



# Urban Fertilizers & the Chesapeake Bay

An Opportunity for  
Major Pollution Reduction





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# Executive Summary

For more than 26 years, states in the Chesapeake Bay region have attempted to clean up the Bay, but it continues to choke on a lethal overdose of pollution. In order to achieve a clean, sustainable Bay, states in the Bay watershed will have to reduce nitrogen levels in Bay waters another 30 percent and reduce phosphorus by an additional 8 percent—in spite of a projected population increase of 30 percent by the year 2030. Reductions of that magnitude will only be possible if governments target all the watershed’s sources of nutrient pollution.

Excess nitrogen and phosphorus, along with sediment, is a leading cause of recurring poor water quality in the Bay and the waters that feed it. About 30 percent of the Bay’s phosphorus load comes from urban and suburban runoff. Those same developed lands account for 10 percent of the nitrogen-tainted runoff. Yet not nearly enough has

been done to reduce nutrient runoff from developed lands.

While Maryland regulators are requiring farmers to do better at controlling nutrient-laden runoff from their fields, the state is mostly ignoring the watershed’s dominant crop: grass. Throughout the Bay watershed, nearly 3.8 million acres are now planted in turf grass, and the acreage is growing as residential development expands and replaces farm fields. Turf grass is Maryland’s biggest crop by far, with as much as 1.3 million acres planted in grass statewide. That compares with 1.5 million acres planted for all other crops in Maryland in 2009. Yet it is the least regulated of the state’s major crops.

Turf grass becomes a pollution problem when it is covered with too much fertilizer, which contains nitrogen and phosphorus. The nutrients in fertilizer can help maintain healthy lawns, but in excess they

can wash into nearby waters when it rains or snows. Excess fertilizer nutrients can also seep directly into groundwater. Whether the fertilizer is organic or chemical, its nutrients can harm the Bay and local waterways.

Tracking fertilizer use on developed land is such a low priority that the state doesn't keep statistics on it, but Maryland Department of Agriculture records show "non-farm use" fertilizer sales are quickly catching up to farm fertilizer sales. The best estimates suggest that Maryland landowners apply at least 86 million pounds of nitrogen fertilizer to state lawns every year.

This fertilizer makes its way into rivers and the Bay. In one suburban Baltimore watershed, researchers found 56 percent of the nutrients in a local stream came from lawn fertilizer. Scientists in Texas, Wisconsin, Minnesota, Connecticut and Canada have also confirmed that pollutants in lawn fertilizer can significantly harm surface water quality.

Other states have taken action to address this important, fast-growing pollution source. Minnesota was the first state to ban phosphorus in lawn fertilizer beginning in 2002. A follow-up survey found this is one method of reducing nutrient pollution that was popular with consumers and cost nothing.

Because phosphorus can build up to high levels in soils, Minnesota officials think there will be a lag until about 2012 before they see improved water quality as a result of the ban. But in Ann Arbor, Michigan, a similar ban produced quicker results. Within a year of enacting the citywide ban, phosphorus levels in the nearby Huron River dropped an average of 28 percent.

Other states, including New York and New Jersey, have recently banned phosphorus in lawn fertilizer, imposed buffer zones around water bodies, and taken other steps to limit fertilizer runoff from lawns.

Maryland's law on fertilizer usage is weak. It requires the 700 lawn care companies and other businesses that fertilize 10 acres or more of "non-farm land" to follow University of Maryland Cooperative Extension Service guidelines on fertilizer use and to submit annual reports to the Maryland Department of Agriculture. The state reviews less than 10 percent of these reports each year. State reviewers routinely find that roughly one-fourth of the companies fail to take basic steps to minimize fertilizer use, such as testing the soil to find out whether additional fertilizer is needed. The maximum fine for violating the state lawn fertilizer regulations is \$1,000. But

in 2009 the state collected only one \$250 fine. Despite the state Agriculture Secretary's pledge to make enforcement of nutrient management regulations a high priority, in 2010 the state again collected only one fine.

Though they are not impacted directly by existing laws, homeowners can play a critical role in reducing urban fertilizer pollution. Maryland does very little to teach consumers about the environmental harm done by over-fertilizing lawns, or to demonstrate Bay-safe fertilizing strategies. The state Extension Service literature on the subject is confusing and contradictory, and its only outreach effort is through the state's volunteer Master Gardeners.

Reducing urban fertilizer pollution means both limiting the nutrients in the fertilizer itself and ensuring applicators put less fertilizer on the ground. The following low-cost policies would help achieve both goals:

- Rewrite the existing guidelines that dictate how and when

professionals apply fertilizer such that the guidelines are aligned with statewide water quality restoration goals for the Chesapeake Bay and its tributaries

- Ban phosphorus from all fertilizers, organic and synthetic, intended for use on established turf grass
- Require a science-based upper limit on the amount of nitrogen in all fertilizers intended for use on established lawns, and require that at least a fifth of the nitrogen be "slow-release," which leads to less runoff
- Provide adequate funding so the state can enforce fertilizer usage by professional applicators as well as fertilizer manufacturers and distributors
- Prohibit application of fertilizer in specific situations that would facilitate runoff, such as applying when the ground is frozen or when rainfall is expected

# A Polluted Bay

The Chesapeake Bay is the nation's largest estuary and perhaps its most critically endangered. It has been more than 26 years since the Chesapeake Bay Agreement created a regionwide partnership "to improve and protect the water quality and living resources of the Chesapeake Bay." Yet the federal government describes Bay water quality as "poor" or "very poor."<sup>1</sup> The most recent water quality assessment, which covers the years 2007 to 2009, found that only 12 percent of the Bay and its tidal waters contained enough dissolved oxygen to meet the minimum standards of the federal Clean Water Act. In the rest of the Bay, oxygen levels are too low for most forms of aquatic life to survive.<sup>2</sup>

The Bay is choking on a lethal overdose of pollution—a toxic stew of human-made chemicals and some natural substances produced far in excess of nature's balance. The two principal culprits are the

elements nitrogen and phosphorus, nutrients essential for all plant and animal growth. But when the land receives more of these nutrients than it needs, and even more than it can absorb, most of the excess ends up in the nearest water body.

Grassy urban areas like residential lawns or golf courses become part of the problem when they are treated with excess fertilizer, which contains nitrogen and phosphorus. The nutrients in fertilizer can help maintain healthy lawns, but in excess they can wash into nearby waters when it rains or snows. Excess fertilizer nutrients can also seep directly into groundwater. Whether the fertilizer is organic or chemical, the nutrients in it can have the same damaging effect on the Bay and local waterways.

Once that excess nitrogen and phosphorus reaches the Bay, it fuels runaway algae growth. The algae clouds Bay waters, cutting off the

sunlight that underwater grasses need to survive. The algae eventually die and are decomposed by bacteria, which consume oxygen as they break down the algae. When the natural system gets so out of balance that this algal bloom-and-decay process dominates the environment, large underwater areas become oxygen-starved “dead zones.” Bay creatures flee from these zones if they can or die of suffocation.

As a result of excess nutrient pollution, the Chesapeake Bay has lost about 90 percent of the grass beds that once carpeted a half-million acres or more of its bottom. More than 80 percent of the Bay and its tidal tributaries are zones of either low oxygen or no oxygen.<sup>3</sup> Bay waters are plagued by “mahogany tides” and other harmful alga blooms; seafood harvests have plummeted; Maryland watermen are leaving the Bay for jobs on land;



*Macroalgae bloom that washed up onto the Oxford beach along the Tred Avon River in Maryland. Credit: Emily Nauman, flickr.com*

and the Chesapeake traditions that have shaped Maryland’s identity as the “Land of Pleasant Living” are in danger of disappearing.

# How Can Fertilizer be a Pollutant?

**N**itrogen and phosphorus are abundant natural elements, and all green plants need both of them. While individual plants' needs vary, most plants need more nitrogen than phosphorus. Both elements are naturally present in most soils. Over time plants can use up the available elements and soils can become nitrogen- or phosphorus-depleted. This is why farmers, landscaping companies and homeowners apply fertilizers to crops, gardens and lawns.

Most fertilizers contain a blend of nitrogen, phosphorus, and other trace elements that benefit plants. The ratios of those beneficial elements vary with the type of fertilizer used. Chicken manure, an organic fertilizer widely used on farmland in the Eastern Shore, is high in phosphorus. Most fertilizers manufactured for home use

are formulated to contain two to six times as much nitrogen as phosphorus.<sup>4</sup>

Nitrogen is highly mobile. If the soil contains more nitrogen than plants can use, the excess quickly evaporates into the air or is washed by rainfall into the nearest water body. Phosphorus, a mineral, remains in most soils up to a point. But when phosphorus levels exceed the soils' capacity to contain it, rainfall washes the excess into the nearest stream or storm sewer, which funnels it into the Bay. This process can continue for years even if no more phosphorus is applied to the land.<sup>5</sup>

People who live in urban or suburban areas equipped with storm sewers should not be misled by the phrase "storm sewer." While sanitary wastewater is piped to

sewage treatment plants, with rare exceptions our region's stormwater runoff is not treated to remove pollutants.

It's more accurate to think of storm sewers as streams confined within pipes. Scientists at the



*Area of low oxygen.* Credit: Alan Liefing, flickr.com

Baltimore Ecosystem Study have found that these streams-within-pipes have their own biological processes that use up small amounts of nitrogen and phosphorus. But the plants and animals in natural streams have more opportunities to filter out pollutants.<sup>6</sup> Unlike streams, with their natural meanders and pools, the stormwater system is designed to quickly carry away large amounts of water. So after heavy rains, stormwater outfalls can deliver large doses of fertilizer-laden runoff directly to the Bay.

Once they reach waterways, nitrogen and phosphorus behave slightly differently. In most cases overdoses of phosphorus trigger algae blooms in fresh waters such as urban and suburban streams and rivers. Scientists think excess nitrogen is the element responsible for most of the runaway algae growth in the Bay's brackish and salt waters.<sup>7</sup>

# Bay Cleanup So Far

It has been nearly three decades since the Bay states' elected leaders responded to citizens' demands to clean up the Bay and vowed tough, comprehensive action to roll back nutrient pollution. In December 1984 the governors of Maryland and Virginia and the mayor of the District of Columbia joined the U.S. Environmental

Protection Agency to create the Chesapeake Bay Program, which is charged with coordinating the multi-state clean-up effort. The Chesapeake Bay Program and regional states set ambitious goals for reducing nutrient pollution.

But after 26 years, the nutrient reduction goals have yet to be



*Sailboat on the Bay.* Credit: David Preston, flickr.com

met. In order to achieve a clean, sustainable Chesapeake Bay, states will have to reduce nitrogen levels another 30 percent and reduce phosphorus by an additional 8 percent—in spite of a projected population increase of 30 percent by the year 2030.<sup>8</sup> Reductions of that magnitude will only be possible if governments target all the known sources of nutrient pollution in the watershed.

Regulators' strategy to date has concentrated on so-called "low hanging fruit." These are discreet sources of pollution that can be linked to an outfall pipe and a discharge permit, such as sewage treatment plants, industrial pipes, or large agribusiness operations. Until recently, they have taken little action against most other sources of pollution, most importantly the swaths of paved urban surfaces, farm fields, and grassy areas like lawns or golf courses.

Though this limited approach ultimately will not restore the Bay, it is showing results. For instance, an overhaul of the region's largest sewage plant has been effective.

The Bay Program estimates that those improvements, along with upgrades at other sewage treatment plants, have cut phosphorus pollution from sewage by two-thirds and nitrogen pollution by nearly half.<sup>9</sup>

We will not restore the Bay until we deal with pollution from urban and suburban areas. According to the Bay Program, 31 percent of the Bay's phosphorus load comes from urban and suburban runoff, while those same developed lands account for 10 percent of the nitrogen-tainted runoff.<sup>10</sup> And as a 2009 federal report on Chesapeake Bay water quality pointed out, "runoff from urban and suburban lands is the (only) one of the sources of pollution that is increasing."<sup>11</sup> And it will continue to increase as the Bay watershed's population grows.

In 1985 developed lands accounted for less than 10 percent of the Bay's nitrogen pollution, according to Bay Program estimates. By 2008 it had grown to 14 percent. The Bay Program's goals anticipate that urban and suburban areas' share of the Bay pollution load will stay at about that level.<sup>12</sup>

# Maryland's Biggest Crop: Turf Grass

When talking about developed urban and suburban land, it may be natural to imagine strip malls, high ways, and other paved areas. But it is inaccurate to think of developed land as entirely covered by concrete and other hard surfaces. In fact, urban and suburban areas are extensively planted in a dominant, heavily fertilized crop: turf grass. And the amount of land devoted to turf grass is expanding rapidly as suburbs consume farmland and forests.



*Lawn Sprinkler.* Credit: Robert S. Donovan, flickr.com

In the late 1990s the turf grass industry estimated that throughout the entire Bay watershed, just over 3 million acres were planted in turf grass. By 2004-2005, the estimate had climbed to nearly 3.8 million acres, according to a study by the Chesapeake Stormwater Network.<sup>13</sup>

The increase in turf grass is linked to residential development. The counties with the greatest amount of turf grass are all suburban jurisdictions surrounding major metropolitan centers, such as the District of Columbia; Baltimore, Maryland; Harrisburg, Pennsylvania; and Richmond and Norfolk, Virginia. Three counties (Fairfax, VA, and Montgomery and Howard, MD) were found to have more than 40 percent of their land area covered by turf grass.<sup>14</sup>

The Chesapeake Stormwater Network found in 2010 that within the Bay watershed there are an

estimated 6.1 million ‘turf grass farmers’ growing grass for lawns, parks, playing fields, road swales and so on. These grass farmers “currently spend nearly \$5 billion a year (including more than \$600 million expended alone for fertilizers and chemicals).”<sup>15</sup>

Turf grass is Maryland’s single biggest crop by far. Estimates of the amount of Maryland’s land that is planted in grass vary, from a low of about 990,000 acres<sup>16</sup> to a high of 1.3 million.<sup>17</sup> According to the Chesapeake Stormwater Network, about 23 percent of Maryland’s land within the Chesapeake Bay watershed is planted in grass.<sup>18</sup> In 2009 Maryland’s next-largest crop, corn, occupied about 460,000 acres, while all row crops covered 1.5 million acres, according to the USDA.<sup>19,20</sup>

There is a crucial difference between turf grass and all other crops. In Maryland, farmers growing corn, soybeans, or vegetables are required to prepare nutrient management plans that show how they will minimize fertilizer runoff from their land. Their nutrient management plans must be filed with the state Department of Agriculture, which is responsible for ensuring compliance.

Most grass growers have no such requirement. Homeowners who “grow their own” green lawns may

apply any amount of fertilizer they choose, regardless of how much nitrogen and phosphorus is present in the soil.

As far back as 1996, the Chesapeake Bay Program recognized the importance of controlling fertilizer runoff from urban and suburban lawns and other grassy areas. That year, it concluded in an official report:

“It is essential that homeowners, industries providing services and supplies to homeowners, and managers of parks, recreational facilities and golf courses all understand their roles and responsibilities in managing nutrients for environmental protection.”

The report recommended a variety of steps to reduce the flow of lawn fertilizer runoff, including surveys of urban fertilizer use, training for public agencies and private technicians, public information workshops, outreach to grounds managers of state and federal lands, water quality cooperation agreements with retailers and lawn care firms, technical assistance at all levels, and “a unified approach.”<sup>21</sup>

Fifteen years later, that unified approach has yet to materialize, and the problem of polluted runoff from urban and suburban lawns continues to worsen.

It is difficult to know how much fertilizer is being applied to Maryland lawns, since the state does not keep track of homeowners' fertilizer usage or compile a statewide estimate of use by lawn companies, golf courses and managers of other large properties. The Department of Agriculture does, however, keep records of fertilizer sales in Maryland. Researchers have used these figures to attempt to estimate the statewide use of fertilizer on lawns. More than likely, not all of the lawn fertilizer sold in Maryland in a given year ends up being applied to Maryland land in that year. Nonetheless, the sales figures make it plain that the unregulated use of fertilizer on lawns is a significant and growing problem.

In 1991 the amount of fertilizer sold for use on farmland was more than 7 times the amount sold for non-farm uses; 700 million pounds were sold for crops versus 100 million pounds for uses off the farm, according to the Maryland Dept. of Agriculture. Seventeen years later, the sales records reveal a dramatic turnaround: fertilizer sales for crops plummeted to 430 million pounds, while non-farm sales increased more than threefold, to 310 million pounds.<sup>22</sup>

Researchers have used other methods to estimate the statewide use of fertilizer for lawns. In a 2010 study for the Choptank River Eastern

Bay Conservancy, researcher Isabel Junkin took a low estimate of the amount of land planted in grass statewide, about 990,000 acres, and multiplied it by the University of Maryland Cooperative Extension Service's recommended fertilization rate for home lawns, about 2 pounds of nitrogen fertilizer per 1,000 square feet.<sup>23</sup>

The resulting estimate was that more than 86 million pounds of nitrogen fertilizer are applied to turf grass in Maryland every year. That would make turf grass the most fertilizer-hungry crop grown in Maryland. The crop that consumes the next-largest amount of fertilizer is corn; according to Department of Agriculture statistics, corn growers apply about 64 million pounds of nitrogen fertilizer to their crops statewide.<sup>24</sup>

But do these methods exaggerate the amount of fertilizer that Marylanders are using? Do people really fertilize their lawns that much? Just a glance at the nearest golf course, hospital lawn or roadside swale at the height of a Maryland summer will tell a careful observer that with few exceptions, institutional landowners do indeed fertilize their grass. But according to a recent estimate by the Chesapeake Stormwater Network, golf courses, parks, ball fields, median strips and institutional lawns account for only about 17 percent of the grass grown



*Man applying fertilizer using a spreader.*  
Cappi Thompson, flickr.com

in Maryland. Homeowners maintain the remaining 83 percent.<sup>25</sup>

One survey in two middle-class Baltimore County neighborhoods, Glyndon and Baisman Run, found most homeowners do fertilize their lawns, often in amounts well in excess of Cooperative Extension Service recommendations. In 2003 scientists with the Baltimore Ecosystem Study went door to door in the two communities and found that 56 percent of Baisman Run homeowners and 68 percent of Glyndon homeowners fertilized their lawns regularly. Most were do-it-yourselfers, and only 17 percent of those homeowners began by conducting a basic soil test to determine whether or not their lawn needed fertilizer. Instead, the researchers said, most homeowners looked at the lawn's color; if it wasn't bright green, they fertilized it.<sup>26</sup>

When professional lawn care companies applied the fertilizer,

the amounts ranged from 2.1 to 3.3 pounds of nitrogen per 1,000 square feet—within the range the Cooperative Extension Service currently recommends for commercial fertilizers. But among do-it-yourselfers, the amounts of fertilizer used ranged from one-fifth of a pound of nitrogen to nearly eight pounds of nitrogen per 1,000 square feet.<sup>27</sup>

At the upper end of that range, nitrogen-laden runoff is all but inevitable. In fact, another Baltimore Ecosystem Study scientist estimated that more than half of all the nitrogen that flows into the Glyndon watershed comes from lawn runoff. (The figure was lower in Baisman Run, but that wasn't because Baisman Run homeowners were better at managing lawn fertilizers. Rather, the neighborhood's septic tanks were leaking and its waterways were more polluted, so lawn fertilizer runoff made up a smaller share of the pollution.)<sup>28</sup>

In spite of the Chesapeake Bay Program's 1996 finding that Bay restoration planners need to know how much fertilizer flows from lawns into Maryland streams and the Bay, few other studies have been done. The University of Maryland Extension Service concentrates its research program on nutrient management for farm crops. Any attempt to track runoff from urban and suburban areas confronts

the hard fact that developed areas produce multiple types of nutrient pollution, such as septic tank leachate, sewage pipe leaks, and airborne deposition of nitrogen and other pollutants from autos, trucks, and

factory smokestacks. The research is difficult, but not impossible. It has been done in other states, and policymakers have paid attention to the results.

# Scientific Evidence of Fertilizer Pollution

Scientists in other states have found that lawns do produce nutrient laden runoff under many circumstances. The variables that affect the amount of runoff include: the amount of fertilizer applied, the soil type, whether the land is level or steeply sloped, the health of the grass, the amount and timing of rainfall, and whether the soil is already saturated with phosphorus.<sup>29</sup> Some examples:

- In a 2001 study, researchers from the U.S. Department of Agriculture measured nutrient levels in a stream in Austin, Texas, before it flowed through a public golf course and after it emerged from the property. The 13-month study found “statistically significant increases” in concentrations of two nitrogen compounds, nitrate and nitrite.<sup>30</sup>
- In a five-year follow-up on the same site, the researchers found about 3 percent of all

the nitrogen and 6 percent of all the phosphorus applied to the golf course ended up in the stream. The percentages were small, but over time levels of water soluble phosphorus in the stream were high enough to exceed the EPA’s recommendation of 0.1 milligrams per liter, and were comparable to phosphorus runoff measured from farm lands. “The findings of this study emphasize the need to balance golf course fertility management with environmental risks, especially with respect to phosphorus,” the researchers concluded.<sup>31</sup>

- In a 2006 study on mature Kentucky bluegrass, when the grass was fertilized at about twice the recommended level, water flowing from the site had more than twice as much nitrate as the EPA’s maximum allowable level for safe drinking water. (Nitrate in drinking

water can cause “blue baby syndrome,” a potentially grave form of oxygen deprivation.)<sup>32</sup>

- Several studies found that quick-release nitrogen fertilizer, which is formulated to quickly “green up” a lawn, is much more likely to run off into streams than slow release nitrogen.<sup>33</sup>
- A two-year Connecticut study published in 2006 examined the timing of lawn fertilizer applications. The scientists found that the later in the year fertilizer was applied, the higher the levels of nitrogen in the runoff. When fertilizer was applied on Sept. 15, about 15 percent of the nitrogen ran off. But when fertilizer was applied on Dec. 15, more than 40 percent of the nitrogen escaped.<sup>34</sup>

One study took place in Minnesota, where car license plates bear the slogan, “Land of 10,000 Lakes.” In the early 1990s concern about deteriorating water quality in local rivers and streams led the town of Plymouth, MN, a suburb of St. Paul, to ban fertilizer that contains phosphorus in 1995. Five years later, researchers compared the water quality in Plymouth with Maple Grove, a nearby suburban community that had not banned phosphorus fertilizer.



*Dead fish entrapped on a floating seagrass mat in the Choptank River in Maryland. A toxic algal bloom is the suspected cause of the fish kill. Credit: Adrian Jones, flickr.com*

The study found that runoff water in Plymouth, where the phosphorus ban was in effect, contained 12 to 15 percent less phosphorus than Maple Grove’s runoff did. The phosphorus levels went down even though about 25 percent of Plymouth residents continued to use fertilizer containing phosphorus in spite of the local ban. The researchers predicted that over time, Plymouth’s water would get even cleaner as phosphorus levels in soils gradually declined.<sup>35</sup>

Since the two types of fertilizers cost the same amount, the cost to reduce phosphorus pollution in Plymouth’s water was zero. The researchers pointed out that the estimated cost to construct urban and suburban infrastructure to filter out pollutants was approximately \$500 for every pound of phosphorus removed.<sup>36</sup>

# Action in Other States

After the experience in Plymouth, Minnesota passed the first statewide ban on the sale of fertilizer containing phosphorus (except for new lawns and in cases where soil tests showed that phosphorus was needed). The law, which was phased in between 2002 and 2005, exempted sod farms and golf courses from the phosphorus ban. The law also requires anyone who spills or spreads any type of fertilizer on paved surfaces, where it could quickly be washed into rivers and lakes, to clean it up immediately. The law, enforceable by local police, made any violation a misdemeanor.<sup>37</sup>

The legislation called for a report on the law's effectiveness, due in 2007. That report found that the ban on fertilizer containing phosphorus:

- Had no effect on fertilizer prices or stores' fertilizer sales
- Had not led to shortages of phosphorus-free fertilizer

- Posed no problems for merchants
- Was popular with consumers, who liked the idea of protecting their state's lakes

Compliance with the law was excellent, the state found. The report estimated it would take until 2012 for measurable water quality improvements to show up, because some local soils were saturated with phosphorus, which would continue to run off the land for several years.<sup>38</sup>

Several states, including one in the Chesapeake Bay watershed, have recently passed laws restricting phosphorus in fertilizer. Examples include:

- A Maine law that took effect in January 2008, requiring stores that sell lawn fertilizer containing phosphorus to post signs explaining that phosphorus-laden runoff can

pollute freshwater lakes, rivers and wetlands. The notices inform consumers that fertilizer containing phosphorus “should not be used,” except on new lawns and when a soil test shows phosphorus is needed. The notices “request” that homeowners avoid using fertilizer with phosphorus in all other circumstances.

- A phosphorus ban in New York, part of which is in the Chesapeake Bay watershed, goes into effect in January 2012. Like the Minnesota law, it bans lawn fertilizer containing phosphorus, except on new lawns or in cases where soil test shows phosphorus levels are too low. It also bans applying fertilizer to paved surfaces. The New York law also bans fertilizer applications between December 1 and April 1, and bans fertilizer application within 20 feet of surface waters, unless there is a vegetated buffer zone.
- New Jersey’s law was signed by Gov. Chris Christie in January 2011. It bans phosphorus in lawn fertilizer, with exceptions similar to Minnesota’s. It also bans fertilizing lawns between November 15 and March 1, and when the ground is frozen; requires lawn care professionals to maintain a 10-foot buffer

from waterways, and requires homeowners to maintain a 25-foot buffer; and requires all fertilizer blends sold in the state to contain at least 20 percent slow-release forms of nitrogen. Slow-release nitrogen can lead to less runoff. Golf courses are exempt.

Municipalities that have enacted local phosphorus bans include Sanibel, Florida; Annapolis, MD, which became the first city in the Chesapeake Bay watershed to ban the sale of phosphorus fertilizer in January 2009; and Ann Arbor, Michigan, which banned phosphorus in fertilizers in 2006. While it’s too soon to measure the effects on water quality in most communities, the Ann Arbor ban has already produced encouraging results.

University of Michigan Professor John Lehman had already been measuring nitrogen and phosphorus levels in the city’s Huron River when the Ann Arbor ordinance went into effect. Lehman found that within one year of the ordinance, phosphorus levels in the Huron River dropped an average of 28 percent.<sup>39</sup> Lehman couldn’t say whether the drop was due to the ordinance banning phosphorus fertilizer, or whether local residents were using less fertilizer because of public education about the issue and a general increase in environmental awareness.<sup>40</sup>

# Maryland's Relatively Weak Laws

The state Department of Agriculture's Urban Nutrient Management Program regulates Maryland companies and individuals that apply fertilizer to 10 acres or more of "non-farm land"—including lawn care companies, golf courses, parks, airports, sports fields, road swales and highway rights of way. The state requires these companies and individuals to take soil tests before applying fertilizer, follow the University of Maryland Cooperative Extension Service's fertilizer application recommendations, and keep records of fertilizer applications. Failure to comply can result in administrative fines of up to \$1,000.<sup>41</sup>

The Urban Nutrient Management Program covers 700 operations—about 400 lawn care companies, 200 golf courses, and 100 institutional lawn care divisions. The Department of Agriculture has assigned one staff member to handle all of these operations,

and according to its recent annual reports, the department inspects the records of 10 percent of these firms each year.

In fact, the department actually inspected fewer than 10 percent. In 2009, the program reviewed the paperwork of 36 firms, issued ten written warnings, and fined one company \$250.<sup>42</sup> In 2010, the Agriculture Department inspected 63 companies' paperwork, issued 14 warning letters, and imposed one fine.<sup>43</sup>



*Park lawn near the water.* Credit: Javier Ignacio Acuna Ditzel, flickr.com

In other words, in each of the last two years the state found that more than 20 percent of the companies whose records it inspected failed to live up to the law's minimal requirements. If that rate is typical of all 700 companies, some 140 professional lawn care firms are failing to take simple precautions to prevent fertilizer-tainted runoff from reaching the Bay. Also, the Department's enforcement efforts resulted in only one fine each year. "Enforcement will continue to be a major focus of the program in coming years," the 2009 annual report states nonetheless.<sup>44</sup>

Homeowners get very little guidance from the state when it comes to reducing fertilizer use. The University of Maryland Extension Service recommends that homeowners test their soils to determine whether they need fertilizer before they apply it. But the Extension Service's informational pamphlets, which purport to guide homeowners in fertilizer use, are dense with complex mathematical formulas. They present homeowners with a daunting sequence of steps for deciding how much fertilizer to use.<sup>45</sup>

The Extension Service literature does not send homeowners a clear, consistent message linking their own fertilizer use to the Bay's health. Lawn care guidance assumes that homeowners understand



*Sunset over Tangier Island.* Credit: Chesapeake Bay Program

the environmental consequences of over-fertilizing, and only mentions the threat to the Bay in passing, with no explanation of how excess fertilizer damages the Bay. A separate eight-page booklet, "Lawns and the Chesapeake Bay," does explain the issue briefly, but the booklet then goes on to recommend optional extra fertilizations for lawns. Homeowners who follow the booklet's suggestions would increase the total amount of nitrogen fertilizer applied to their property by up to 50 percent.<sup>46</sup>

Finally, the Extension Service does very little public outreach aimed at persuading homeowners to reduce fertilizer use on lawns. This public outreach work is the responsibility of volunteers in the state's Master Gardener program, which is primarily focused on growing vegetables and ornamental plants, not lawn care. The Master Gardener program offers training in composting and has produced videos entitled "Side-Dress Your

Veggies,” “No-Till Gardening” and “How to Collect a Soil Sample,” but it has not produced a video or training program to address the much larger issue of excess lawn fertilization. The Master Gardener’s Bay-

Wise landscape training programs devotes one of its ten lessons to lawn fertilization. By 2010 about 724 Maryland properties had been certified as BayWise.<sup>47</sup>

# Policy Recommendations

Despite decades of insufficient cleanup efforts, the Chesapeake Bay can still be restored to a healthy state if we get serious about reducing all sources of pollution. We need to better enforce current cleanup policies and establish stronger ones at the same time. Curbing pollution from urban and suburban areas will be especially critical as Maryland's population grows and development continues consuming forests and farmland.

Excess fertilizer on turf grass accounts for a significant portion of the urban pollution sector, because turf grass is Maryland's largest single crop and many homeowners and professionals over-fertilize. Fortunately, reducing fertilizer pollution is one of the most cost-effective cleanup options.

Reducing urban fertilizer pollution means both limiting the

nutrients in the fertilizer itself and ensuring applicators put less fertilizer on the ground. The following low-cost policies would help achieve both goals:

- Rewrite the existing guidelines that dictate how and when professionals apply fertilizer such that the guidelines are aligned with statewide water quality restoration goals for the Chesapeake Bay and its tributaries
- Ban phosphorus from all fertilizers, organic and synthetic, intended for use on established turf grass
- Require a science-based upper limit on the amount of nitrogen in all fertilizers intended for use on established lawns, and require that at least a fifth of the nitrogen be "slow-release," which leads to less runoff

- Provide adequate funding so the state can enforce fertilizer usage by professional applicators as well as fertilizer manufacturers and distributors
- Prohibit application of fertilizer in specific situations that would facilitate runoff, such as applying when the ground is frozen or when rainfall is expected

Putting these cost-effective policies in place and better enforcing our existing policies will enable Maryland to significantly reduce its urban fertilizer pollution. Doing so will be a critical step in clamping down on the growing urban pollution sector and help us once and for all achieve a restored Chesapeake Bay.

# Notes

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