auditing 10% of facilities required to have nutrient management plans through on-site visits. In 2008, the Commission audited only 21 of approximately 350 facilities with nutrient management plans, or approximately 6%.[113] Practically speaking, this is the result of prioritizing Concentrated Animal Feeding Operation (CAFO) audits over nutrient management plan audits.

The Delaware program requires people implementing an NMP to submit annual reports indicating the amount of animal wastes applied to the land. Photo courtesy of Stock.xchng

In addition to required reporting and auditing, the Commission receives approximately fifty-five citizen complaints each year. By statute, the Commission is required to investigate citizen complaints and hold a hearing regarding any legitimate complaints within 120 days.[114] In 2008, the Commission received 46 complaints and reported 43 as resolved.[115]

Enforcement

Failure to develop or implement a nutrient management plan or a failure to obtain and maintain required certification is considered a violation of the Delaware program and is subject to enforcement action.[116]

The potential penalties a noncompliant party could face under the program are substantial. The language of Delaware law mandates that the justice of the peace court impose a minimum civil penalty of at least $25 (but no more than $1000) for each violation.[117] Each day of violation constitutes a separate violation, up to a maximum of $10,000.[118] Delaware law further grants the Commission the authority to petition the Court of Chancery for an injunction or restraining order or an additional administrative penalty of up to $1,000 per violation.[119]

In Delaware, agricultural operation with eight or more livestock must develop and implement a nutrient management plan. Photo by Lynn Betts, courtesy of USDA NRCS.

The Commission's enforcement philosophy reflects a preference for using "carrots" over "sticks." The Commission pursues three or four violations a year, many of which can be resolved informally and quickly. Agency sources report that the Commission will pursue fines in about two cases a year, but typically only for blatant violations such as winter manure application. The Commission has never pursued an injunction under the Delaware program.

Significantly, the Delaware program allows a citizen to bring a type of enforcement action against violators of the program.[120] Any person can bring suit in the Court of Chancery for injunctive relief against the violator.[121] Alternatively, any person can bring suit in the Court of Chancery for injunctive relief against the Delaware Department of Agriculture of the Commission for failure to fulfill an act or duty required under the Delaware program.[122]

Measured Results

The Commission's Annual Report measures results in terms of participation and not in terms of nutrient pollution prevention or reduction. For example, the 2008 report states that the Commission maintained 1,767 nutrient certifications during 2008 and that public and private nutrient management planning covered a combined total of 337,650 acres.[123]

Program Assessment

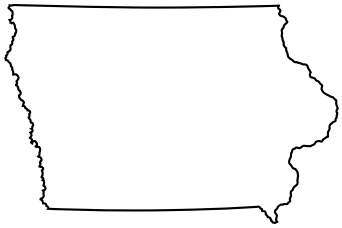
Nutrient management planning is an important tool in nitrogen and phosphorus pollution reduction, and Delaware's decision to require these plans broadly should be commended. However, the program's monitoring and enforcement in practice has been anemic, and does not convey a message that the Commission is serious about compliance with the requirements.

Currently, less than one half of those with nutrient management plans submit their required annual reports. Furthermore, the Commission is unlikely to discover any violators who do not submit annual reports because the Commission meets only a little over half of its annual auditing goal. Failure to require annual reports or follow through on audits means that violations of the nutrient management planning requirement are not being discovered.

Nonetheless, despite the Commission's failure to follow through on monitoring and enforcement, the citizen complaint mechanism seems to be reasonably effective – the Commission resolved 43 of 46 citizen complaints in 2008, roughly ten times the three or four violations the Commission pursued in the same year.

The Delaware Commission's policy has been to reserve resources for educational programming rather than expend them on penalizing violations. It emphasizes a cooperative attitude toward agricultural operations. The Commission fostered this spirit of cooperation by phasing in the requirements over a five-year period, from 2003 to 2007. The Commission tends not to pursue adversarial enforcement actions unless environmental harm can be shown or the case provides an opportunity to establish important precedent. Whatever sacrifices these decisions have made in terms of program compliance, agency sources report that acceptance of the program in the agricultural community is increasing.

Iowa



Summary

Many states have programs designed to minimize soil erosion, but Iowa provides a nuisance-like remedy against real property owners who exceed prescribed soil loss limits. Limiting soil erosion not only preserves agricultural soils, it protects water quality by reducing excessive quantities of pollutants such as suspended solids, sediment and phosphorus in rivers and streams. Iowa's mechanism allows landowners whose property is adversely affected by erosion on neighboring properties to file a complaint with the local Soil and Water Conservation District (SWCD). The SWCD may then force the offending property owner to implement soil and water conservation practices, but only if 50% cost share is provided. Unfortunately, the public is generally unaware of the program, so complaints are underutilized and compliance is underachieved.

Program Requirements

Iowa's soil erosion minimization program begins with SWCDs developing tolerable soil loss limits for various classes of land, taking into account "topography, soil characteristics, current use and other factors affecting propensity to [sic] soil erosion."[124] Soil loss limits are usually expressed in "T," the maximum tolerable rate of soil erosion expressed in tons/acre/year.[125] The SWCD may also require particular soil and water conservation practices within the district, but it has no authority to require those practices so long as a property owner complies with soil loss limits.[126] These rules must be approved through a public hearing process.[127] All real property owners are required to comply with SWCD rules, but certain types of practices (those traditionally used for erosion control on construction sites) cannot be required on lands used for agriculture only.[128]

Compliance Monitoring

Iowa property owners are not required to monitor or report their own soil losses. Instead, compliance with soil loss limits is monitored by SWCDs through inspections triggered by either a public complaint or a SWCD Commissioner's reasonable grounds to suspect improper soil losses. Most inspections are complaint-driven, undertaken in response to a public complaint that soil erosion on a neighboring property is damaging the complainant's property. In such case, the SWCD "shall" inspect the property to determine whether such sediment damages are occurring and whether erosion is occurring in excess of established loss limits.[129] A SWCD Commissioner may also inspect property if he or she has reasonable grounds to believe that soil losses on the property are exceeding adopted soil loss limits.[130] In either situation, if the property owner or occupant refuses entry, the SWCD may obtain a search warrant from a county district court to allow inspection.[131]

Enforcement

If an inspection reveals erosion in excess of soil loss limits, how enforcement proceeds depends on whether the excessive erosion is damaging property owned or occupied by another. If damage to property is occurring, the SWCD "shall" issue an administrative order describing the violation.[132] The administrative order will indicate a date no later than six months after service of the order by which work necessary to remedy the violation must commence and a date no later than one year after service by which work

Eroded stream crossing without fencing. Photo by Lynn Betts, USDA NRCS.

Sediment chokes this stream due to many years of erosion on nearby unprotected farmland. Photo by Tim McCabe, courtesy of USDA NRCS.

shall be completed.[133] If the required actions are not commenced or completed by the specified dates, or if the landowner indicates to the SWCD that he or she does not intend to comply with the order, then the SWCD "shall" petition the district court for a court order requiring immediate compliance with the administrative order.[134]

If damage to property is not occurring, then enforcement will depend on the magnitude of the violation of soil loss limits. If the rate of soil erosion is less than twice the soil loss limit, the SWCD will send a notice describing the violation and the technical and financial assistance available to help attain compliance---but that is the extent of enforcement that can be pursued under such a circumstance.[135] If the rate of soil erosion is twice the soil loss limit or more, then the notice will also contain an explanation that a court order may be obtained to compel compliance and the notice will be delivered by personal service or certified mail.[136] However, such a court order may not be sought until notice of this more serious violation has been served upon the property owner for at least three consecutive years. The court order would outline steps to come into compliance with a soil conservation plan that must be completed within six months.[137]

However, enforcement is frustrated by the rule that under either enforcement scenario, property owners are not required to establish new permanent or temporary soil and water conservation practices unless cost share funds (up to 50%) have been made available to the property owner.[138] An application for cost share funds constitutes "commencing work" for purposes of the rule, and effectively tolls the compliance periods in the administrative order until cost share funds have been allocated to the property owner.[139] If a landowner is awarded cost share funding but does not comply with an administrative order, or alters or fails to maintain the practice, the SWCD is required to issue an administrative order to demand compliance and a district court order if the administrative order is not obeyed.[140]

Measured Results

The Iowa soil erosion program does not require any annual reporting or assessment of the program, nor does it track or publish instances of enforcement under or participation in the program.

Program Assessment

By design, Iowa's program is not comprehensive: it only addresses pollution from soil erosion. But the soil loss limits apply broadly, and the program has yet-unattained potential to address that category of water quality concerns. One of the most interesting features of the Iowa soil erosion control program is that the statute affords SWCDs no discretion in whether to inspect complaints of soil losses, issue administrative orders to those who violate SWCD soil loss rules or pursue court orders against those who do not comply with administrative orders. Ultimately, however, violations have no meaningful consequences and enforcement is impaired by the cost-share requirement.

The program appears to suffer from a lack of public awareness and little willingness on the part of citizens to report neighbors' violations. Further, although a landowner experiencing soil losses may be willing to install practices to help preserve his or her investment in his or her own property, the lack of adequate cost-share funding may prevent improvements from being made. There may well be more latent willingness to participate in the program than there is money to implement it. Overall, these factors contribute to underutilization of the Iowa soil loss program.

Kentucky

Summary

The Kentucky Agriculture Water Quality Act requires the owner of each statutorily-defined 'agriculture operation' to develop and implement a water quality plan, consisting of applicable best management practices (BMPs) mandated by the Kentucky Agriculture Water Quality Authority. However, in practice the statute is only enforced against "bad actors"---those who are shown to be creating an actual pollution problem and who refuse to respond to a violation notice.

Program Requirements

The Kentucky Agriculture Water Quality Act is designed to protect surface and groundwater resources from potential pollutants generated by agriculture and forestry operations throughout the state. This Act established Kentucky's Agriculture Water Quality Authority, a multidisciplinary peer group charged with establishing statewide and regional agriculture water quality plans that include a range of BMPs selected to reduce pollutant loading from agricultural and silvicultural operations in the state.[141]

Pursuant to the Act, the Kentucky Agriculture Water Quality Authority created a statewide plan (the Kentucky Agriculture Water Quality Plan), consisting of sixty BMPs applicable to six different areas: silviculture, pesticides and fertilizers, farmstead, crops, livestock, streams and other waters.[142] These BMPs serve as the baseline requirements for water quality plans for individual agricultural operations.

The Agriculture Water Quality Authority is also responsible for helping the Division of Water designate water priority protection regions, where water quality monitoring indicates that agriculture is contributing to water quality pollution problems.[143] A separate regional water quality plan would then be created, adding BMPs as necessary to address the local pollution concerns.[144] If the pollution can be traced to an individual or group of individual land users, and the agency will work with those land users to remedy the pollution and pursue enforcement actions against them as necessary (see enforcement discussion below).[145] Since the Act was passed in 1994, not one watershed has been designated a "water protection region."

All agricultural operations (defined as any parcel of 10 or more contiguous acres used for agriculture or forestry production) are required to develop individual water quality plans that incorporate all BMPs from the statewide or regional plan that are applicable to that particular operation.[146] If a landowner wishes to deviate from the statewide plan in any way, he or she must first obtain approval from the regional conservation district.[147] Technical and cost-share assistance are available to help operations develop and implement water quality plans, so long as the operator has not been deemed a bad actor.[148]

Landowners have five years to implement the BMPs cited in their individual management plans.[149] A landowner is presumed to be in compliance with the requirements of the Agriculture Water Quality Act once he or she has timely and properly implemented the applicable requirements of the statewide or regional agriculture water quality plan.[150]

Compliance Monitoring

In practice, an individual water quality plan, and, by association, an agriculture operation, is inspected only when that operation is part of a water priority protection region and is a traceable source of pollution or the subject of a citizen complaint. This model of violation detection depends on a robust and reliable statewide water quality monitoring program, which Kentucky does not currently maintain.

Operators are not required to register or file the water quality plan with any agency. As a result, most water quality plans escape scrutiny altogether.

Enforcement

Unfortunately, the enforcement scheme used by the Kentucky Agricultural Water Quality Authority provides little incentive to comply with the requirements of the Act. Technically, failure to have a water quality plan or implement applicable BMPs from the statewide plan is a violation of the Act.[151] But practically speaking, no violation will be discovered without a citizen complaint or pollution problem traceable to the agricultural operation.

If the Division of Water finds that an operation is being conducted in a manner that results in water pollution, or if an operator has failed to implement the BMPs from its water quality plan, the land user will be notified in writing of his or her violation.[152] Such notification must include the facts alleged to constitute noncompliance, a reminder of the availability of technical and financial assistance, and a reasonable period for compliance.[153]

The written notification provides landowners with the opportunity to remedy violations and avoid enforcement. The operator may submit a compliance plan that outlines a schedule for creating or modifying a water quality plan and implement necessary BMPs within a reasonable period of time.[154] If the operator refuses to comply with or respond to the written notification, he or she will be deemed a "bad actor."[155] Bad actors are subject to formal enforcement action and lose eligibility for technical and cost-share assistance.[156] The Cabinet's Office of Legal Services or the attorney general shall then institute an action for the recovery of any penalties and costs and bring a cause of action seeking an injunction.[157] Violation of the statute is punishable by civil penalty not to exceed $1000.[158] Compliance with the statewide and any regional agriculture water quality plan is a mitigating factor in determining whether to impose civil penalties.[159]

To date, not one agricultural operation has been deemed a "bad actor." However, agency sources report 180 instances of documented noncompliance, most often the result of citizen complaints. Each operator who has been found to violate the statute has opted to participate in the "corrective measures" program to remedy the violation short of formal enforcement action.

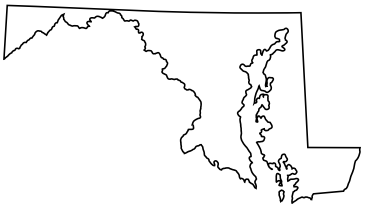
Kentucky's program requires agricultural operations to implement appropriate water quality BMPs. Photo courtesy of Stock.xchng.

Measured Results

Agency sources speculate that the slow progress in achieving compliance with the Agriculture Water Quality Act is gradually improving the quality of Kentucky's waters, but no effort has been made to quantify the improvement.

Program Assessment

Overall, the concept behind the Kentucky Agriculture Water Quality Act is sound: require agricultural operations to implement appropriate water quality BMPs. However, the program as currently administered lacks accountability, and its soft approach to polluters has even been called "almost laughable" by one commentator.[160] A violator can easily escape detection, and if he or she is caught, there are no meaningful consequences. Indeed, there is no incentive to develop a water quality plan at all until the operator receives a notice of violation.



Summary

The Maryland Nutrient Management Program (Maryland program) requires farm operations over a certain threshold to develop and implement nutrient management plans to minimize use of nitrogen and phosphorous. The program also instructs farm operators and those who apply nutrients to complete certain educational requirements. However, weak penalties combined with the likelihood that violations may not be discovered provide little incentive to comply with the program's requirements.

Program Requirements

The Maryland Water Quality Improvement Act, passed in 1998, requires any agricultural operation with $2,500 or more in annual gross income or livestock operation with eight or more livestock to obtain and implement a nutrient management plan.[161] A nutrient management plan is defined as a plan "to manage the amount, placement, timing, and application of animal waste, commercial fertilizer, sludge, or other plant nutrients to prevent pollution by transport of bioavailable nutrients and to maintain productivity."[162] It must consider factors including bioavailable nitrogen and phosphorus in soil and in fertilizer to be applied; expected crop yields; soil erodibility and capacity to retain nutrients; and best management practices.[163] Agricultural operators must update their plans every three years (or sooner if the operation changes within those three years).[164]

The program authorizes cost-share funds to be used to reimburse agricultural operators for up to 87.5% of the cost of hiring a private consultant, up to $3000.165 However, annual funding in the cost-share program available for nutrient management services has steadily declined over the past few years, and typically runs out after the first few months of the year.[166] In addition to cost sharing, the Maryland Cooperative Extension Service offers nutrient management planning services to agricultural operations throughout the state.[167]

Once a nutrient management plan is adopted, the agricultural operation must implement the plan.[168] Agricultural operations are required to submit an Annual Implementation Report by March 1 of each year.[169] The Annual Implementation Report describes how a nutrient management plan was implemented during the previous season, notes any changes in circumstances to which the operation needed to adapt, and verifies that a valid plan will be followed in the upcoming year.[170]

Maryland's nutrient management planning program is complemented by a number of educational requirements that apply to those involved in developing nutrient management plans and those who apply nutrients. A nutrient management plan can only be developed by a person certified to make such a plan.[171] To become a private nutrient management consultant---one who creates nutrient management plans for others---a person must submit an application, complete an education program, pass an exam, and show that he or she is covered by a license to create such plans.[172] If an agricultural operator wishes to make his or her own nutrient management plan, a "farm operator's plan development certificate" may be obtained.[173]

Those who apply nutrients for hire must either be a certified nutrient management consultant or work for a certified nutrient management consultant.[174] Landowners who apply nutrients to more than 10 acres must obtain vouchers for continuing education credits every three years.[175]

Maryland's program notably includes a provision that governs commercial fertilizer application in non-agricultural contexts as well. A person who applies commercial fertilizer to more than ten acres of nonagricultural property annually or to any state-owned nonagricultural property must do so in accordance with University of Maryland Cooperative Extension Service guidelines.[176]

Compliance Monitoring

The Maryland Department of Agriculture is specifically directed to "determine compliance with the provisions of this section" by reviewing nutrient management plans held by agricultural operations and by conducting on-site inspections.[177] The Department of Agriculture issues an annual report discussing these efforts. The last three years of reports have shown increases in the percentages of agricultural operations that have submitted their required nutrient management plans and Annual Implementation Reports; however, the total number of agricultural operations considered to be subject to the requirement has been reduced from 6100 operations in 2007 to 5727 operations in 2009.[178] Without explanation for this adjustment, one cannot determine whether compliance has actually improved.

It does appear that enforcement and monitoring efforts were fortified in 2009. By December 31, only 12 of 5,727 eligible agricultural operations were out of compliance with the requirement to have a nutrient management plan.[179] Similarly, all but 57 of 5727 agricultural operations had submitted their 2009 Annual Implementation Reports.[180] To achieve these filing results, the Department of Agriculture demanded a combined total of over $34,000 in fines and issued over 1600 warning letters.[181] Despite progress in procedural compliance with the Nutrient Management Program, the Department of Agriculture discovered through 400 site visits in 2009 that only 69% of agricultural operations inspected were operating in compliance with a nutrient management plan.[182] Fines totaling $3500 were levied to bring these operations into compliance.[183]

Enforcement

Enforcement in Maryland's program follows separate tracks, depending on whether the agricultural operation violates the requirement to have a nutrient management plan, the requirement to implement the plan, or the educational requirements. In any case, the enforcement mechanism provides little incentive to comply with the law.

Sunrise over the Chesapeake Bay. Photo Courtesy of Stock.xchng.

If the Department of Agriculture finds that an agricultural operation does not have a required nutrient management plan, it will first notify the operation of the requirement.[184] However, as the Department relies on the state's property tax registry to identify agricultural properties that may be subject to the requirement, it does not currently have an effective way of identifying agricultural operations that involve 8 or more animal units or bring in $2500 or more in gross income from agriculture, and so has no reliable way to determine which operations are in violation of this provision. If an agricultural operation is notified and then fails to obtain a nutrient management plan within a "reasonable period of time," it may be fined---however the maximum penalty for this violation is only $250.[185] This penalty is so weak that an agricultural operation could easily choose not to participate in nutrient management planning and simply build a $250 annual penalty into its operational costs.

If the Department of Agriculture discovers an agricultural operation that is not implementing its nutrient management plan, it will send a warning letter for this first violation.[186] A second violation is subject to a fine of up to $100 per violation.[187] Each day of continued violation is considered a separate violation,[188] but the annual penalty per agricultural operation is capped at $2,000.[189] Although these penalties are also insubstantial, they reinforce the perverse incentive to never obtain a plan in the first place: failure to have a plan may result in a mere $250 fine, but having a plan opens the door to a $2000 annual penalty if the plan is not followed.

Operations that violate either the requirement to have a nutrient management plan or the requirement to implement the plan may be required to repay cost-share funds received by the operation and may be disqualified from future cost-share payments.190 The Department of Agriculture may also deny, suspend, or revoke a license or certification for violation of nutrient management regulations.[191]

Maryland's program has few provisions to urge compliance with its educational requirements. The only provision for enforcement of educational requirements is a $250 penalty for a person who makes a nutrient management plan without obtaining the requisite certificate or license from the Department.[192]

Measured Results

Maryland does not have a program designed specifically to track results of the Nutrient Managemet Program. However, efforts to track progress toward reducing pollution in the Chesapeake Bay as a whole may provide insight into the nature of the problem and the relative contribution of agricultural nonpoint pollution to the Bay. (See page 26).

Program Assessment

The Maryland program's premise of requiring nutrient management plans is a good one, but it is crippled by public resistance, illogical enforcement provisions, and difficulty in identifying those who are subject to its requirements. The program was controversial from its inception and remains unpopular.

The penalty structure associated with enforcement of violations actually incentivizes agricultural operations not to develop nutrient management plans. It is difficult to imagine a successful program structured in this way. The penalties need to be fortified to send the message that the program is a serious requirement.

Finally, although applying the nutrient management plan requirement to operations that gross at least $2500 or involve 8 or more animal units seems fairly calculated to reach legitimate agricultural endeavors that might impact water quality, this provision has caused problems in identifying who is subject to the requirement. If the agency cannot determine who meets those thresholds, then a different threshold should be adopted.

Chesapeake Bay Ecocheck Program

NASA satellite image of Chesapeake Bay.

Most of Maryland lies within the Chesapeake Bay watershed, which suffers from severe degradation due to nitrogen and phosphorus pollution. As part of an interstate effort to monitor the health of the Chesapeake Bay and the states' progress toward clean-up goals, the National Oceanic and Atmospheric Administration (NOAA) and the University of Maryland Center for Environmental Sciences have collaborated to create the Chesapeake Ecocheck program.[1] Ecocheck has created a Bay Health Index that integrates water quality and biotic indicators into an overall score for the health of various regions in the Chesapeake Bay.[2] Overall, poor health persists in the Bay, both in areas that are dominated by agricultural runoff issues and those that are dominated by wastewater pollution discharges.[3]

In the Eastern Shore area in Maryland---where agriculture dominates---modest improvements since 1998 (when the Water Quality Improvement Act was passed) in the Lower Eastern Shore, Mid Bay and Upper Bay have been offset by declines in the Upper Eastern Shore, Choptank River and Lower Bay.[4] Although significant improvements in ecosystem health have not yet been shown to result from the Maryland Nutrient Management Program, one must not conclude that nutrient management is ineffective. Instead this evidence may indicate that halfhearted implementation of a nutrient management program is not effective and that one should not expect to see significant results unless a program is seriously implemented.

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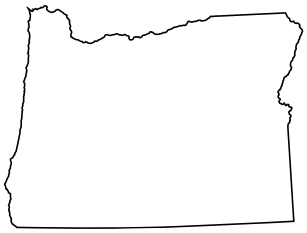
[1] Chesapeake EcoCheck, http://www.eco-check.org (last visited Mar. 4, 2010).

[2] Chesapeake EcoCheck - Methods - Health Report Card, http://www.eco-check.org/reportcard/chesapeake/2008/methods/ (last visited Mar. 4, 2010).

[3] Chesapeake Bay Report Card 2008, http://www.eco-check.org/reportcard/chesapeake/2008/ (follow "2008 Report Card Overview" hyperlink, then click on "Background," "Region Summaries," "Health Index Map" and "Synopsis" tabs) (last visited Mar. 4, 2010).

[4] Chesapeake Bay Report Card 2008, http://www.eco-check.org/reportcard/chesapeake/2008/(follow "2008 Report Card Overview" hyperlink, then click on "Comparison" tab and choose "1998" from drop-down list) (last visited Mar. 4, 2010).



Summary

The Oregon Agricultural Water Quality Management Act appears to be a comprehensive tool to manage nonpoint pollution on watershed basis. The Act gives the Oregon Department of Agriculture authority to require pollution reduction practices of otherwise unreachable nonpoint sources. However, in reality the Area Plans and associated rules stemming from this law are exceedingly vague, and enforcement is nearly nonexistent.

Under the Act, watershed groups create Water Quality Management Plans (Area Plans) to address water quality problems and meet water quality goals. Rules are adopted to implement those plans, and landowners are required to comply with those rules. However, rather than prescribing strict and clear BMPs, the rules are typically written to be more like goals, leaving a great amount of flexibility as to how a landowner may comply with them. Landowners like this approach, but it makes enforcement difficult, if not impossible. Add to this the Act's reliance on complaint-driven compliance, and the result is a program that falls far short of its potential.

Program Requirements

The Oregon Agricultural Water Quality Management Act authorizes the state Department of Agriculture to create Water Quality Management Plans for particular areas of the state, establish rules for land owners consistent with those plans, and enforce failures to comply with such rules.[193]

The Department of Agriculture has the authority to delineate boundaries of specific rural and agricultural areas that will be subject to a water quality management plan, but only in response to an independent federal or state requirement to do so.[194] Most typically, such a delineation is triggered by a requirement to develop a Total Maximum Daily Load (TMDL) for an impaired watershed where the water quality management plan is intended to implement the load allocations granted to agricultural nonpoint sources.[195] A management area can also be established when the state has declared an area a groundwater management area or in response to any other specific state or federal requirement to create such a plan. To date, management plans have been established for thirty-nine areas.[196]

Once a management area has been established, the Department of Agriculture is required to "develop and carry out a water quality management plan for the prevention and control of water pollution from agricultural activities and soil erosion."[197] The plan and any rules adopted pursuant to the plan must be founded in science.[198] The Department of Agriculture must work with a Local Water Quality Management Area Advisory Committee composed of various stakeholders to develop the plan.[199] Together these groups identify local water quality problems and opportunities for improvement, and create plans designed to reduce water pollution from agriculture and soil erosion. As each management area faces different environmental challenges, adopted rules and recommendations may differ between regions---however many of the rules that have been adopted so far in these management areas are similar to one another and are consistently vague.

An Area Plan is a program designed to "achieve the water quality goals and standards necessary to protect designated beneficial uses."[200] The Area Plan is required to describe 1) the water quality issues of concern, 2) the designated beneficial uses being adversely affected, 3) the water quality objectives of the plan, 4) the pollution prevention and control practices deemed necessary to achieve water quality standards, 5) the schedule for implementation of those measures and 6) a strategy to ensure that the necessary measures are implemented.[201] Technically, all land owners, occupiers and operators must be in compliance with any Area Plan adopted in their region.[202] This definition includes all who are engaged

The John Day River outside of Condon, Oregon. Photo by Sara Wilson, USDA NRCS.

in commercial activity relating to the growing or harvesting of agricultural crops or the production of agricultural commodities.[203] However, of the measures and practices identified in an Area Plan, only those that are adopted as "rules" are theoretically enforceable.[204] In practice, this means that landowners are given a great amount of latitude, both in terms of how they approach meeting water quality goals and whether they comply with the goals of the Area Plan at all.

Enforceable rules adopted to implement the Area Plans are typically quite minimal. For example, rules often require subject landowners to establish riparian vegetation and prohibit discharge of wastes into waters of the state.[205] The primary weakness of the rules is their complete ambiguity. The landowner is then ultimately left to identify which BMPs might comply with the ambiguous rules.

Few of these rules deal directly with nitrogen and phosphorus pollution, in large part because the Oregon Department of Environmental Quality's regulation of nitrogen and phosphorus (i.e. water quality standards and TMDLs) is undeveloped. An example of an Area Plan that does address these nutrient-pollutants is the Middle Deschutes Management Area, where "nutrient application rates and timing must not exceed specific crop requirements."[206]

Compliance Monitoring

The Agricultural Water Quality Management Act does not require the active supervision of operations or any reporting by landowners. The only opportunity the Department of Agriculture has to determine compliance with the Act is through on-site inspections after notice to the landowner.[207] In practice, the inspections are complaint-driven, typically in response to concerns of water quality violations expressed by a neighboring landowner or state agency.

Enforcement

As mentioned above, enforcement is usually triggered only by a complaint of a suspected water quality violation submitted to the Oregon Department of Agriculture. The Department of Agriculture will then issue an advisory notice, informing the landowner of the alleged violation and the agency's intent to investigate further. The notice will also typically remind the landowner of his or her responsibilities under the Water Quality Management Area Plan, and of the availability of technical and financial assistance from the agency. The Department of Agriculture is empowered to inspect the property suspected of causing the water quality violation with or without landowner consent, so long as the landowner is notified in advance.[208] The Department of Agriculture receives about 50-60 complaints of water quality violations per year, of which up to 90% reveal actual violations. The advisory letter usually prompts landowners to come into compliance, and no formal action by the agency is necessary. If the Department of Agriculture investigation determines that conditions on the property are inconsistent with rules implementing the appropriate Area Plan, the agency will then provide official notification to the landowner, directing the landowner to bring the operation into compliance.[209] The land owner is usually given a compliance period of 30 days to remedy the violation, during which time the landowner may work closely with the Department of Agriculture to cooperatively solve water quality problems and take advantage of educational technical and financial assistance available from a number of state and federal agencies. The landowner may still

at this point implement water quality management practices of his or her choosing, as long as the practices will ostensibly remedy the water quality violation and bring the property into compliance with the Area Plan rules.

At the close of the compliance period, the Department of Agriculture will inspect the property to determine whether the violation persists. If it does, the agency will send another letter directing the landowner to take corrective action and prescribing practices that must be implemented before the close of a second compliance period. Upon issuance of such a letter, the prescribed practices become mandatory and the landowner no longer enjoys flexibility of compliance.

Landowners who do not comply with Area Plan rules within the second compliance period are subject to a civil penalty. Civil penalties of up to $2,500 for a first violation or $10,000 for any subsequent violation may be imposed, with each day of noncompliance after the compliance period has elapsed representing an additional violation.[210] When assessing civil penalties, the Department must consider the past history of the landowner's violations and/or attempts to comply, the seriousness of the violation, the risk to public health or safety, whether the violation was intentional, negligent or accidental and whether the violation was repeated or continuous.[211] Ultimately the Department of Agriculture rarely imposes civil penalties, usually only once or twice per year. The ambiguity of the rules, the fact that landowners choose BMPs without scientific guidance, and the tendency to be sympathetic toward agricultural interests may all contribute to such minimal enforcement activity by the Department.

Measured Results

The Oregon Department of Agriculture has not yet focused resources on determining the water quality impacts of the Agricultural Water Quality Management Act, but state officials recognize the need to demonstrate the program's effectiveness. To remedy this deficiency, the agency is considering working with the Oregon Department of Environmental Quality and local Soil and Water Conservation Districts to more closely survey the effectiveness of each Area Plan on a watershed basis.

Program Assessment

One of the theoretical strengths of the Oregon program is its flexibility. Landowners appreciate having independence in choosing among water quality control practices, and agency sources report a spirit of cooperation between the landowners and the Department of Agriculture. However, this flexibility has come at the expense of uniformity and results. The wide array of measures and practices which could potentially be utilized by individual landowners make compliance monitoring difficult, sacrificing efficient enforcement in favor of flexible implementation. Determining compliance under an approach featuring optional BMPs requires better water quality monitoring data than are currently utilized. By allowing a landowner to adopt any one of many suggested practices to attain water quality standards, compliance cannot be determined by monitoring implementation alone.

Landowners must adopt management practices consistent with regional water quality goals. Photo by Gary Wilson, USDA NRCS.

Wisconsin

Summary

The Wisconsin Department of Natural Resources (DNR) has promulgated a set of agricultural water quality performance standards that apply universally to all cropland and livestock facilities. The program is implemented through county land conservation committees, who are charged with ensuring that lands within their jurisdiction comply with performance standards. Wisconsin offers a generous cost-share program for implementing these performance standards---at least 70% of the cost is paid out of state funds---but the performance standards often cannot be made enforceable against landowners unless an offer of cost-sharing is made. To date, the program has not been allocated enough funding to be fully implemented.

Program Requirements

Wisconsin's program for controlling nonpoint pollution from agriculture begins with performance standards (many would call them "BMPs") contained in Chapter NR 151 of the Wisconsin Administrative Code, which became effective October 1, 2002.[212] These performance standards apply to all crop production and livestock production and include the following principles:

Agricultural Performance Standards

- Control cropland erosion to meet tolerable rates.
- Build, modify or abandon manure storage facilities to accepted standards.
- Divert clean runoff away from livestock and manure storage areas located near streams, rivers, lakes or areas susceptible to groundwater contamination.
- Apply manure and other fertilizers according to an approved nutrient management plan.

Manure Management Prohibitions

- No overflow of manure storage facilities.
- No unconfined manure piles near waterbodies.
- No direct runoff from feedlots or stored manure into state waters.
- No trampled stream banks or shorelines from livestock.[213]

The performance standards adopted by Wisconsin DNR are then implemented through conservation practices prescribed by Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP).[214] The DATCP has adopted regulations concerning these conservation practices---for example, detailing the standards that a nutrient management plan developed under NR 151 must meet.[215]

Wisconsin's program is keyed on the availability of state cost share funds in many, but not all situations. All new operations must comply with the performance standards, regardless of the availability of cost share,[216] and operations that already comply with performance standards must remain in compliance and are not eligible for cost share.[217] If no eligible costs are associated with complying with the performance standards, then no cost share offer is required to make compliance mandatory.[218]

However, existing facilities not already in compliance with performance standards are not required to comply with performance standards unless at least 70% cost share has been made available.[219] If an economic hardship is demonstrated, then cost share of up to 90% may be provided.[220]

The Wisconsin program is administered at the county level, where county land conservation committees are required to develop Land and Water Resource Management plans that include an NR 151 implementation program. To date, all 72 Wisconsin counties have added an implementation strategy to

their plans, and many have developed ordinances to help administer the NR 151 program.[221]

Compliance Monitoring

Since NR 151 is implemented at the county level, implementation plans are subject to local variability. DATCP regulations do outline certain implementation actions the counties can take, and several that the counties must take.

Each county is directed to systematically assess parcels of land within its jurisdiction to determine compliance with performance standards.[222] In 2008, as part of this ongoing land records assessment, 53 (of 72) counties reviewed cost-share agreements, 43 counties reviewed self-reporting documents and 39 reviewed local ordinances.[223] Three counties reported no landowner records reviews.[224] After reviewing land records, the county is directed to schedule evaluations with landowners and then send a status report to each landowner to indicate whether he or she is in compliance with performance standards.[225] In 2008, 52 counties conducted these on-site evaluations.[226] If the operation is not in compliance, the status report would inform the landowner of corrective measures to be taken, estimated costs of implementing those measures, and cost share availability.[227]

The landowner can respond to the status report voluntarily by making a cost share request.[228] In that instance, the landowner and the county will sign a contract, called a cost-share agreement.[229] The cost-share agreement will set forth the steps the landowner must take to meet performance standards and the cost of those steps that the local government will provide.[230] If the landowner does not respond or voluntarily take action, the county may issue the landowner a Landowner Notification, including a legitimate offer of cost-sharing and an explanation of the possible enforcement consequences of the landowner's failure to comply.[231]

In addition to the initial landowner compliance investigation, the county land conservation committee is directed to inspect each landowner's

Upper Mississippi River Watershed- Wisconsin. Photo by Bob Nichols, USDA NRCS.

Beef cattle grazing in Columbia County, WI. Photo by Bob Nichols, USDA NRCS.

compliance at least once every six years.[232] The county may also ask landowners to certify on a periodic basis (e.g. annually) that the operation complies with relevant performandards.[233] Each county must submit an annual report of implementation status to the DATCP.[234]

The Wisconsin DNR can also conduct onsite evaluations of compliance with performance standards, but it must first notify the county land conservation committee (or other municipality with jurisdiction).[235]

Enforcement

If the landowner breaches a cost share agreement or fails to respond to a Landowner Notification and "non-regulatory" attempts to resolve the situation have failed, the county may commence enforcement against the landowner.[236] Enforcement is thought of as "stepped enforcement" and typically begins with a Notice of Violation letter.[237] If the landowner persists in noncompliance, the county would schedule an enforcement conference between the landowner, the county and DNR representatives. During such a conference, officials attempt to set up compliance goals and a timeline for reaching those goals. Finally, if no agreement can be reached during the enforcement conference or if the landowner fails to follow the terms of the enforcement conference, formal enforcement proceedings may be pursued, either through DNR, the county, or the local district attorney, or through withholding of state financial assistance.[238] Formal enforcement proceedings may seek a penalty not less than $10 but not more than $5000.[239]

Measured Results

The Wisconsin DNR evaluates the runoff management program annually, but rather than assessing improvements in water quality or even landowner compliance rates, the agency measures its success in terms of the time and money counties dedicate to the program.[240] The 2008 Annual Report (the most recent report available as of the date of this memorandum) indicated that 32 counties dedicated more than 50% of their staff time toward implementing the program and 47 counties devoted over 50% of their cost share dollars to the achievement of performance standards.[241] State officials recognize that evaluating compliance with the performance standards would be a better gauge of success, but they are still working out the best way to track this information from the counties.

Program Assessment

The framework of Wisconsin's program is strong: it specifies important runoff performance standards and (in theory) requires those performance standards to be met by all agricultural operations. The program is designed to work well with the willing landowner, and is crafted to encourage compliance cooperatively through the availability of public cost share funds and technical assistance from the county and state.

However, Wisconsin's program is not well-structured to respond to landowners who refuse to comply with performance standards. Although an uncooperative producer risks court-imposed fines and an enforcement order to reach performance standards without cost share funds, the attorney general is extremely unlikely to pursue an enforcement case referred by DNR (only one such case has been brought since the program's inception). Thus a producer risks little by refusing to comply with performance standards.

Class I trout stream in Columbia County, WI. Photo by Bob Nichols, USDA NRCS.

A major factor limiting the success of the Wisconsin program is the insufficient allocation of funds to the state cost-share program. When 70% cost share is required to make performance standards mandatory for existing producers and the state fails to fully fund the cost share program, counties can make very little progress in implementing nonpoint pollution reduction measures on the ground. The mechanism by which counties receive funding further slows down the process, as counties must apply competitively for grant funding a year in advance of projects commencing.

Finally, although administering the program on the county level makes some practical sense in terms of managing pollution locally, this structure is also a fundamental weakness. Counties have limited resources to dedicate toward monitoring compliance with program requirements. Even if counties could adequately track compliance, developing a statewide picture of the program's effectiveness is difficult because data collection is distributed across dozens of local governments. Local government officials may also be more likely to grant leniency to their neighbors and not monitor to ensure strict compliance with the performance standards.

Overarching Nonpoint Programs At a Glance

State	Who Must Comply with Regulation	Type of Program	Citizen Role	Cost Share	Enforcement Remedies Available
California	All "dischargers," including nonpoint dischargers	Pollution permits that include nonpoint pollution control plans			$500-20,000; injunction
Delaware	Farmers with 8 or more livestock or 10 or more acres of nutrient-applied land	Nutrient management plans	Citizen complaint process; citizens may sue for injunction against agency or polluter		Mandatory fine of $25-1000 per day of violation (up to $10,000 max) plus discretion to impose $1000 additional fine per violation; injunction
Iowa	Landowners	Soil loss limits	Neighboring landowner complaint triggers enforcement	50% cost share required to proceed with enforcement	Court order to comply
Kentucky	Agricultural operations	Water quality plans that incorporate required best management practices	Citizen complaint process	Available if operation is not a "bad actor"	$1000 max; injunction
Maryland	Farm operators with $2500 or more in farm income or 8 or more livestock	Nutrient management plans		Available up to 87.5%, but limited funds	$250 max for not having a plan; $2000 annual max for not implementing plan
Oregon	Landowners	Regional water quality management plans with which landowners must comply	Citizen complaint process		$2500 max for first violation; $10,000 max for subsequent violations
Wisconsin	All crop and livestock production	Agricultural water quality performance standards (BMPs)		70%-90% available; at least 70% cost share required to make requirements mandatory for some existing operations	$10-5,000

Best Management Practices Required by Regulation

2

In addition to examining overarching regulatory schemes for controlling nonpoint source pollution, we also targeted five individual practices to control nonpoint pollution that could be required by states:

- Vegetative buffer requirements
- Land application setbacks
- Winter manure application prohibitions
- Livestock exclusion requirements
- Fall fertilizer restrictions

These five were chosen because they are readily adoptable, relatively straightforward agricultural practices that could easily be required by states. They are basic, common-sense practices that should be followed by all agricultural operations.

These best management practices focus on water pollution from livestock manure and commercial fertilizers. Manure composition differs somewhat depending on the type of livestock being raised, but pollutants like nitrogen, phosphorus, pathogens and pharmaceuticals are almost certain to be part of the mix. Commercial fertilizers primarily cause nitrogen and phosphorus pollution.

The vegetative buffer requirements, land application setbacks and winter manure application prohibitions often would apply to both livestock operations and row crop production. Livestock exclusion requirements apply to livestock facilities and fall fertilizer restrictions apply to production of row crops.

Native grasses and forbs are part of the planting mixture in a conservation buffer along Bear Creek in central Iowa.
Photo by Roger Hill, USDA NRCS.

Vegetative Buffers

Introduction

This section discusses regulations that require vegetative buffers next to surface waters. A more detailed discussion of each state program follows this introductory comparative analysis of the field of state regulations. We have included a checklist of elements that should be included in an effective vegetative buffer regulation on page 38. The section concludes with a table showing these regulations "at-a-glance."

Background on Best Management Practice

A vegetative buffer slows down runoff, filtering out pollutants and cooling water before it reaches a sensitive stream, river or lake ecosystem. Plants in the buffer take nitrogen and phosphorus from the runoff to grow, and the roots of the plants stabilize stream banks, preventing pollution from erosion. Vegetative riparian buffers are a critical but underutilized tool for improving water quality in watersheds with nonpoint pollution impacts.

Regulatory Language

Regulations will typically establish a minimum prescribed width of vegetative buffer required to be maintained. North Carolina requires a 200-foot minimum buffer width in the floodplain of the Goose Creek watershed (a watershed containing endangered mussels). For the rest of the Goose Creek watershed, a minimum 100-foot vegetative buffer is required. A 100-foot buffer also applies to lakes and perennial streams in Minnesota. Finally, shoreland agriculture and agriculture in proximity to "other special protection areas" in Minnesota, plus two more watersheds in North Carolina require a 50-foot vegetative buffer. In terms of water quality, the wider the vegetative buffer, the more pollution will be avoided.

Who Must Comply with Regulation

North Carolina applies a vegetative buffer requirement to all development activity, including both agricultural and non-agricultural development.[242] This approach, if applied without overly-broad exemptions, would go a long way toward protecting waters from nonpoint source pollution of all kinds. Minnesota requires vegetative buffers for shoreland agricultural activity and for those who land-apply manure.

A note about vegetative buffers and land application setbacks

Many sources require or recommend either "buffers" or "setbacks" from surface waters, but the terms are sometimes used interchangeably and the definitions are not consistent. In this report a "vegetative buffer" (also called a "conservation buffer" "riparian buffer" or "filter strip") refers to a vegetated area of a specified width maintained adjacent to a waterbody. A "land application setback" establishes a distance from a waterbody within which no land application of manure, fertilizers, pesticides and/or wastewater is permitted. The two practices are not mutually exclusive: states often specify that no manure may be applied within a vegetative buffer, and states with land application setbacks sometimes present vegetative buffers as an alternative to a wider land application setback requirement. This report will discuss vegetative buffers and land application setbacks independently, but recognizes the interrelationship that exists between the two practices. Vegetative buffers are superior to land application setbacks in terms of water quality, but both are necessary to comprehensively manage nonpoint pollution.

Exceptions from Regulation

Broad exemptions can have the effect of weakening otherwise-strong vegetative buffer requirements. North Carolina's watershed-specific programs only apply to existing riparian buffers, and carry no requirement to create or restore buffers that have already been destroyed. North Carolina has also created compensatory mitigation and variance provisions as relief from riparian buffer requirements.

Existing State Regulations

North Carolina

North Carolina does not have a statewide vegetative buffer protection program, but a number of watersheds within the state have developed vegetative riparian buffer protections. The Neuse River Basin and Catawba River Basin provide two similar examples of typical vegetative buffer protections, while the Goose Creek watershed provides an example of rules established to protect a sensitive area containing threatened and endangered freshwater mussels.

Both the Neuse River Basin and Catawba River Basin seek to protect 50-foot vegetative buffers, but the respective buffer requirements apply to different types of waters: in the Neuse River Basin, requirements apply to surface waters in the Basin (intermittent streams, perennial streams, lakes, ponds and estuaries),[243] but only the Catawba River mainstem below Lake James and mainstem lakes are subject to the vegetative buffer requirement.[244] Both basins specifically exempt wetlands from riparian buffer requirements.[245]

Both basins' rules apply only to existing undeveloped riparian areas - in other words, areas within the 50-foot buffer area that have already been developed are exempt, and landowners are not required to create or restore vegetative buffers.[246] The 50-foot buffer is divided into two "zones" to which slightly different protections apply. Zone 1 is the 30 feet closest to the waterbody and is to be left uddisturbed aside from specified uses.[247] Zone 1 in the Catawba basin is to be a "forested area," while in the Neuse basin it is to be a "vegetated area."[248] Zone 2 is the remainder of the buffer and is to be a "stable vegetated area" left undisturbed; however, more impacts are tolerated within it - for example, grading and revegetation --- if such activity will not compromise the health of Zone 1.[249]

The vegetative riparian buffer rules specify the land uses that are "prohibited," "allowable," "allowable with mitigation" and "exempt" within the zones of the 50-foot buffer.[250] One who proposes a use that is "allowable" or "allowable with mitigation" must present evidence of "no practical alternatives" to the Division or delegated local authority in order to obtain such a determination and proceed with such a use.[251] The rules contain extensive tables specifying these uses, and uses not specified in the tables are prohibited.[252] Relevant to this report is the fact that agricultural uses are not specified and therefore are prohibited.[253] In the Neuse River basin, "ongoing fertilizer application" is an explicitly prohibited use.[254]

Riparian buffer along Bear Creek, in Story County, Iowa. Photo by Lynn Betts, USDA NRCS.

The Goose Creek watershed vegetative buffer rules are slightly stronger than those in the Neuse and Catawba River basins. The Goose Creek watershed is located within the Yadkin Pee-Dee river basin and provides habitat for freshwater mussels that are species of concern, threatened, endangered--- including the Carolina heelsplitter, which has been a federally-listed endangered species since 1993.[255]

Vegetative buffers within the Goose Creek watershed are 200 feet for waterbodies within the 100-year floodplain and 100-feet for waterbodies not located within the 100-year floodplain.[256] The structure of the rules is similar to those in the Catawba and Neuse basins, in that existing uses are exempt,[257] and uses allowed or proscribed within the basin are listed in the rules (except the categories in this watershed are "exempt" "potentially allowable" and "prohibited").[258] Again, ongoing fertilizer application is specifically prohibited, and agricultural uses are prohibited.[259] Riparian areas in the Goose Creek watershed are not divided into "zones," as those in the Catawba and Neuse basins are.

While the vegetative buffer rules in these basins are generally strong, a number of provisions have been included that weaken them. First, as mentioned above, the rules exempt existing uses, the end result of which is that water quality will not improve under this plan, it will only be prevented from getting worse as a result of new development in riparian areas. Second, a variance provision is available in all three basins, which is allowed on the basis of "practical difficulties or unnecessary hardships."[260] The standards governing the ability to grant a variance are no worse than many other variance provisions, but as seen elsewhere the availability of a variance is largely dependent on the attitude of the body charged with granting them. Third, North Carolina has a state statute that provides for relief from vegetative buffer requirements by allowing compensatory mitigation for destruction of vegetative buffers.[261] The statute does state that impacts to vegetative riparian buffers should be avoided and minimized and that no practical alternative to the destruction of vegetative buffers should exist, [262] but it is uncertain how strictly this is adhered to in practice. The alternatives include: 1) payment into a fee-in-lieu-of fund for vegetative buffer restoration; 2) donation of real property that will provide the same or greater water quality protection in the same river basin; 3) restoration or creation of a vegetative buffer that will provide equivalent or greater water quality protection that is not otherwise required to be restored; or 4) construction of some alternative measure that reduces nutrient loading as well or better than the vegetative buffer that is lost in the same river basin.[263]

Minnesota

Minnesota's shoreland zoning regulations have specific rules for agricultural uses in shoreland areas, in other words areas near "public waters" as defined by statute.[264] Shoreland areas are defined as 1,000 feet

Checklist

Elements of an effective vegetative buffer regulation

- ☐ Apply to all agricultural operations (or better yet, to all development)
- ☐ Require a specified minimum width of vegetative buffer along all surface water
- ☐ Specify that buffers should consist of perennial, non-pest vegetative species
- ☐ Refrain from exemptions and waiver provisions
- ☐ Enforcement provisions that establish meaningful penalties (injunctions and substantial monetary fines) for violations of the regulation
- ☐ Adequate staff and funding to pursue violations
- ☐ A citizen complaint mechanism to report violations

from the ordinary high water mark of a lake, pond, river or flowage and either 300 feet from a river or stream or the designated floodplain of a river or stream, whichever is greater.[265] General cultivation is allowed in shoreland areas, but only if a "shore impact zone" of 50 feet is "maintained in permanent vegetation or operated under an approved conservation plan" consistent with Natural Resources Conservation Service (NRCS) technical standards.[266] Application of fertilizer, pesticides or animal wastes in shoreland areas must be conducted so as to minimize impacts to the shore impact zone and the public water.[267]

Minnesota also has a vegetative buffer requirement within its land application setback rules that applies to owners of animal feeding operations (including but not limited to federally-defined CAFOs) and those who store, transport, dispose or use manure or wastewater.[268] Manure application to unfrozen soils must maintain either: 1) A vegetative buffer that is 100 feet wide along lakes and perennial streams or 50 feet wide along other "special protection areas" or 2) A 25-foot vegetative buffer if manure is incorporated and is applied at a rate that does not allow soil phosphorus to increase over a 6-year period. [269]

The vegetative buffer must consist of perennial grasses or forages, and must not receive manure applications from any animal feedlot or manure storage area.[270] Other BMPs govern the land-application practices that serve to protect water quality in tandem with the vegetative buffer.[271]

Vegetative Buffer Regulations at a Glance

State	Applies to	Vegetative Buffer Requirement	Exceptions
North Carolina: Catawba River watershed; Neuse River watershed	All proposed development in existing undeveloped riparian areas	50 feet	Certain development activities allowed within "zone 1" (30 feet from streambank), more activities allowed within "zone 2" (outer 20 feet of buffer). No requirement to create or restore buffers. Compensatory mitigation available. Variances available.
North Carolina: Goose Creek watershed	All proposed development in existing undeveloped riparian areas	200 feet (within 100-year floodplain) or 100 feet (outside of 100-year floodplain)	Only specified development activities allowed within buffers. Variances available. Compensatory mitigation available.
Minnesota	Shoreland areas (defined by statute as 1000 feet from lake, pond, river or flowage and 300 feet from a river or stream or the designated floodplain of a river or stream, whichever is greater)	50 feet	
	Areas where manure is land-applied	100 feet (from lakes or perennial streams) or 50 feet (from other "special protection areas")	Vegetative buffer can be reduced to 25 feet if manure is incorporated and applied at specified rates

Land Application Setbacks

Liquid manure from a hog feeding operation in northeast Iowa is being pumped onto cropland with a "honey wagon." Photo by Tim McCabe, USDA NRCS.

Introduction

This section discusses regulations that require land application setbacks. After this introductory comparative analysis of the field of state regulations we have included a checklist of elements that should be included in an effective land application setback regulation. A more detailed discussion of each state program follows, and a table comparing state programs "at-a-glance" concludes this section.

Background on Best Management Practice

Land application setbacks prevent direct runoff into surface waters and help to keep nitrogen and pathogens from leaching through the soil profile into surface and groundwater. This is usually accomplished by establishing a zone of a minimum width near water sources wherein application of substances is not allowed. Land application setbacks are usually aimed at manure application, but could also be used to reduce pollution from chemical fertilizers and pesticides.

Regulatory Language

When it comes to setback distances, wider is better. The distance that land application must be set back from surface waters varies somewhat, but is very commonly 100 feet (Arkansas, Colorado, Georgia, Ohio, Pennsylvania, Wyoming). Iowa and Wyoming require 200-foot land-application setbacks of all Animal Feeding Operations (as defined by the state) and Confined Swine Feeding Operations, respectively. New Jersey and Alabama only require 50-foot setbacks, although New Jersey has a formula that would require wider setbacks if slopes are over 6%.

A number of states allow creation of a narrower vegetative buffer as an alternative to the above-described setback distances. The most common alternative is a 35-foot vegetative buffer (to which no manure is applied) in lieu of a 100-foot land-application setback (Colorado, Georgia, Ohio, Pennsylvania, Wyoming). The alternative to Iowa's 200-foot manure application setback is a 50-foot vegetative buffer. New Jersey allows a 25-foot vegetative buffer alternative, subject to adjustment if slope is greater than 6%.

Some states have established wider setbacks from sensitive or high quality waters or water sources. While some of these setbacks are aimed at protecting designated high quality aquatic resources (Arkansas (300 feet), Alabama (200 feet)) or protecting wetlands (Iowa (200 feet)), most are concerned with protecting groundwater and other human water sources. Many of these specify distances from drinking or potable water sources or wells (Alabama (200 feet), Iowa (200 feet), Maine (100 feet), Ohio (300 feet)), and/or setback distances from land features that flow to groundwater, such as sinkholes (Iowa (200 feet), Ohio (300 feet)). Alabama also has a separate setback of 100 feet from non-potable water sources. These requirements give additional protection for higher-priority water resources and should be carefully considered when developing nonpoint pollution regulations.

Similarly, a number of states have explicitly empowered their regulatory agencies to require greater setbacks when required to protect water quality (Alabama, Arkansas, Iowa, and Pennsylvania). Giving the agency explicit authority to protect water quality in sensitive areas or where public health concerns are involved is always a good idea.

Who Must Comply with Regulation

The group to which regulations apply is defined differently from state to state, but the most effective setback regulations would apply widely to most, if not all, land applications of manure. Some regulations apply generally to agricultural operations (Ohio), animal manure handlers (Georgia), land application of manure, waste or wastewater (Arkansas, Alabama, Iowa) or state-defined animal confinements (Pennsylvania). New Jersey specifically regulates application of poultry manure.

We note that many states have manure application setback rules that apply to NPDES-permitted CAFOs (a topic that is otherwise beyond the scope of this report). The requirement is commonly a 100-foot setback with an alternative 35-foot vegetative buffer.[272] Colorado also applies setback requirements to "large non-permitted CAFOs" that do not seek NPDES permit coverage.

Exceptions from Regulation

Manure application close to water almost always leads to water pollution. Unfortunately, states commonly include weakening exceptions into land-application setback regulations. Wyoming and Colorado allow a demonstration that through other conservation practices or land conditions, pollution reduction will be equivalent to or greater than the pollution reduction that would be achieved by the setback.

Iowa allows manure application closer or adjacent to water if the manure is incorporated or injected, however incorporation and injection do not alleviate the risk of manure leaching through the soil

Checklist

Elements of an effective regulation requiring land application setbacks

- ☐ Apply to all manure spreading (better yet, to commercial fertilizer/pesticide application as well)
- ☐ Require land application to be set back at least 100 feet from rivers, streams (including intermittent streams), lakes, ponds, wetlands, and wells
- ☐ Allow the administering agency to require wider setbacks as necessary to protect surface water and groundwater quality
- ☐ Refrain from exemptions and waiver provisions
- ☐ Enforcement provisions that establish meaningful penalties (injunctions and substantial monetary fines) for violations of the regulation
- ☐ Adequate staff and funding to pursue violations
- ☐ A citizen complaint mechanism to report violations

profile into surface or groundwater. Delaware offers alternative setbacks when winter cover crops are established after application (which, again, does not necessarily mitigate water quality impacts) and may also approve "other alternatives" to compliance with setback requirements.

Existing State Regulations

Alabama

Alabama's setback requirements address land application of waste and/or wastewater. The regulations require a setback of no less than 50 feet from surface waters of the state, including perennial and intermittent streams, ponds, lakes, springs and sinkholes.[273] Setbacks of at least 100 feet are required from non-potable wells and water supplies and 200 feet from public water supplies, designated high-quality waters and potable wells and water supplies.[274]

No alternatives to compliance with these setbacks are offered - to the contrary, the regulations emphasize that the Alabama Department of Environmental Management may require additional setback distances based on NRCS guidelines, site-specific conditions or as necessary to protect water quality.[275]

Arkansas

Arkansas requires that land application of waste or wastewater be set back 100 feet from streams (including intermittent streams), ponds, lakes, springs, sinkholes, rock outcrops, wells and water supplies.[276] Setbacks should be 300 feet from "extraordinary resource waters" as designated by the Arkansas Pollution Control and Ecology Commission.[277]

No exemptions or exceptions apply. The Arkansas Department of Environmental Quality may require additional setback distances "necessary to protect waters of the state."[278]

Colorado

Colorado, like many other states, regulates land application of manure from CAFOs. But Colorado also applies those same regulatory requirements to "large non-permitted CAFOs" (those not proposing to discharge and not seeking NPDES coverage under the 2008 CAFO rules).[279]

Colorado requires 100-foot setbacks for application of manure and wastewater from down-gradient surface waters, open tile line intake structures, sinkholes, agricultural well heads, or other conduits to surface waters.[280] An alternative 35-foot vegetated buffer (where applications of manure are prohibited) may be used instead of the 100-foot setback.[281]

Colorado permits the CAFO to demonstrate that the setback or buffer "is not necessary because implementation of alternative conservation practices or land application site conditions will provide pollutant reductions equivalent to or better than the reductions that would be achieved by the one hundred foot (100') setback."[282]

Georgia

Animal manure handlers in Georgia must ensure that land application of manure is set back at least 100 feet from surface waters (streams, ponds, springs, sinkholes, wetlands, etc.) and dry wells.[283]

As an alternative to the 100-foot setback, a 35-foot perennial vegetative buffer may be maintained between the manure application and surface waters.[284]

Exceptions to these requirements must have prior approval from the Georgia Department of Agriculture.[285]

Illinois

Illinois requires livestock management facilities comprised of 1000 or more animal units to create a waste management plan.[286] If waste is to be land-applied, the waste management plan must include a provision that disallows manure application within 200 feet of any surface water.[287] The 200-foot setback is not required if the surface water is upgradient from the application or if adequate diking exists.[288] In any

case, application is not allowed within 150 of potable water wells.[289]

Iowa

Iowa's universally-applicable manure application rules require a setback of 200 feet from "designated areas" or 800 feet from a high quality water resource.[290] A designated area is "a known sinkhole, or a cistern, abandoned well, unplugged agricultural drainage well, agricultural drainage well surface inlet, drinking water well, lake, designated wetland, or water source."[291] A "water source" includes lakes, rivers, streams, reservoirs, and ditches, but does not include lakes or ponds "without outlet to which only one landowner is riparian."[292]

The rules provide that a 50-foot vegetative buffer may serve as an alternative to the 200-foot setback requirement.[293] That alternative buffer must consist of permanent vegetation and must not be subject to manure application.[294]

If manure is injected or incorporated on the same day, the area is exempt from setback requirements.[295] This is especially problematic, because incorporation/injection directly adjacent to a stream or up to a wellhead still allows pollution to leach through the soil profile into the water.

Maine

Maine requires nutrient management plans for facilities that confine and feed 50 or more animal units or store or use more than 100 tons of manure from other agricultural operations.[296] A nutrient management plan must contain setback requirements.[297] No specific setbacks are required from surface waters, but setback distances must be determined using site specific BMPs and must be effective in controlling runoff and preventing contamination of surface water.[298] In the case of drinking water wells, manure application setbacks must be a minimum of 100 feet.[299]

Minnesota

Minnesota has a limited land application setback requirement that applies to owners of animal feeding operations (including but not limited to federally-defined CAFOs) and those who store, transport, dispose or use manure or wastewater.[300] The regulation states simply that "manure and process wastewater must not be applied to land within 50 feet of an active or inactive water supply well, sinkhole, mine or quarry."[301] This provision as designed only applies to groundwater, but as discussed on pages 38-39, Minnesota has corresponding vegetative buffer requirements designed to protect surface water.

Runoff from fields following a brief storm. Photo by Tim McCabe, USDA NRCS.

New Jersey

New Jersey's manure setbacks apply only to those who store or land-apply poultry manure.[302] The manure application setback requirement is 50 feet from "defined drainage channels and sinkholes."[303] However, if slopes are greater than 6%, the setback will be 8 times the percent slope times 100.[304]

Alternatively (or perhaps preferably, given the ambiguous drafting of the statute) a manure-free vegetative buffer zone of 25 feet will suffice in lieu of the 50 foot setback.[305] On slopes greater than 6%, this setback must be 4 times the percent slope times 100.[306]

Pennsylvania

Pennsylvania's setback requirements apply to state-defined Concentrated Animal Operations (agricultural operations where the animal density exceeds two [Animal Equivalent Units] per acre on an annualized basis) and those who receive manure from Concentrated Animal Operations, either directly or indirectly.[307] The regulations require that mechanically land-applied manure be set back 100 feet from surface waters.[308] Surface waters include perennial or intermittent streams with a defined bed and bank, lakes, and ponds.[309]

As an alternative to the 100-foot setback, a 35-foot vegetated buffer meeting NRCS standards may be employed to prevent manure runoff into surface waters.[310]

The Pennsylvania Conservation Commission may establish stricter requirements as necessary by regulation.[311]

Wyoming

For Confined Swine Feeding Operations (those consisting of 1000 or more swine), a waste management plan must include manure application setbacks (called "buffer zones").[312] For these facilities, the application of liquid manure, manure sludges and slurries, and solid manure must be set back 200 feet from a perennial or intermittent water body or water well permitted for current domestic purposes.[313] Liquid manure, manure sludge and slurry application must also be set back 200 feet from ephemeral streams.[314] This rule is simple and straightforward and contains no exemptions or compliance alternatives.

Nitrogen being applied to growing corn field. Photo by Lynn Betts, USDA NRCS.

Land Application Setbacks At a Glance

State	Applies to:	Manure Spreading Setback from Surface Waters	Width of Vegetative Buffer Alternative to Setback	Manure Spreading Setback from High Quality Waters
Alabama	Land application of waste/wastewater	50 feet		100 feet from non-potable water supplies; 200 feet from designated high-quality or potable water supplies
Arkansas	Land application of waste/wastewater	100 feet		300 feet from designated "extraordinary resource waters"
Colorado	CAFOs and large non-permitted CAFOs	100 feet	35 feet	
Georgia	Animal manure handlers	100 feet	35 feet	
Illinois	Waste management plans for livestock operations over 1000 animal units	200 feet		
Iowa	Land application of manure	200 feet	50 feet	800 feet from high quality water resource
Maine	Nutrient management plans	As necessary to control runoff and prevent contamination of surface water		100 feet from drinking wells
Minnesota	Animal feeding operations and those that store, transport, dispose or use manure or wastewater			50 feet from water supply well, sinkhole, mine or quarry
New Jersey	Land application of poultry manure	50 feet from defined drainage channels and sinkholes (adjusted by formula if greater than 6% slope)	25 feet from defined drainage channels and sinkholes (adjusted by formula if greater than 6% slope)	
Pennsylvania	Concentrated Animal Operations (as defined by state) and those who receive manure from Concentrated Animal Operations	100 feet	35 feet	
Wyoming	Land application of liquid manure, manure sludges and slurries, and solid manure by Confined Swine Feeding Operations	200 feet		

Winter Manure Restrictions

Winter Scene along Bear Creek in Story County, Iowa. Photo by Roger Hill, USDA NRCS.

Introduction

This section discusses regulations that require winter manure application restrictions. After this introductory comparative analysis of the field of state regulations we have included a checklist of elements that should be included in an effective winter manure application regulation. A more detailed discussion of each state program follows, and a table comparing the programs "at-a-glance" concludes this section.

Background on Best Management Practice

When soil is frozen or snow-covered, or when it is overly saturated with water, manure will not stay where it is spread. Instead, the manure will run off the land--- immediately upon application, later when the snow melts, or both---polluting our waterways with nitrogen, phosphorus and other contaminants. Liquid manure application in the winter is of primary concern, as it easily runs over frozen ground and into surface water rather than soaking into the soil. Solid manure application can also be problematic if applied to snow-covered soil, because it can run off along with the snow melt when the weather warms.

Regulatory Language

Because these types of regulations restrict the application of manure during times when that application is likely to pollute water, defining when the restriction is in effect is an important element of the regulation. This is done in two ways. One way is to restrict manure applications during particular ground conditions, such as when soil is frozen or snow-covered (Illinois, Indiana, Maryland, Minnesota). Other states apply restrictions to saturated soils (Colorado Kansas, Wyoming) or restrict application during rain events (Wyoming). The other way is to prohibit application of manure between calendar dates, for example, between December 15 and April 1. (Maine, Vermont).

Neither approach is perfect. Regulations that restrict application based on ground conditions rely on a subjective and somewhat difficult-to-enforce condition. Regulations that are based on calendar dates may be under-inclusive, in that they do not apply to frozen/snow conditions that occur outside those dates. They may also be over-inclusive, prohibiting application during times that would otherwise not threaten water quality. Both scenarios may be subject to some uncertainty as climate patterns shift in coming years.

Some states incorporate both approaches, prohibiting application, for example, "between December 17 and February 15 or when ground is frozen or snow-covered." (Delaware) This approach provides a measure of safety by prohibiting application between the calendar dates when manure is most likely to run off as a result of improper soil conditions, but also prohibits application at other times when the soil is frozen or snow-covered. This approach is the most reasonable and the most protective of water quality. However, a regulation that is both date-based and condition-based can be improperly constructed. For example, Iowa restricts application on snow-covered ground between December 21 and April 1. This means that if the ground is snow-covered prior to December 21, manure application is not restricted, even though that application is still likely to result in water pollution.

All but two of the states studied restrict application of both liquid and solid manure during inappropriate soil conditions. Iowa and Wyoming are the exceptions, restricting only liquid manure applications. Indiana applies different restrictions to liquid and solid manure. The best regulation will apply to both liquid and solid manure applications.

Who Must Comply with Regulation

Some winter manure regulations are based on the type of land to which manure would be applied. For example, limitations might apply to all agricultural lands (Maine) or agricultural operations (Vermont). Minnesota prohibits manure spreading from animal feeding operations that apply within 300 feet of rivers, perennial and intermittent streams, lakes and wetlands. Some states also tie restrictions (Indiana, Tennessee)---or exemptions from restrictions (Illinois)---to the slope of the land, under the theory

Checklist

Elements of an effective winter manure application regulation

- ☐ Apply to all agricultural lands
- ☐ Prohibit manure application "between (two locally-appropriate dates) or when ground is frozen or snow-covered"
- ☐ Apply to both liquid and solid manure applications
- ☐ Require a variance proceeding (in which the applicant must prove that no alternatives to winter application are available) and additional water quality protections if emergency winter application is necessary on a very limited basis. The availability of a variance does not relieve an operator from the responsibility for maintaining adequate manure storage
- ☐ Enforcement provisions that establish meaningful penalties (injunctions and substantial monetary fines) for violations of the regulation
- ☐ Adequate staff and funding to pursue violations
- ☐ A citizen complaint mechanism to report violations

that there will be more runoff from steeper slopes.

Many winter manure regulations are aimed at some type of confined animal feeding operation, but the definitions vary significantly. The state examples included in this section are those that have winter manure restrictions that apply to facilities beyond the scope of a CAFO NPDES permit. Several states only restrict winter manure application from very large facilities (over 1000 animal units) (Colorado, Illinois, Kansas (swine only) and Wyoming (swine only)) and others from medium-sized confinements (Iowa (500 animal units) and Indiana (e.g. 300 cattle)).

A few states include the winter manure prohibition as a required element of a nutrient management plan, when such plans are required beyond the CAFO NPDES permit program (Kansas and Maryland), or a waste management plan (Illinois). Conversely, Delaware specifically restricts winter manure application on lands that are not covered by a nutrient management plan.

Finally, one state studied (Tennessee) aims the winter manure application limitations at third-party manure haulers hired by CAFOs.

In order to protect water quality, winter manure spreading should be limited anywhere where manure is spread. A restriction that applies to "all agricultural lands" would be best, as it includes almost everywhere that manure is spread, whether by the operation itself or by a third party.

Exceptions from Regulation

Some states provide exemptions for emergencies (Iowa, Vermont). While these types of exemptions sound reasonable, they have no lesser impact on water quality. Emergency situations should be avoided by maintaining adequate storage, and failure to do so, such that it requires an emergency winter manure application, should be considered a violation of the regulation.

Indiana operations can request an exemption from winter manure restrictions, but the regulation does not indicate when one should or should not be granted.

Some states tie exemptions to requirements that runoff control practices be employed (Illinois, Kansas, Maryland, Vermont), but none clearly define adequate practices. While these practices may mitigate some of the negative effects of winter manure application, these exemptions undermine water quality protections and make the regulation ambiguous and difficult to enforce.

Existing State Regulations

Colorado

Colorado has adopted regulations that protect water quality from "non-permitted large CAFOs"--in other words, CAFOs that are not seeking NPDES coverage because they do not propose to discharge. The regulations state that "there shall be no discharge to surface water from land application activities when the ground is frozen or saturated."[315] The language does not prohibit winter manure application, only the discharge that results from such application. This drafting is problematic, because once the manure has been applied, little can be done to stop the manure from running off into surface waters. Further, the provision is difficult to enforce because the resulting discharge may not occur until long after the application.

Delaware

Delaware's nutrient management law[316] requires a nutrient management plan for all animal feeding operations (8 or more animal units) and for property in excess of 10 acres upon which nutrients are applied. Where a nutrient management plan is required, all land-applied nutrients must be applied in accordance with that plan.[317] Neither the statute nor its regulations specify whether nutrient management plans must restrict winter applications of manure.

While the absence of winter application restrictions in nutrient management plans is problematic, Delaware regulations do restrict winter manure applications for lands that are not required to

have a nutrient management plan. In these areas, all land applications of nitrogen and phosphorus fertilizers are prohibited between December 17 and February 15 or at any other time when the surface area is covered by snow or frozen.[318] A fertilizer is defined as "any synthetic or carbon based substance that is added to the soil to supply one or more plant nutrients," and so includes manure.[319] Indeed, a Delaware Department of Agriculture press release states that the purpose of the regulation is "to limit the application of commercial and manure based fertilizer during the time of the year that is most vulnerable for nutrient runoff."[320]

Two features of this regulation stand out as exemplary: 1) restricting application of all nitrogen and phosphorus fertilizers (not just manure) when soil conditions are inappropriate and 2) using a date-based restriction in combination with a condition-based restriction to be maximally protective without being overly restrictive. If this regulation also applied to lands with nutrient management plans, it might well be used as a model.

Illinois

Illinois' Livestock Management Facilities Act requires an owner or operator of a livestock management facility consisting of more than 1000 animal units to adopt a waste management plan.[321] A waste management plan must include a provision that livestock waste must not be applied on frozen or snow-covered ground unless one of two conditions is met: (1) land slopes are 5% or less; or (2) adequate erosion control practices exist.[322]

This regulation has three main problems. Importantly, it only applies to very large livestock operations, excluding impacts from many smaller operations. A facility with 999 cattle does not cause any less of a water quality problem if its manure is spread on frozen ground. The second problem is that it allows manure application on frozen or snow-covered ground with "adequate erosion control practices," but does not define what those practices are. Finally, 5% slopes are steep compared to other states' thresholds, and allowing manure application on steep frozen slopes may not protect water quality.

Manure will not stay where it is spread when soil is frozen or snow-covered. Photo courtesy of Stock.xchng.

Indiana

Indiana's winter manure application restrictions apply to all confined feeding operations, defined in part as operations containing at least 300 cattle, 600 swine or sheep or 30,000 fowl.[323] For these operations, spray irrigation of liquid manure to snow-covered or frozen ground is prohibited.[324] Application of solid manure to frozen ground is prohibited if the slope of the land exceeds 2%, unless adequate residue protection or crop cover is established.[325] For any new or amended confined feeding operation approved after June 4, 2008, application of solid manure to frozen or snow-covered ground is prohibited outright.[326] However, the regulation leaves the door open so that during the application process, the facility can request (and obtain) permission to apply manure to frozen ground.

Iowa

In late May 2009, the Iowa legislature passed a new winter manure application law[327] that replaces its old system of recommended BMPs. The new law prohibits surface application of liquid manure on snow-covered ground from December 21 to April 1 and on frozen ground from Feb. 1 to April 1, except under emergency circumstances.[328] Any emergency

application must be consistent with conditions listed in the regulation,[329] but improper management or design of manure storage is not an emergency that warrants the exemption.[330] An exemption also applies if manure is injected or incorporated.[331] Further, the new law requires the Department of Natural Resources to submit an annual report to the legislature, detailing all emergency applications that were allowed, estimating the water quality impact of the application and evaluating the effectiveness of actions taken to ameliorate the emergency application.[332]

These regulations are a step forward for Iowa, but still leave much to be desired. First, the winter application restrictions do not apply to dry or solid manure. Second, the prohibition only applies to manure originating from animal feeding operations containing more than 500 animal units, leaving out important contributors to water pollution.[333] Finally, the way the regulations are worded, if the ground is frozen or snow-covered on dates other than those specified, the restrictions do not apply. This twist is a confusing and pointless undermining of the water quality benefits a law like this should provide.

Kansas

Kansas law requires nutrient management plans for all swine facilities that have 1,000 or more animal units.[334] These swine facilities "shall not apply manure or wastewater to frozen or saturated soil, except where soil conservation practices to control runoff in compliance with the requirements of this section are identified in the facility's nutrient utilization plan and are followed by the facility."[335]

Maine

Maine has a fairly strong statute dealing with winter application of manure. In relevant part, the statute reads:

> (1) Winter spreading of manure prohibited. Beginning December 1, 1999, a person may not spread manure on agricultural fields between December 1st of a calendar year and March 15th of the following calendar year. This prohibition

A blanket of snow covers this central Maryland farm. Photo by Tim McCabe, USDA NRCS.

includes the spreading of manure and spraying or irrigation of liquid manure.

(2) Variance. Upon application to the commissioner, the commissioner may grant a variance to allow a person to spread manure during the winter due to financial hardship or other circumstances that necessitate the application. In granting a variance, the commissioner must impose restrictions to minimize potential environmental degradation and prescribe actions to ensure future compliance.[336]

The statute has broad application, prohibiting any person from spreading manure on agricultural lands during the winter months. The variance provision could be problematic, as the "financial hardship" threshold could open the door to a host of variance applications. However, as exemptions go, this variance provision is a better alternative, in that it requires the official who grants the variance to impose conditions to protect water quality. The fact that the statute provides that winter spreading of manure constitutes a civil violation warranting a fine of up to $1000 per day for every day that spreading occurs is also a signal that this statute is serious in its intent to protect water quality.[337]

Maryland

Maryland's winter manure restrictions allow application only under certain circumstances and only in a certain manner even in those circumstances. As discussed on pages 23-26, Maryland requires nutrient management plans for all agricultural operations grossing more than $2500 from agriculture and livestock operations consisting of 8 or more animal units.[338] Maryland's nutrient management regulations prohibit winter application of manure under all circumstances on hard-frozen or snow-covered ground.[339] Winter application is permitted "only if the farm operation has inadequate storage, a non-stackable manure, and no other reasonable option to manage it," and then only as a temporary solution.[340] Such application may only occur if the following restrictions are also adhered to:

- Winter manure application shall not be made on fields when predominant soils are the following poorly drained soil types: Portsmouth, Pocomoke, Bayboro, Johnston, and Plummer.

- Manure applications shall not be made to land with a slope greater than 7%.

- A setback of at least 100 feet from all surface waters shall be maintained, unless best management practices providing water quality protection equivalent to such a setback are in place. (Surface water is defined as any permanent or intermittent, continuous, physical conduit for transporting water. Shovel ditches and water leads are not included as surface waters for purposes of this policy.)

- Rates of application shall be minimized, and available acreage used to the greatest extent practical. In no case shall the application rate per acre exceed the crops' phosphorus removal requirements.

- Applications should be made into existing vegetative cover, such as cover crops or small grain

- If vegetative cover is not used, manure applications shall be made to land that has a minimum of 30% residue coverage, and is maintained as such until after March 1.[341]

While it would be better to allow no exceptions to the manure application restriction, these conditions are quite comprehensive.

Minnesota

Minnesota has adopted regulations pertaining to land application of manure from animal feedlots.[342] Among other things, these regulations prohibit manure application to frozen or snow-covered soils within "special protection areas."[343] Special protection areas are defined as 300 feet from any lake, river, stream or protected wetland.[344]

Runoff from this livestock yard may enter a nearby stream and degrade water quality. Photo by Tim McCabe, USDA NRCS.

Tennessee

Tennessee has an interesting regulation that applies to some livestock waste haulers. Tennessee CAFO NPDES permits must include a condition requiring the CAFO to keep on file a signed agreement from any third-party waste hauler transferring more than 100 tons of litter, manure, or process wastewater from the CAFO.[345] The agreement form is included as an appendix to the regulations, and includes as a condition that waste must not be applied to frozen ground or on steep slopes.[346] While this regulation fills in an important gap that may otherwise exist in a manure management law (the unregulated hauling of many tons of livestock waste), it would not be sufficient as a stand-alone regulation.

Vermont

The Vermont legislature charged the Agency of Agriculture, Food and Markets with creating a comprehensive nonpoint source pollution reduction program that includes both Best Management Practices (BMPs) and also broader "Accepted Agricultural Practices," which are statewide restrictions designed to reduce nonpoint pollutant discharges through implementation of improved agricultural techniques. In relevant part, these regulations provide:

> 4.03(d): Manure shall not be spread between December 15 and April 1 unless the Secretary grants an exemption because of an emergency situation, such as, but not limited to, the structural failure of a manure storage system or for other specific management needs. In granting an exemption, the Secretary shall determine that the manure will be spread on fields with the least likelihood of generating runoff to the adjoining surface waters. Being granted an exemption does not relieve persons from complying with the Vermont Water Quality Standards.[347]

This provision as written is strong, clear and has broad application to all agricultural operations, providing that manure "shall not be spread" during the winter months except in emergency situations. It also provides enforcement mechanisms including written warnings, cease and desist orders, and fines of up to $1,000 per day, up to $25,000 per continuing violation.[348]

Wyoming

Wyoming restricts winter application of manure, but only from Confined Swine Feeding Operations consisting of 1000 or more swine. For liquid animal wastes and manure slurries and sludges alike, the regulations state that land application "shall not be undertaken when soil is saturated, frozen, or covered with ice or snow or immediately before or during a storm event."[349] This simple prohibitory statement could be quite effective in protecting water quality if it applied more broadly to all manure applications and if solid manure application was also covered.

Winter Manure Application At a Glance

State	Applies to	When	Liquid Manure	Solid Manure
Colorado	Non-permitted large CAFOs (e.g. 1000 cattle; 2500 swine; 125,000 chickens)	Frozen or saturated ground	Discharge prohibited	Discharge prohibited
Delaware	Lands not required to have a nutrient management plan (those that apply to less than 10 acres or have fewer than 8 animal units)	Between December 17 and February 15 or when ground is frozen or snow-covered	Prohibited	Prohibited
Illinois	Livestock management facility consisting of more than 1000 animal units	Frozen or snow-covered ground	Prohibited	Prohibited
Indiana	Confined feeding operations (300 cattle; 600 swine or sheep; 30,000 fowl)	Frozen or snow-covered ground	Spray irrigation prohibited	Prohibited if over 2% slope unless adequate residue protections or crop cover
	Confined feeding operations approved after 2008	Frozen or snow-covered ground		Prohibited
Iowa	Animal feeding operations consisting of more than 500 animal units	Snow-covered ground from December 21 - April 1	Prohibited	
		Frozen ground from February 1 - April 1	Prohibited	
Kansas	Swine facilities over 1,000 animal units	Frozen or saturated soil	Prohibited	Prohibited
Maine	All agricultural lands	December 1 - March 15	Prohibited	Prohibited
Maryland	Farms grossing more than $2500 per year	Hard-frozen or snow-covered ground	Prohibited	Prohibited
Minnesota	All animal feedlots applying within 300 feet of surface waters	Frozen or snow-covered ground	Prohibited	Prohibited
Tennessee	Third-party manure haulers disposing 100 tons or more waste from a CAFO	Frozen ground or steep slopes	Prohibited	Prohibited
Vermont	All agricultural operations	December 15 - April 1	Prohibited	Prohibited
Wyoming	Confined swine feeding operations consisting of 1000 or more animals	Frozen, snow- or ice-covered, or saturated soil or immediately before or during a storm event	Prohibited (including manure slurries and sludges)	

Livestock Exclusion

Photo courtesy of Stock.xchng.

Introduction

This section discusses regulations that require livestock exclusion from surface waters. After this introductory comparative analysis of the field of state regulations we have included a checklist of elements that should be included in an effective livestock exclusion regulation. A more detailed discussion of each state program follows, and a table comparing the regulations concludes this section.

Background on Best Management Practice

When livestock are allowed to graze in streams, rivers or lakes, erosion and nutrient pollution are increased. The stream channel or shoreline gets trampled, increasing erosion and destroying riparian vegetation. Nitrogen and phosphorus pollution is exacerbated by erosion and runoff as well as by manure that grazing cows introduce directly in the water.

Livestock exclusion is typically accomplished by fencing livestock out of streams, rivers and lakes. While this practice is conceptually similar to the practice of preserving vegetative buffers (many vegetative buffers may in fact restrict livestock access), this section focuses only on regulations that are specifically aimed at livestock exclusion.

Regulatory Language

The language used by states to restrict access by livestock to surface waters is fairly straightforward, typically prohibiting operations from allowing livestock to come into direct contact with surface waters. Differences lie in whether the prohibition is softened by exemptions, as discussed below.

By way of comparison, the Federal CAFO rules require operators to "prevent direct contact of confined animals with waters of the United States."[350] The state regulations we discuss in this section are those that apply beyond NPDES-permitted CAFOs.

Who Must Comply with Regulation

Livestock can come into contact with surface water in confinements (such as open lot confinements that are not regulated as CAFOs) or by pasturing (where livestock can roam openly in a large, vegetated area).

Confined operations that allow stream or lake access can cause tremendous water quality damage, so any effective regulation would prohibit these types of operations from allowing such access. Even though the impact is presumably more dispersed, pasturing also has the potential to create water quality problems if vegetative riparian cover is destroyed by the grazing animals.

Wisconsin and Kentucky apply their requirements broadly to both situations by regulating "livestock operations" and "landowners," respectively. Other states with livestock exclusion regulations limit their scope to confined operations, which remedies only the most concentrated impacts. New Jersey applies its regulations to agricultural operations that confine livestock, while Minnesota applies its livestock exclusion requirements to non-CAFO animal feedlots (explicitly excluding pasturing). Colorado has special requirements for non-discharging large CAFOs that are not seeking NPDES permits.

Exceptions from Regulation

There may be limited circumstances in which livestock access to surface water can be managed so as to not degrade water quality, such as in the context of stream crossings and certain instances of livestock watering. Several state regulations provide exceptions that allow livestock access to surface water under specified circumstances. Colorado allows access for stock watering where no other drinking water access is available, and limits the exclusion requirement "as appropriate based on existing physical conditions and site constraints." New Jersey allows access if the access is controlled in accordance with specified BMPs (providing alternative water sources and fencing sensitive areas). Wisconsin's limits only apply where high concentrations of animals prevent the maintenance of vegetative cover. If exceptions to livestock exclusion are allowed, concern for water quality should limit the exceptions so that they cannot be invoked if vegetation is not in fact maintained in the grazing area up to the stream bank.

Enforcement Provisions

The regulations vary widely in terms of the power the state has to enforce them. Colorado has the strongest enforcement provisions, allowing penalties of up to $10,000 per day of violation, injunctions and cease-and-desist orders. New Jersey also has good enforcement provisions, directing the Department of Agriculture to investigate alleged violations and allowing fines of up to $1000 per violation per day. Wisconsin, on the other hand, cannot enforce its requirements against most operations unless a public subsidy is offered to the operator. Kentucky's provisions do not even become mandatory (let alone enforceable) until a violation of a water quality standard is proven.

Checklist

Elements of an effective livestock exclusion regulation

- ☐ Apply broadly to all livestock operations
- ☐ A prohibition on livestock access to surface water, including rivers, streams lakes and ponds (other than those constructed for the purpose of livestock watering)
- ☐ Minimal exemptions, if any, for pasturing that require vegetative cover to be maintained under all circumstances
- ☐ Enforcement provisions that establish meaningful penalties (injunctions and substantial monetary fines) for violations of the regulation
- ☐ Adequate staff and funding to pursue violations
- ☐ A citizen complaint mechanism to report violations

Existing State Regulations

Colorado

In Colorado, livestock exclusion is explicitly required of "non-permitted large CAFOs," effectively closing a pollution loophole that was created by the 2008 federal CAFO rules. Colorado's rule requires any CAFO confining more than specified numbers of animals (e.g. 1000 cattle) that is not seeking NPDES coverage to implement practices that protect water quality, similar to the provisions of the CAFO rule. The livestock exclusion requirement included in these rules states simply that the non-permitted large CAFO must "prevent direct contact of confined animals with surface water."[351] This regulation was adopted pursuant to the Colorado Water Quality Control Act[352] so violations of the Act can be abated using any of the tools available under the Act, including cease-and-desist orders,[353] injunctions and temporary restraining orders,[354] and fines of up to $10,000 per day of violation.[355]

Kentucky

As discussed in Part One[356] the Kentucky Agriculture Water Quality Act requires landowners to adopt applicable BMPs contained in statewide and/or regional water quality plans. One of the statewide BMPs listed for livestock requires landowners to keep livestock out of streams or limit access to streams. The BMP states that this is to be accomplished by:

- Manag[ing] livestock to prevent them from polluting streams.
- Maintain[ing] grass on areas affected by livestock along streams.
- Keep[ing] livestock out of streams except at crossings & watering sites if adequate grass cannot be maintained.
- Us[ing] temporary fencing to keep livestock out of these areas as needed.[357]

The implementation of these practices is neither monitored nor enforced unless a water quality violation is discovered---typically through a citizen complaint provision. Under the Kentucky regime, the landowner would be notified of the violation, triggering an enforceable requirement that measures be taken to limit livestock access to waters. If the operator fails to comply or respond to the written notification, the operator becomes a "bad actor" and is subject to enforcement action as well as the loss of assistance eligibility.[358] Unfortunately, the Kentucky Agriculture Water Quality Act as it is currently administered lacks accountability.[359]

Minnesota

The Minnesota Administrative Rules contain separate livestock exclusion provisions for two types of animal operations. Animals of a facility capable of holding 1000 or more animal units or a statutorily-defined CAFO simply must not be allowed to enter waters of the state.[360]

For smaller operations, the livestock exclusion rule is somewhat circumscribed. An animal feedlot that is smaller than 1000 units or a non-CAFO must be fenced in order to prevent animals from entering to a lake classified by the Minnesota Department of Natural Resources as a "natural environment lake, recreational development lake, or a general development lake."[361] Practically speaking these classifications cover all lakes in the state, but the rule leaves rivers and streams unprotected.

An animal feedlot is a confinement designed as an area where manure may accumulate or where vegetative cover cannot be maintained within the enclosure.[362] This is explicitly differentiated from "pastures," which are areas where grazing occurs but vegetative cover can be maintained.[363]

New Jersey

New Jersey provides that no agricultural operations shall allow livestock in any confined areas, regardless of size, to have access to waters of the state "unless such access is controlled in accordance with the New Jersey Department of Agriculture BMP Manual."[364] To be exempt from the strict prohibition, the BMP Manual states that alternative water supplies should be offered in the context of livestock grazing, in order

to keep animals away from streambanks and riparian zones.[365] Additionally, the BMP manual requires that animals be fenced to keep them away from riparian areas and sensitive water resources, taking into account "the fact that fencing can have the effect of concentrating animals in particular areas, such as along the fence line, where paths may become channels that concentrate and accelerate runoff," but that some fencing can be installed across slopes to slow down runoff.[366]

The regulations direct the Department of Agriculture to investigate alleged violations of the rules and take appropriate action, which may include, but is not limited to, civil administrative fines up to $1000.[367] The Department may allow up to 60 days to correct the noncompliance.[368] If a person fails to pay a fine levied under this regulation, a court may order an additional fine of up to $1000 and may use the power of the court to collect the fines.[369]

Wisconsin

Wisconsin's livestock exclusion rule is part of a larger effort meant to manage agricultural runoff throughout the state, as discussed on pages 30-33. The rule states that "a livestock operation may not allow unlimited access by livestock to waters of the state in a location where high concentrations of animals prevent the maintenance of adequate sod or self-sustaining vegetative cover."[370] This applies to every livestock producer in the state, including both confinements and pastures.[371] Livestock operations that are required to obtain a facility siting permit are always required to exclude livestock from streams,[372] but livestock exclusion is only enforceable against existing operators subject to the availability of cost-share funds.[373]

Livestock Exclusion At a Glance

State	Applies to:	Requirement	Limitations
Colorado	Non-permitted large CAFOs	Prevent direct contact of confined animals with surface water	
Kentucky	Landowners	Implement best management practice limiting livestock access to streams	Not enforceable unless water quality violation identified
Minnesota	Facilities capable of holding 1000 or more animal units and CAFOs	Livestock must not be allowed to enter waters of the state	
	Facilities smaller than 1000 animal units and non-CAFOs	Livestock must be fenced to prohibit entry to (and must not be allowed to enter)lakes	
New Jersey	Livestock in confined areas	Livestock shall not be allowed access to the waters of the state	Exception if livestock access is controlled in accordance with BMPs: providing alternative water sources and fencing sensitive areas
Wisconsin	All livestock producers	Livestock may not be allowed unlimited access to waters of the state	Applies to "location(s) where high concentrations of animals prevent the maintenance of adequate sod or self–sustaining vegetative cover;" Somewhat limited by cost-share availability

Fall Fertilizer Restrictions

Photo courtesy of Stock.xchng.

Introduction

This section discusses regulations that require fall fertilizer application restrictions. A checklist of elements that should be included in an effective fall fertilizer regulation follows this introductory comparative analysis of the field of state regulations. Each state program is then discussed in more detail, and a table of the regulations concludes this section.

Background on Best Management Practice

Fertilizer containing nitrogen is often applied to fields used for row crops in the fall in an effort to save money and time in the spring. Unfortunately, much of this fertilizer runs off into surface water, leaches into groundwater (causing dangerous nitrate problems in drinking water), and volatilizes into the air. In fact, crops frequently use less than 30% of applied nitrogen fertilizer.[374] Fall fertilizer application restrictions are therefore necessary to limit the amount of nitrogen that reaches waterways.

Most states studied have only enacted restrictions on fall nitrogen application. While phosphorus binds to soil and therefore does not run off as readily as nitrogen, many commercial phosphorus fertilizers also contain forms of nitrogen. For this reason, limiting phosphorus application to soils in fall (as Maryland does) is a prudent approach.

As very few states have adopted enforceable restrictions on fall applications of fertilizer, this section will also examine a handful of technically voluntary recommendations in order to compare elements that could be incorporated into enforceable restrictions.

Regulatory Language

Restrictions on fall fertilizer can simply state that fertilizer should not be applied in the fall (Southeastern Minnesota BMP). South Central Minnesota recommends that fertilizer not be applied until soil is below 50 degrees F (below which temperature nitrifying organisms are no longer as active[375]) but it could be difficult for regulators and farmers to determine when the restriction applies to individual operations. The most easily-applied

restrictions specify calendar dates when fertilizer cannot be applied, basing those dates on defensible local climate conditions. (Nebraska's Central Platte District)

Who Must Comply with Regulation

Restrictions that apply generally to "agricultural operations" are the most effective and fair. (Nebraska). Alternatively, some states require nutrient management plans from operations other than CAFOs (Maryland, Wisconsin) and include restrictions on fall fertilizer application in the list of required elements of those plans.

Exceptions from Regulation

States that otherwise restrict fall application of fertilizer usually allow application for the purpose of establishing a fall-planted crop (Wisconsin, West Virginia, Maryland). Maryland further directs that such fertilizer be applied as close as possible to the timing of plant uptake.

Checklist

Elements of an effective fall fertilizer regulation

- ☐ Apply to all agriculture operations
- ☐ Prohibit applications of commercial nitrogen fertilizer and phosphorus fertilizers that contain nitrogen between specified dates
- ☐ Identify locally-appropriate dates for prohibition based on average soil temperatures
- ☐ Allow fall-seeded crops to be fertilized close to time of planting with fertilizers that are less likely to run off into surface water or leach into groundwater

Existing State Regulations

Maryland

Maryland's fall fertilizer restrictions are unique in that they apply to phosphorus as well as nitrogen fertilizer. As discussed in Part 1, Maryland requires nutrient management plans for all agricultural operations grossing more than $2500 from agriculture or livestock operations consisting of 8 or more animal units.[376] Maryland's nutrient management regulations require that nutrient applications be timed to:

> (1) Be as close to plant nutrient uptake periods as possible;
>
> (2) Maximize plant utilization efficiency and minimize the potential for nutrient movement; and
>
> (3) Be consistent with guidelines contained in the Maryland Nutrient Management Manual, Section I-D.[377]

The Nutrient Management Manual outlines very particular restrictions that apply from September 1 through November 15. Chemical fertilizers are allowed during this time period as "starter fertilizers" for small grains and fall-seeded crops. Manure may be applied as a starter fertilizer for fall-seeded crops if recommended rates and timing are followed (e.g. small grains have a maximum of 40 pounds available nitrogen/acre). Application over this rate may be allowed, however, if necessary to avoid winter application because manure storage is inadequate, so long as fall application does not exceed the next year's phosphorus removal requirements. These applications must be made into existing vegetative cover or planted with a cover crop.[378]

Minnesota

Minnesota's 1989 Comprehensive Groundwater Protection Act established a task force to "study the effects and impact on water resources from nitrogen fertilizer use so that best management practices, a fertilizer management plan and nitrogen fertilizer use regulations can be developed."[379]

Fertilizer containing nitrogen is often applied to fields used for row crops in the fall in an effort to save money and time in the spring. Photo courtesy of Stock.xchng.

The Groundwater Protection Act provides that the Minnesota Department of Agriculture may promulgate enforceable rules called Water Resource Protection Requirements, but to date, no such rules have been adopted. Instead, Minnesota's Nitrogen Fertilizer Management Plan recommends BMPs for nitrogen fertilizer management that are only voluntary.[380] However, since water quality problems caused by nitrogen pollution persist in Minnesota, voluntary measures do not appear to be enough. The BMPs described below could be readily adopted as Water Resource Protection Requirements and made enforceable.

Many of the Nitrogen Fertilizer Management Plan BMPs apply regionally. All nitrogen fertilizer application in the fall is discouraged in Southeastern Minnesota, because the area has high average annual precipitation, permeable soils, and karstic terrain.[381] Several other regional BMPs (South Central, Southwest, West-Central, and Northwest Minnesota) recommend delaying fall application of fertilizer until the soil temperature is below 50 degrees at a six inch depth to minimize nitrification.[382] Any fall application in this area should be anhydrous ammonia or urea.[383]

Some of the BMPs also address fertilizer use in "special situations." In an example relevant to fall application, the BMPs recommend no fertilizer be applied in the fall in areas with coarse-textured soils or areas where soil is irrigated.[384]

Nebraska

Nebraska has 23 Natural Resources Districts that are authorized to create Ground Water Management Areas and establish required BMPs to protect water quality.[385] Nebraska has experienced increasing levels of nitrate in groundwater,[386] so the BMPs generally aim to protect groundwater quality in particular.

Several Ground Water Management Areas have developed fall nitrogen application restrictions linked to different "phases." Phases are areas defined based on the amount of nitrogen already present in groundwater. For example, in Phase I areas in the Lower Platte North Natural Resources District, fall fertilizer is prohibited on non-sandy soils until November 1 and on sandy soils until March 1.[387] In Phase II areas, an additional requirement applies, wherein nitrogen applied to non-sandy soils between November 1 and March 1 must be applied with an inhibitor.[388] In Phase III areas, nitrogen application is prohibited until March 1.[389]

Another example of fall fertilizer protections is the Central Platte Natural Resources District. Fall applications of nitrogen are prohibited on sandy soils in all areas. In Phase I areas, nitrogen application is allowed on heavy soils after November 1 and nitrogen may be applied on sandy soils after March 1. In Phase II areas, nitrogen application is prohibited on all soils until after March 1. In Phase III and Phase IV areas, nitrogen application is prohibited on all soils until after March 1, after which special spring application rules apply.[390]

West Virginia

West Virginia has adopted regulations outlining voluntary BMPs for fertilizers and manures. These BMPs provide that "no person should apply fertilizers containing nitrogen to land that has coarse-textured soils when the application occurs in the fall, unless that application is made to support the growth of a fall cover crop."[391] This regulation is simple and straightforward, and could be effective if it were required rather than voluntary.

Wisconsin

As discussed on pages 30-33, Wisconsin has adopted performance standards that apply to all crop production and livestock production.[392] One of these performance standards requires that commercial fertilizers be applied according to a nutrient management plan.[393] In order to be eligible for cost-share funds, a nutrient management practice must be consistent with the NRCS technical guide nutrient management standard 590, which has been adopted as an appendix to the conservation practice regulations.[394]

For high permeability soils or soils with a high likelihood of leaching to groundwater, nitrogen applications are prohibited in the fall except to establish fall-seeded crops.[395] When application is allowed to establish fall crops, commercial nitrogen rates cannot exceed 30 pounds per acre.[396] On irrigated fields, nitrogen applications must be split or delayed to ensure that nitrogen is applied primarily after crops have already been established or a nitrogen inhibitor must be used.[397]

Fall Fertilizer At a Glance

State	Mandatory/ Voluntary	Requirement	Nitrogen	Phosphorus
Maryland	Mandatory component of nutrient management plans	Nitrogen and phosphorus must be timed as close to plant uptake as possible; Between September 1 - November 15, generally can only be applied to establish fall crops	Yes	Yes
Minnesota: Southeastern Region	Voluntary	All fall application of nitrogen discouraged	Yes	
Minnesota: South Central, Southwest, West-Central and Northwest Regions	Voluntary	Delay fall application of nitrogen until soil is below 50 degrees at six inches deep; use anhydrous ammonia or urea in the fall	Yes	
Nebraska	Mandatory for agricultural operations	Requirements based on areas defined as "Phases:" fall application of nitrogen prohibited on sandy soils and in certain areas until March 1; prohibited on heavy or non-sandy soils until November 1; may be applied in certain areas between November 1 and March 1 if applied with an inhibitor	Yes	
West Virginia	Voluntary	Nitrogen application discouraged on coarse textured soils in fall unless to support a fall crop	Yes	
Wisconsin	Mandatory component of nutrient management plans	Fall application prohibited on high permeability soils or soils with a high likelihood of leaching to groundwater except to establish fall crops	Yes	

Endnotes

[1] *See* U.S. EPA, EPA 841-B-03-004, National Management Measures to Control Nonpoint Source Pollution from Agriculture ch. 1, at 3 (July 2003) [hereinafter Pollution from Agriculture].
[2] *See id.* ch. 2, at 9–27; U.S. EPA, Pharmaceuticals and Personal Care Products: Frequent Questions, http://www.epagov/ppcp/faq.html#sources.
[3] U.S. EPA, EPA 841-B-06-002, Wadeable Streams Assessment: A Collaborative Survey of the Nation's Streams, ES-6 (Dec. 2006) [hereinafter Wadeable Streams Assessment], *available at* http://www.epa.gov/owow/streamsurvey/pdf/WSA_Assessment_May2007.pdf.
[4] Wadeable Streams Assessment ES-6; State-EPA Nutrient Innovations Task Group, An Urgent Call to Action 1 (Aug. 2009) [hereinafter Urgent Call to Action].
[5] U.S. EPA, EPA-822-B-00-002, Nutrient Criteria, Technical Guidance Manual, Rivers and Streams 4 (July 2000) [hereinafter Nutrient Criteria Guidance].
[6] What is Hypoxia?, Hypoxia in the Northern Gulf of Mexico, www.gulfhypoxia.net/overview (last visited Feb. 25, 2010).
[7] U.S.EPA, Science Advisory Board, Hypoxia in the Northern Gulf of Mexico 10 (2008), *available at* http://yosemite.epa.gov/sab/sabproduct.nsf/C3D2F27094E03F90852573B800601D93/$File/EPA-SAB-08-003complete.unsigned.pdf.
[8] *Id.*
[9] National Centers for Coastal Ocean Science, Gulf of Mexico Ecosystems & Hypoxia Assessment (NGOMEX), http://www.cop.noaa.gov/stressors/pollution/current/gomex-factsheet.html (last visited Feb. 25, 2010).
[10] Nat'l Research Council & Comm. on the Miss. River and and the Clean Water Act, Mississippi River Water Quality and the Clean Water Act: Progress, Challenges and Opportunities 45 (2008), http://nap.edu/catalog/12051.html [hereinafter NRC Report] (download free pdf).
[11] Nutrient Criteria Guidance, *supra* note 5, at 4.
[12] *Id.* at 4-5.
[13] *Id.*
[14] Wadeable Streams Assessment, *supra* note 3, at 30.
[15] *Id.* at 35, 36.
[16] U.S. EPA, EPA 841-R-08-001, National Water Quality Inventory: Report to Congress, 2004 Reporting Cycle 16 (Jan. 2009), *available at* http://www.epa.gov/owow/305b/2004report/.
[17] *Id.* at 18.
[18] Urgent Call to Action, *supra* note 4, at 13.
[19] *Id.* at 16.
[20] *Id.*
[21] *Id.* at 17.
[22] *Id.*
[23] *Id.*
[24] *See id.* at 31.
[25] 33 U.S.C. §§ 1342(a)(1), 1362(14) (2006).
[26] *Id.* § 1362(14).
[27] *See* 40 C.F.R. § 122.21(a) (2010).
[28] *Id.* § 122.23(e).
[29] *See* Pollution from Agriculture, *supra* note 1, ch. 2, at 9.
[30] *See* Urgent Call to Action, *supra* note 4, at 31.
[31] 40 C.F.R. §§ 122.21(i)(8)(x), 122.42(e).

[32] Cal. Water Code § 13263(g) (West 2009).
[33] *See*, State Water Res. Control Bd., Cal. EPA, Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program 2 (2004) [hereinafter Implementation Policy] ("All activities and factors that could affect the quality of State waters shall be regulated to attain the highest water quality that is reasonable.").
[34] Cal. Water Code § 13000.
[35] Implementation Policy, *supra* note 33, at 3.
[36] Cal. Water Code § 13320.
[37] *Id.* §§ 13141–13142.
[38] *See* California Basin Plans, http://www.waterplan.water.ca.gov/waterquality/basin_plan.cfm.
[39] Cal. Water Code § 13168; Implementation Policy, *supra* note 33, at 5.
[40] Implementation Policy, *supra* note 33, at 5, 14; Cal. Water Code §§ 13168, 13186.
[41] Implementation Policy, *supra* note 33, at 6.
[42] *Id.* at 4.
[43] Cal. Water Code § 13263(i).
[44] Implementation Policy, *supra* note 33, at 4.
[45] *Id.* at 5.
[46] *Id.*
[47] *Id.*
[48] Implementation Policy, *supra* note 33, at 5.
[49] *Id.* at 6.
[50] *Id.*
[51] *Id.* at 4; Cal. Water Code §§ 13260, 13269 (West 2009).
[52] Implementation Policy, *supra* note 33, at 8; J.M. Gerstein et al., Univ. of Cal. Agric. and Natural Res., Publ'n No. 8203, State and Federal Approach to Control of Nonpoint Sources of Pollution 4 (2005).
[53] Implementation Policy, *supra* note 33, at 4.
[54] *Id.* at 11.
[55] *Id.* at 12.
[56] *Id.* at 11–15.
[57] *Id.* at 8.
[58] *Id.*
[59] *See id.* at 8–11.
[60] *Id.*
[61] *Id.*
[62] *Id.* at 9–10.
[63] *Id.*
[64] State Water Res. Control Bd., Cal. EPA, Water Quality Enforcement Policy 7 (2002), *available at* http://www.swrcb.ca.gov/plans_policies/ [hereinafter Enforcement Policy].
[65] Implementation Policy, *supra* note 33, at 13.
[66] *Id.* at 5.
[67] Cal. Water Code § 13271 (West 2009).
[68] *Id.* § 13267.
[69] Enforcement Policy, *supra* note 64, at 12.
[70] *Id.* at 12.
[71] *Id.* at 12.
[72] *Id.* at 3–4.
[73] *Id.* at 1.

[74] *Id.* at 3–4.
[75] *Id.*
[76] *Id.* at 4.
[77] Cal. Water Code § 13385 (West 2009).
[78] This procedure is similar to the procedure that U.S. EPA uses to determine "significant noncompliance" with pollution limits for these pollutants. *See* Memorandum of U.S. EPA, Revision of NPDES Significant Noncompliance (SNC) Criteria to Address Violations of Non-Monthly Average Limits, Attachment I (Sept. 21, 1995), http://www.epa.gov/compliance/resources/policies/civil/federal/revisnpdessnc.pdf.
[79] Enforcement Policy, *supra* note 64, at 3.
[80] *Id.* at 3.
[81] *Id.* at 4.
[82] *Id.*
[83] *Id.* at 22.
[84] *Id.* at 16.
[85] *Id.* at 3.
[86] *Id.* at 3.
[87] *Id.* at 17–20.
[88] *Id.* at 20.
[89] *Id.*
[90] *Id.* at 20-23.
[91] *Id.* at 47–48.
[92] Cal. Water Code § 13385 (West 2009).
[93] Enforcement Policy, *supra* note 64, at 23.
[94] *Id.* at 23.
[95] *Id.*
[96] Cal. Water Code § 13328.
[97] Enforcement Policy, *supra* note 64, at 24–25.
[98] Enforcement Policy, *supra* note 64, at 25.
[99] *Id.* at 25–26.
[100] Del. Code tit. 3, § 2247(a) (2010).
[101] *Id.* § 2247(a).
[102] *Id.* § 2247(b).
[103] *Id.*
[104] *Id.* § 2247(d).
[105] *Id.*
[106] *Id.*§ 2247(j).
[107] *Id.*
[108] *Id.* § 2241.
[109] Nutrient Mgmt., Del. Dep't of Agric., DOC. NO. 65-01-25/05/05/04, Who Can Develop My Nutrient Plan? (2005).
[110] *Id.*
[111] Del. Code tit. 3, § 2290(b).
[112] 2008 Del. Nutrient Mgmt. Comm'n Ann. Rep. 3 (2009) [hereinafter Annual Report 2008], *available at* http://www.dda.delaware.gov/nutrients/forms/2008/NM_2008%20Annual%20Report%20-%20Final.pdf.
[113] *Id.* at 4.
[114] Del. Code tit 3, § 2261.

[115] 2008 Annual Report, *supra* note 112, at 2.
[116] Del. Code tit 3. § 2280(a).
[117] *Id.* § 2280(a)(1).
[118] *Id.*
[119] *Id.* § 2280(a)(2).
[120] *Id.* § 2281.
[121] *Id.* § 2281(1).
[122] *Id.* § 2281(2), (3).
[123] 2008 Annual Report, *supra* note 112, at 3.
[124] Iowa Code § 161A.44 (2010).
[125] U. S. Department of Agriculture, Natural Res. Conservation Service, National Soil Survey Handbook, 618.63(a) (2009).
[126] Iowa Code § 161A.44(3)(a).
[127] *Id.* §§ 161A.45–46.
[128] *Id.* § 161A.44.
[129] *Id.* § 161A.47.
[130] *Id.* § 161A.62.
[131] *Id.* § 161A.51.
[132] *Id.* § 161A.47.
[133] *Id.*
[134] *Id.* § 161A.49.
[135] *Id.* § 161A.61(1)(a).
[136] *Id.* § 161A.61(1)(b).
[137] *Id.* § 161A.61(2).
[138] *Id.* § 161A.48 (1); *see also* Iowa Code § 161.74 (1)(a).
[139] Iowa Code § 161A.48 (3).
[140] Iowa Code § 161.61(3).
[141] Ky. Rev. Stat. Ann. § 224.71-110 (West 2009).
[142] Agric. Water Quality Auth., The Kentucky Agriculture Water Quality Plan, (2008), *available at* http://www.conservation.ky.gov/NR/rdonlyres/56757AE1-3752-443F-88AF-A0E8DAFA4AFD/0/KAWQPlanRevised2008.doc.
[143] Ky. Rev. Stat. Ann. § 224.71-110(4)(e).
[144] *Id.* § 224.71-120(5).
[145] *Id.* § 224.71-120(6).
[146] *Id.* §§ 224.71-100(1), 71-120(3), (7).
[147] Ky. Rev. Stat. Ann. § 224.71-120(8) (West 2009).
[148] *Id.* §§ 224.71-110(4)(f), 71-120 (3), 71-130(2).
[149] *Id.* § 224.71-120(3).
[150] *Id.* § 224.71-120(3), (9).
[151] *Id.* § 224.71-130.
[152] *Id.* § 224.71-130(1).
[153] *Id.*
[154] *Id.* § 224.71-130(1)(c).
[155] *Id.* § 224.71-100(2).
[156] *Id.* § 224.71-130(2).
[157] *Id.* § 224.99-020.

[158] *Id.* § 224.99-010(8).
[159] *Id.* § 224.71-130(3).
[160] John H. Davidson, Conservation Plans in Agriculture, 31 Envtl. L. Rep. 10,501 (2001).
[161] Md. Code Ann., Agric. § 8-803.1(b), (e), (f) (West 2009).
[162] *Id.* §8-801(c).
[163] *Id.* § 8-801.1; Md. Code Regs. 15.20.07.05(A)(3), (B) (2010).
[164] Md. Code Regs. 15.20.07.05(D).
[165] Md. Code Ann., Agric § 8-803.1(d); 2009 Md. Agric. Water Quality Cost-Share Program Ann. Rep. 10, *available at* http://www.mda.state.md.us/pdf/macsar09.pdf.
[166] 2009 Md. Agric. Water Quality Cost-Share Program Ann. Rep. 10; 2008 Md. Agric. Water Quality Cost-Share Program Ann. Rep. 9, *available at* http://www.mda.state.md.us/pdf/macsar08.pdf; 2007 Md. Agric. Water Quality Cost-Share Program Ann. Rep. 7, *available at* http://www.mda.state.md.us/pdf/macsar07.pdf.
[167] Univ. of Md. Extension, http://anmp.umd.edu/Bkgrnd/History.html (last visited Feb. 25, 2010).
[168] Md. Code Ann., Agric. § 8-803.1(f).
[169] *Id.* § 8-801.1(b)(1); Md. Code Regs. 15.20.07.06(A)(3).
[170] Md. Code Regs. 15.20.07.06(A)(3).
[171] Md. Code Ann., Agric. § 8-802 (a).
[172] *Id.* § 8-803(a), (b).
[173] *Id.* § 8-803 (g).
[174] *Id.* § 8-803.2.
[175] *Id.* § 8-803.3.
[176] *Id.* § 8-803.4.
[177] *Id.* § 8-803.1(k).
[178] *See* Md. Dep't of Agric., 2009 Md. Nutrient Mgmt Program: Ann. Rep., *available at* http://www.mda.state.md.us/pdf/nmar09.pdf; 2008 Md. Nutrient Mgmt Program: Ann. Rep., *available at* http://www.mda.state.md.us/pdf/nmar08.pdf; 2007 Md. Nutrient Mgmt Program: Ann. Rep., *available at* http://www.mda.state.md.us/pdf/nmar07.pdf.
[179] 2009 Md. Nutrient Mgmt Program: Ann. Rep. 3.
[180] *Id.* at 3.
[181] *Id.*
[182] *Id.* at 4.
[183] *Id.*
[184] Md. Code Ann., Agric. § 8-803.1(h) (1) (West 2009).
[185] *Id.* § 8-803.1(h)(2).
[186] *Id.* § 8-803.1(i)(1)(i).
[187] *Id.* § 8-803.1(i)(1).
[188] *Id.* § 8-803.1(i)(3).
[189] *Id.* § 8-803.1(i)(2)(i).
[190] *Id.* § 8-803.1(j).
[191] *Id.* § 8-805.
[192] *Id.* § 8-802 (d).
[193] Or. Rev. Stat. §§ 568.900-933 (2007).
[194] *Id.* § 568.909(1).
[195] *Id.* § 568.909(1)(a).
[196] *See* Area Plans and Rules, http://www.oregon.gov/ODA/NRD/water_agplans.shtml (last visited Feb. 25).
[197] Or. Rev. Stat. § 568.909 (2) (2007).

[198] *Id.*
[199] Or. Admin. R. 603-090-0020 (2009).
[200] *Id.* at 603-090-0030(1).
[201] *Id.*
[202] Or. Rev. Stat. §§ 568.903, 912.
[203] *Id.* § 568.900(2).
[204] *Id.* § 568.912(1).
[205] *See* Or. Admin. R. 603-095-0100 to -3960 (2009).
[206] *Id.* at 603-095-1640(6)(a).
[207] Or. Rev. Stat. § 568.915.
[208] *Id.* § 568.915(1).
[209] *Id.* § 568.918.
[210] *Id.* § 568.933(3), (4).
[211] *Id.* § 568.933(6).
[212] Wis. Admin. Code NR § 151.01 (2010).
[213] Wis. DNR, Performance Standards and Prohibitions, http://www.dnr.state.wi.us/Runoff/ag/perfstds.htm.
[214] Wis. Admin. Code ATCP § 50.02 ANNOT.
[215] *See*, e.g., Wis. Admin. Code ATCP § 50.04 (3).
[216] Wis. Admin. Code NR §§ 151.09(3)(d), 095(4)(d).
[217] *Id.* §§151.09(3)(b), 095(4)(b).
[218] *Id.* §§ 151.09(3)(c)(2), 095(4)(c)(2).
[219] *Id.* §§ 151.09(3)(c)(1), 09(4)(d)(2), 095(4)(c)(1), 095(5)(d)(2).
[220] *Id.* §§ 151.09(4)(d)(2)(c), 09(5)(d)(2)(c).
[221] 2007 Wis. Land and Water Conservation Ann. Progress Rep., *available at* http://dnr.wi.gov/runoff/pdf/2007 AnnualProgressReport.pdf.
[222] Wis. DNR, Implementation Strategy for NR 151—Agricultural Nonpoint Performance Standards and Prohibitions 3 (2003) [hereinafter Implementation Strategy], *available at* http://dnr.wi.gov/runoff/pdf/ag/ strategy151.pdf.
[223] 2008 Wis. Land and Water Conservation Ann. Progress Rep. 11, *available at* http://dnr.wi.gov/runoff/pdf/2008 AnnualProgressReport.pdf.
[224] *Id.*
[225] Implementation Strategy, *supra* note 223, at 4.
[226] 2008 Wis. Land and Water Conservation Ann. Progress Rep. 11.
[227] Implementation Strategy, *supra* note 223, at 4.
[228] *Id.*
[229] *Id.*
[230] *Id.* at 5.
[231] *Id.* at 4–5.
[232] Wis. Admin. Code ATCP § 50.16(a) (2010); Implementation Strategy, *supra* note 223, at 6.
[233] *Id.* § 50.15(b).
[234] *Id.* § 50.18.
[235] Wis. Admin. Code NR § 151.09(8)(a), 095(9)(a).
[236] Implementation and Strategy, *supra* note 223, 5-6.
[237] *Id.*
[238] *Id.*
[239] Wis. Admin. Code NR § 151.09(7); Wis. Stat. § 281.98 (2009).

[240] 2008 Wis. Land and Water Conservation Ann. Progress Rep. at 10.
[241] *Id.*
[242] Note: Georgia has enacted a stream buffer rule within its land use regulations, but unfortunately has exempted agriculture and forestry from the requirement. The regulations state that perennial river corridors shall be protected by a 100-foot natural vegetative buffer that shall be maintained on either side of the stream. Ga. Code Ann. §§ 12-2-8 (g)(1)(A), (g)(2)(D) (2009).
[243] 15A N.C. Admin. Code 2B.0233(3) (2010).
[244] *Id.* at 2B.0243(3).
[245] 15A N.C. Admin. Code 2B.0233(3), 0243(3) (2010).
[246] *Id.* at 2B.0233(3)(b), 0243(3)(a).
[247] *Id.* at 2B.0233(4)(a), 0243(4)(a).
[248] *Id.*
[249] *Id.* at 2B.0233(4)(b), 0243(4)(b).
[250] *Id.* at 2B.0233(7), 0243(7).
[251] *Id.* at 2B.0233(7), 0233(8), 0243(7), 0243(8).
[252] *Id.* at 2B.0233(6), 0243(6).
[253] *Id.*
[254] *Id.* at 2B.0233(6).
[255] N.C. Dep't of Env't and Natural Res., Goose Creek Watershed: Water Quality Management Plan, http://h2o.enr.state.nc.us/csu/documents/GooseCreek_Facts_Sheet_june09.pdf (last visited Feb. 26, 2010).
[256] 15A N.C. Admin. Code 2B.0605.
[257] *Id.* at 2B.0607(b).
[258] *Id.* at 2B.0607(d).
[259] *Id.* at 2B.0607(l).
[260] *Id.* at 2B.0233(9), 0243(9).
[261] N.C. Gen. Stat. § 143-214.20 (2009).
[262] *Id.* § 143-214.20(a).
[263] *Id.* § 143-214.20(a)(1)-(4).
[264] Minn. R. 6120.2500 Subpart 13 (2009); Minn. Stat. § 103G.005 Subdivision 15(a) (2009).
[265] Minn. R. 7020.0300 Subpart 21.
[266] Minn. R. 6120.3300 Subpart 7(A), (B).
[267] *Id.* 6120.3300 Subpart 7(D).
[268] Minn. R. 7020.2000 Subpart 1.
[269] *Id.* 7020.2225 Subpart 6(B). Special protection areas are defined as lands within 300 feet of waters and wetlands identified as protected by Minnesota DNR and "intermittent streams and ditches identified on United States Geological Survey quadrangle maps, excluding drainage ditches with berms and segments of intermittent streams which are grassed waterways." Minn. R 7020.0300 Subpart 23.
[270] Minn. R. 7020.2225 Subpart 6 (B).
[271] *Id.*
[272] *See* 40 C.F.R. § 412.4(c)(5) (2010).
[273] Ala. Admin. Code r. 335-6-7-.26(2)(c) (2009).
[274] *Id.*
[275] *Id.*
[276] 014-04 Ark. Code R. 005.406(D) (2010).
[277] *Id.*
[278] *Id.*

[279] 5 Colo. Code Regs. § 1002-81.2 (2010).
[280] *Id.* § 1002-81.6(2)(d).
[281] *Id.* § 1002-81.6(2)(d)(i).
[282] *Id.* § 1002-81.6(2)(d)(ii).
[283] Ga. Comp. R. & Regs. 40-13-8-.06(4)(a), (b).
[284] *Id.* at 40-13-8-.06(4)(a).
[285] *Id.* at 40-13-8-.06(4)(d).
[286] 510 Ill. Comp. Stat. 77/20(b)–(d) (2010).
[287] *Id.* at 77/20 (f)(6).
[288] *Id.*
[289] *Id.*
[290] Iowa Code § 459.314(2) (2008); 567 Iowa Admin. Code r. 65.3(3)(g) (2010).
[291] 567 Iowa Admin. Code r. 65.1(455B).
[292] *Id.*
[293] Iowa Code § 459.314(2)(b).
[294] *Id.*
[295] *Id.* § 459.314 (2) (a).
[296] Me. Rev. Stat. Ann. tit. 7, § 4204(2) (West 2009).
[297] 01-001-565 Me. Code R. § 6 (1)(B) (2010).
[298] *Id.* § 6 (1)(B)(2).
[299] *Id.* § 6 (1)(B)(3).
[300] Minn. R. 7020.2000 Subpart 1 (2009).
[301] *Id.* at 7020.2225 Subpart 8(A).
[302] N.J. Admin. Code § 2:76-2A.3(a) (2010).
[303] *Id.* § 2:76-2A.3 (d) (2).
[304] *Id.*
[305] *Id.*
[306] *Id.*
[307] 3 Pa. Cons. Stat. §§ 503, 506(a), 507 (a) (2009).
[308] *Id.* § 507 (a).
[309] *Id.* § 507 (b).
[310] *Id.* § 507 (a).
[311] *Id.*
[312] 020-080-020 Wyo. Code. R. § 36(c) (2010).
[313] *Id.* §§ 37(d)(iii), 38(e)(iii), 39(a)(ii).
[314] *Id.* §§ 37 (d)(iii), 38 (e)(iii).
[315] 5 Colo. Code. Regs. § 1002-81.6(2)(b)(i)(C) (2010).
[316] Del. Code. Ann. tit. 3, §§ 2201–2290 (2010).
[317] 3 Del. Adm. C. § 1201(6.1).
[318] 3-1200-1201 Del. Code Regs. §§ 6.2.2-6.2.3 (2010).
[319] *Id.* at § 3.0.
[320] Press Release, Del. Dep't of Agric., Attention Nutrient Handlers: Winter application of fertilizer and manure is regulated in Delaware (Dec. 4, 2008), http://dda.delaware.gov/pressrel/2008/120408_NMWinterRegs.pdf.
[321] 510 Ill. Comp. Stat. 77/20(b)-(d) (2010); Ill. Admin. Code tit. 8, § 900.801 (2010).
[322] 510 Ill. Comp. State. 77/20(f)(9); Ill. Admin. Code tit. 8, § 900.803(s).
[323] 327 Ind. Admin. Code 16-2-5 (2009).

[324] *Id.* at 16-10-3(f)(3).
[325] *Id.* at 16-10-3(f)(1).
[326] *Id.* at 16-10-3(f)(2).
[327] Act Regulating Animal Feeding Operations et seq., 2009 Iowa Legis. Serv. Ch. 155 (S.F. 432) (West).
[328] Iowa Code § 459.313A(1) (2010), as enrolled in SB 432.
[329] Iowa Code § 459.313A(1)(a)–(d).
[330] Iowa Code § 459.313A(2), as enrolled in SB 432.
[331] Iowa Code § 459.313A(3)(b), as enrolled in SB 432.
[332] Iowa Code § 459.313B, as enrolled in SB 432.
[333] Iowa Code § 459.313A(3)(a), as enrolled in SB 432; Iowa Code § 459.102(44).
[334] Kan. Stat. Ann. § 65-1,182(a) (2009).
[335] *Id.* § 65-1,182(f)(3)(C).
[336] Me. Rev. Stat. Ann. tit. 7, § 4207 (West 2009).
[337] *Id.* § 4209.
[338] Md. Code Ann., Agric. § 8-803.1(b), (e), (f) (West 2009) and *see* discussion *supra* p. 23-26.
[339] Dep't of Agric., Timing of Nutrient Application, http://www.mda.state.md.us/resource_conservation/nutrient_management/manual/timing_of_nutrient_application.php (last visited Feb. 26, 2010).
[340] *Id.* (emphasis added).
[341] *Id.*
[342] Minn. R. 7020.2000, 7020.0300 Subpart 3 (2009).
[343] Minn. R. 7020.2225 Subpart 6.
[344] *Id.* 7020.0300 Subpart 23.
[345] Tenn. Comp. R. & Regs. 1200-4-5.14(7)(l)(2), (16)(e) (2010).
[346] *Id.* 1200-4-5.14 app. A.
[347] 20-010-008 Vt. Code R. § 4.03 (d) (2010).
[348] 20-010-008 Vt. Code R. Introduction (iv); *see* also Vt. Stat. Ann. tit. 6, § 4812 (2010), 28-010-008 Vt. Code R. § 5.01.
[349] 020-080-020 Wyo. Code R. §§ 37(e)(ii), 38(f)(ii) (2010).
[350] 40 C.F.R. § 122.42(e)(iv) (2010).
[351] 5 Colo. Code Regs. § 1002-81.6(2)(f) (2010).
[352] *Id.* at § 1002-80.0.
[353] Colo. Rev. Stat. § 25-8-605 (2009).
[354] *Id.* at § 25-8-607.
[355] *Id.* at § 25-8-608.
[356] *Supra* p. 21-22.
[357] University of Kentucky College of Agriculture, Limiting Access to Streams by Fencing with Alternative Water Systems or Limited Access Points, *available at* http://warehouse.ca.uky.edu/AWQP2000/BMPs/Livestock/LBMP4.htm.
[358] Ky. Rev. Stat. Ann. § 224.71-100 (2) (LexisNexis 2010).
[359] *See supra* p. 21-22.
[360] Minn. R. 7020.2015 Subpart 1 (2009).
[361] *Id.* 7020.2015 Subpart 2.
[362] *Id.* 7020.0300 Subpart 3.
[363] *Id.* 7020.0300 Subpart18.
[364] N.J Admin. Code § 2:91-3.1(a) (2010).
[365] *Id.* 2:91, app. "Best Management Practices for Livestock Grazing Management" (a).

[366] *Id.* 2:91, app. "Best Management Practices for Livestock Grazing Management" (b).
[367] *Id.* 2:91-4.1(a).
[368] *Id.* 2:91-4.1(a)(2).
[369] *Id.* 2:91-4.1(i).
[370] Wis. Admin. Code NR § 151.08 (5) (2010).
[371] Wis. Stat. § 281.16 (1) (c).
[372] Wis. Admin. Code ATCP § 51.20 (7) (2010).
[373] Wis. Admin. Code NR §§ 151.095 (4) (c)(1), (5)(d)(2).
[374] Urgent Call to Action, *supra* note 4, at 17.
[375] Iowa State Univ. Extension, *Remember 50 Degrees F*, (Iowa State Univ. Extension News, Ames, IA), Oct. 4, 2005, *available at* http://www.extension.iastate.edu/news/2005/oct/070401.htm.
[376] *Supra* pp. 23-26.
[377] Md. Code Regs. 15.20.08 (H) (2010).
[378] Maryland Department of Agriculture, *Timing of Nutrient Application*, http://www.mda.state.md.us/resource_conservation/nutrient_management/manual/timing_of_nutrient_application.php.
[379] Comprehensive Groundwater Protection Act of 1989, 1989 Minn. Chapter Law 326 § 33 Subdiv. 1 (3).
[380] Minnesota Nitrogen Fertilizer Task Force Recommendations, Chapter 3, *available at* http://www.mda.state.mn.us/chemicals/fertilizers/nitrogen-task-force-recommend.aspx [hereinafter Task Force Recommendations].
[381] Task Force Recommendations at 4.5.1.
[382] Task Force Recommendations at 4.6.2, 4.7.3, 4.9.2.
[383] Task Force Recommendations at 4.6.2, 4.7.2, 4.9.2.
[384] Task Force Recommendations at 4.10.1.
[385] Neb. Rev. Stat. Ann. §§ 46-712 (a), 46-739 (1) (g) (2009).
[386] Neb. Rev. Stat. Ann. § 46-704.
[387] *See* Lower Platte North Natural Resources District, Groundwater Quality Rules and Regulations, *available at* http://www.lpnnrd.org/projects/water/gwma/gw_quality.html.
[388] *Id.*
[389] *Id.*
[390] Central Platte Natural Resource District, Groundwater Quality Management Requirements, *available at* http://www.cpnrd.org/GWM%20Rules&Regs.pdf.
[391] W. Va. Code R. § 61-22B-4.2 (2010).
[392] Wis. Admin. Code NR § 151.01 (2010).
[393] *Id.* § 151.07.
[394] Wis. Admin. Code ATCP § 50.78.
[395] *Id.* § 50 Appendix D (B) (1) (a).
[396] *Id.*
[397] *Id.* §50 Appendix D (B) (1) (b).

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