


Healthy Farms *for a* Healthy Bay

The Benefits of Agricultural Conservation Programs

MaryPIRG Foundation

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MaryPIRG Foundation

Winter 2005–2006

Acknowledgments

The MaryPIRG Foundation would like to thank the following individuals for providing information for this report: Bill Windley (Maryland Saltwater Sportfishermen's Association), Richie Gaines (Chesapeake Guides Association), Lee Richardson (Maryland farmer), Tommy Dodd (Maryland farmer), Mark Skinner (Accokeek Foundation National Colonial Farm), Carole Morison (Delmarva Poultry Justice Alliance), Dan Vaughan (Daily Crisis Farm), Sumesh Aurora (Mississippi Technology Alliance), Edan Prabhu (Flex Energy), and Norman Astle (Maryland Manure Transport Program). In addition, the authors would like to thank Brad Heavner of MaryPIRG and Elizabeth Ridlington of the State PIRGs for editorial suggestions.

MaryPIRG Foundation thanks the Keith Campbell Foundation for the Environment, the Rauch Foundation, the Town Creek Foundation, and the Clayton Baker Trust for their generous support of this report.

The authors alone bear responsibility for any factual errors. The views expressed in this report are those of the MaryPIRG Foundation and do not necessarily reflect the views of our funders.

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Cover Photo: A Fishing Pier at Sunset, courtesy Jeremy Manking

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Executive Summary

Year after year the Chesapeake Bay is inundated with nutrient pollution as millions of pounds of nitrogen and phosphorous flow into its tributaries from the land and fall into its waters from the air. Every summer the effects of that pollution are revealed in algae blooms and massive dead zones that spread over a third of the bay.

This pollution comes from many sources, including sewage plants, septic tanks, suburban fertilizer use, power plants and car emissions.[1] Despite the best efforts of many farmers, agriculture remains one of the leading sources of these nutrients, which run off of both crop and animal farms.[2]

Maryland law requires farmers to have nutrient management plans so they know just how much fertilizer to use each season and can reduce their runoff by only applying what they need.[3] And there are many additional methods, known as best management practices, that farmers can implement on their fields and farms to further reduce the nutrients running off of them.[4]

But for farmers struggling to make a profit, both nutrient management plans and best management practices can be prohibitively expensive. Without some outside assistance many farmers cannot afford to make these critical reductions.

The solution to help farmers and the bay is simple. Maryland's tributary teams, working with the Department of Natural Resources, have developed a Tributary Strategy that provides a road-map to clean up the bay. They concluded that funding agricultural conservation practices is the most efficient way to help keep farming sustainable and help protect the bay. Their recommended budget for these practices is $800 million over eight years.[5]

State programs such as the Maryland Agricultural Cost-Share Program (MACS) help farmers implement conservation practices that keep farming profitable and reduce runoff into the bay. These programs provide cost-share assistance for practices including:

- Cover crops. Winter crops such as wheat, rye, or barley reduce soil erosion and absorb excess nitrogen and phosphorous that remains in the soil after the summer crop has been harvested.
- Buffer zones. Grass and forest buffers along streams slow erosion and trap nutrients before they enter the water system.
- Manure management. Building manure sheds, transporting manure to areas that need it, and developing management plans all help farmers, especially poultry growers, handle their excess waste.
- Technical assistance. Soil conservation districts provide outreach, education, and support to farmers who are interested in or could benefit from these programs. Without this assistance, few farmers have the time to spend researching practices they could implement to reduce their runoff.

Working farms and the Chesapeake Bay are both essential pieces of Maryland's landscape, history, and heritage. With state cost-share programs, farmers benefit from added financial security in their business and the Chesapeake Bay benefits from healthier waters. Unfortunately, funding for these state cost-share programs has been cut drastically in recent years. Current funding is far short of the levels needed to fully implement these practices across the state.

This report highlights the experiences of two fishermen and five farmers whose lives depend so heavily on the land and the bay. Each individual case study shows the economic difficulties that come from nutrient runoff, the role that conservation practices can play in alleviating that difficulty, and the importance of state cost-share programs for making change happen.

Five years ago Maryland entered the Chesapeake 2000 Agreement, pledging to restore the Chesapeake Bay to a healthy state by 2010.[6] But halfway to that deadline we are not halfway to that goal.[7]

Agriculture is the most cost-efficient place to make the necessary nutrient reductions. Most farmers want to do all they can, and they know what needs to be done to further clean up their farms. The will, science, and technology all exist. All that is needed is the funding.

To protect Maryland's farms and clean the Chesapeake Bay, we should:

- Fund the Tributary Strategy recommendations for agriculture and provide funding for the MACS programs and the Manure Services.
- Require the poultry producers such as Perdue and Tyson to provide more financial assistance to their growers in managing their manure.
- Fund the Soil Conservation Districts and the Agriculture Extension Service to provide technical and policy assistance to farmers for implementing conservation programs.

Photo courtesy Jeremy Menking.

Reducing Runoff to Clean Up the Bay

The Chesapeake Bay is a national treasure and the heart of Maryland. Home to more than 36,000 species of plants and animals, the bay is the largest estuary in the United States and among the most productive in the world.[8]

The bay is an integral component of Maryland's history, economy, and quality of life. But nitrogen and phosphorous pollution are choking the bay, threatening its animal life and endangering its future.

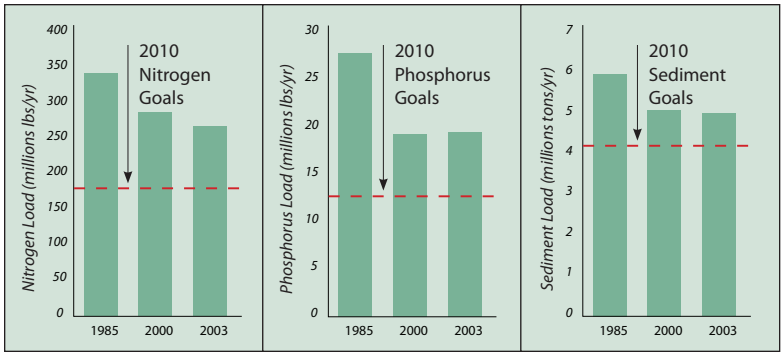
In 1987, Maryland, Pennsylvania, Virginia, and the District of Columbia signed a historic agreement with the United States Environmental Protection Agency (EPA) to clean up the bay. Recognizing that "in recent decades, the Bay has suffered serious declines in quality and productivity," the signatories promised to reduce nutrient loads into the bay to 40% of 1985 levels by the year 2000.[9]

By 1998, however, the bay's condition had not improved, and the EPA added the bay and many of its tidal tributaries to its list of impaired waters.[10] Two years later, Maryland, Virginia, Pennsylvania, and the District of Columbia were joined by Delaware, West Virginia, and New York to create the Chesapeake 2000 Agreement.[11] The parties promised to bring the Chesapeake Bay off the impaired waters list by 2010.[12]

So far the states have made only minimal progress towards that goal. Between 1985 and 2002, the states reduced their nitrogen by just 60 million pounds a year; 103 million pounds short of the 2010 goal of 175 million pounds a year.[13] The states are more on target with phosphorous reductions, having brought annual loads of this nutrient down by 7.6 million pounds, 6.7 million pounds away from the ultimate goal of 12.8 million pounds a year.[14] Sediment has seen less of a reduction. A decrease of 0.79 million tons has left sediment loadings 0.90 million tons away from a goal of 4.15 million tons a year.[15] (See Figure 1.)

The effects of this slow reduction show in a dead zone that stretches across more than a third of the bay every summer. Sediment runoff blocks sunlight entering the water and smothers bottom dwelling plants and animals such as grasses, oysters, and clams.[16] Excess nutrients in the bay feed algae blooms that also block sunlight and, when they decompose, consume all the available oxygen in the water.[17]

Figure 1: Nutrient Reductions and Goals

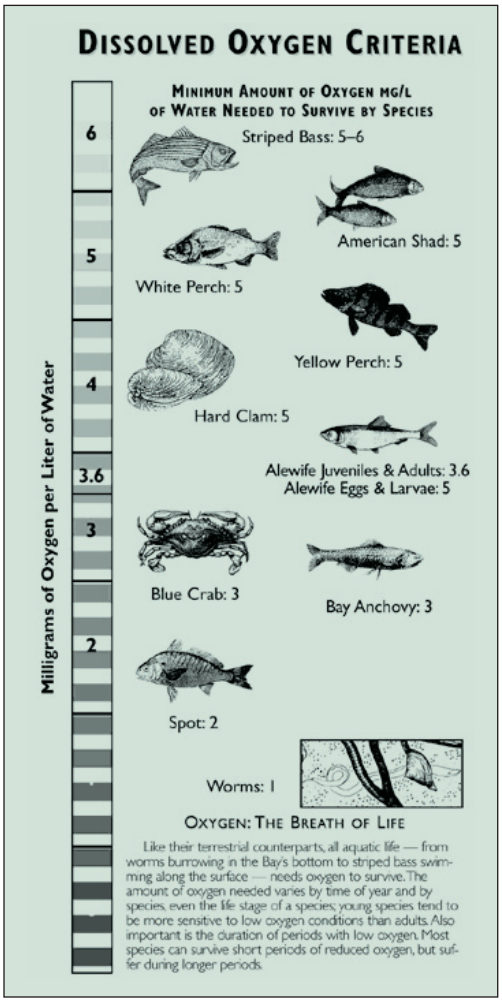


Source: Chesapeake Bay Program.

In August 2005, the dead zone, the part of the bay with less than 5% dissolved oxygen, covered 41% of the bay, making it the second-worst dead zone on record.[18] In addition, the area with absolutely no dissolved oxygen was the largest ever recorded.[19] The dead zone makes water uninhabitable. Plants die and animal life must flee or suffocate.[20] (See Figure 2.)

The dead zone threatens not only the species living within the bay but those living on and around it as well. Marylanders benefit from a healthy bay through an enhanced quality of life and increased recreational opportunities. In a 2002 poll, 88% of residents agreed that pollution is affecting fish and wildlife populations, and 94% felt it was important or very important to undertake bay restoration efforts.[21]

Figure 2: Dissolved Oxygen Criteria



Source: Chesapeake Bay Program.

Although all Marylanders benefit from efforts to reduce polluted runoff into the bay, those who depend on the abundance of its waters stand to benefit most directly. Recreational fishermen and commercial watermen track their lives around the health of the bay.

Recreational Fishermen[22]

Bill Windley knows the importance of clean water for fish populations. President of the Maryland Saltwater Sportfishermen's Association (MSSA) and Mid-Atlantic Senior Advisor to the Recreational Fishing Alliance, he is dedicated to protecting and promoting fish species in the state. He says in the last few years the MSSA has had to become as much a conservation group as a fishing group.

Mr. Windley understands that cleaning up the bay is no simple task. Part of the problem is a lack of healthy filter species in the bay, particularly submerged aquatic vegetation and menhaden. But part of the problem is the nutrients running into the water from land. "When you see silt [in the water] you see the chemicals that were on the land," he observes. He recalls an aerial picture of the bay he saw after the heavy rains fell in April. "Every inch of the bay from the dam all the way down to Solomon's Island had a cloud of silt in it."

"If we want to get a handle on the dead zone we must get a handle on municipal [wastewater] plants and agriculture." But he notes that asking farmers to do more puts them in a difficult position. "Farmers barely make it as it is."

The causes of the problem may be complex, but to fishermen the nature of the problem is clear. The MSSA has 8,000 members in fourteen chapters across the state. Although Mr. Windley fishes primarily in the upper bay, last year he heard a lot that people weren't fishing in

the southern part of the bay. The reason is simple. "People who fish down in the south of the bay get nothing." In the summer months Mr. Windley himself has started fishing primarily off the shore in New Jersey, where better management and cleaner waters guarantee a better catch.

The loss of recreational fishermen has a large economic impact on the state. There are over 700,000 anglers in the state, who log nearly 7.5 million days fishing every year. Sportfishing brings Maryland over $1 billion in economic output, with just over 60% of that revenue coming from saltwater fishermen.[23] Recreational fishing has an impact on other sectors of the economy as well, especially tourism. Maryland ranks fourteenth nationwide for attracting nonresident fishermen, and tourists log 17% of the state's total days spent fishing.[24]

A healthy bay is critical for continued enjoyment of its resources. "To get the bay back to how it was when John Smith was here is not going to happen. But to turn it back into a functional ecosystem is possible."

Table 1: Economic Impact of Recreational Fishing in Maryland for 2001

Total Anglers	700,603
Total Fishing Days	7,471,000
Economic Output	$1,063,396,570
Retail Sales	$557,544,005
Salary and Wages	$270,916,901
Jobs	11,020
Sales and Motor Fuel Taxes	$31,348,481
State Income Taxes	$10,012,837

Source: American Sportfishing Association.

Commercial Watermen[25]

Recreational fishermen enjoy the bay, but commercial watermen must make their living off it. Captain Richie Gaines is president of the Chesapeake Guides Association and runs the Anglers Connection Guide Service. He has seen the Chesapeake Bay deteriorate and knows the cost that has on watermen.

Mr. Gaines has been fishing on the bay since his youth, and what he has seen in recent years worries him. As he notes, "In the last five years water quality has rocketed downhill. From the middle of June through the first part of September, the areas inhabitable by fish are getting smaller and smaller."

Commercial guides make a living by taking recreational fishermen to where the fish are. If there aren't fish, there's nowhere to go. "You have to have an 18 inch rockfish to keep it. Now you have to catch a hundred rockfish to catch one that is 18 inches." Rockfish used to spend the first three years of their life in the bay before moving out to the coast, but deteriorating water conditions are making these fish leave the bay at younger ages, while they are still just 15-16 inches long.

"Your average recreational fishermen are giving up in droves." Guides have to work harder, partner up, and travel farther—20-30% farther every day—just to find fish for their clients. "Overall, guides are struggling." And other watermen are also feeling the pinch. "Commercial watermen are dying. There is no way to make money out there."

But Mr. Gaines has not given up on the bay. He points to the Potomac River as an example of how these waterways can turn around. "The Potomac River was a national disgrace. The problem wasn't industrial pollution, it was nutrients. Then they upgraded Blue Plains Sewage plant and within 10 years there were bass living in the river again."

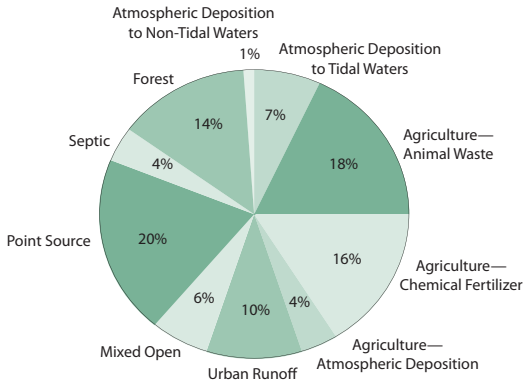
Mr. Gaines is optimistic that the same change could occur on the Chesapeake. "All it takes is the money to modernize sewage and fund farming practices to clean up the bay." But he is worried the state will wait too long before taking action. "Mother Nature will redeem herself, but she can't resurrect herself."

Balancing Nutrients on the Farm, in the Bay

Although nutrient pollution comes from multiple sources, agricultural runoff remains one of the leading sources of pollution in the bay. Farmers have made some reductions in their runoff over the last ten years, but more reductions are still needed. According to the Chesapeake Bay Program, agriculture continues to contribute 38% of the nitrogen and 44% of the phosphorous that runs into the bay each year.[26] But farmers cannot afford to make more reductions without financial assistance. (See Figures 3 and 4.)

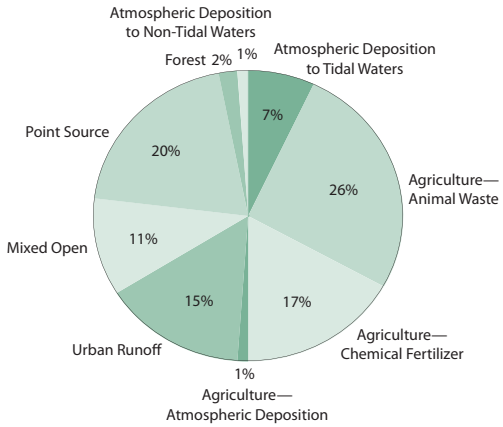
Agricultural runoff occurs when fertilizer-rich soil or manure is washed into streams or volatizes into the air. When farmers apply fertilizers such as manure to their fields, only 20-60% can be taken up by the crop and 5-15% is absorbed by the soil into long-term storage. Approximately 15-35% is lost into the air and another 15-35% is exposed in the soil to leaching and runoff.[27] Thus reducing runoff from farms comes in two phases: first, farmers must limit their use of fertilizer. Second, farmers must install barriers to prevent as much runoff as they can.

Figure 3: Sources of Nitrogen Loads to the Chesapeake Bay
(Including atmospheric deposition to tidal waters)
2002 Total = 298.2 million lbs/year



Source: Chesapeake Bay Program.

Figure 4: Sources of Phosphorus Loads to the Chesapeake Bay
(Including atmospheric deposition to tidal waters)
2002 Total = 21.04 million lbs/year



Source: Chesapeake Bay Program.

Recognizing the impact that agriculture has on the bay, in 1998 the Maryland General Assembly passed the Water Quality Improvement Act. This act required all farmers to develop nutrient management plans for their farms.[28] Although many farmers voluntarily developed these plans before the act, the new law made it mandatory for everyone. To develop a nutrient management plan farmers must test soil samples from their fields, determine the expected nutrient needs of their crops, and analyze the

amount of nitrogen and phosphorous they must apply to meet those needs.[29]

For the farmer, the process can be time-consuming, technically complex, and expensive. But by only applying what they really need, farmers save money on fertilizer and the bay is protected from runoff. Implementing nutrient management plans on all farms bay-wide would reduce nitrogen by 13.6 million pounds and phosphorous by 800,000 pounds every year, meeting 13% and 12% of the state's reduction goals.[30]

Once farmers have controlled what they are putting on their fields, they must then try to reduce what comes off. A variety of best management practices exist, and vary with the type and location of a farm. These practices include winter cover crops, which absorb excess nutrients and prevent soil erosion before it leaves the field, and grass ditches, ponds, and grass or forest buffers, which do the same at the edge of the field.[31] These practices have a direct impact on the quality of the Chesapeake Bay. Cover crops in Maryland alone cause annual reductions of 1 million pounds of nitrogen and 25,000 pounds of phosphorous.[32]

But these projects are also expensive, both in the input costs required to create or plant them and also in the opportunity costs of leaving acres of land unharvested. The Maryland Agricultural Water Quality Cost-Share Program (MACS) provides grants for farmers to help cover the costs of developing nutrient management plans and installing best management practices. The MACS programs pay for 87.5% of a farmer's costs, making it possible for farmers to afford these environmentally critical measures.

This assistance is invaluable in the current farming climate, where the industry is in a precarious position. In a recent report by the Chesapeake Bay Foundation, agriculture in the Chesapeake Bay watershed ranked weak or unhealthy on ten of twelve indicators.[33] Although the costs of farming have dramatically increased in the last few decades, the price farmers receive for their produce has remained relatively stable. In the last year alone energy prices for farmers soared 30%, an increase that affects both fuel and fertilizer costs.[34] Yet the portion that the farmer receives for every dollar spent by consumers on farm produce has shrunk, from 47 cents in 1957 to just 20 cents in 2000.[35]

In the long term, best management practices save farmers money as well as helping the bay. But the short-term cost for installation is often more than the slim operating budget of a farm can handle. State cost-share programs make it possible for farmers to implement practices that reduce runoff and still make a profit on their farm. Land preservation programs also play a vital role in keeping farming sustainable. By supporting farmers, the state keeps land in farming and out of development, making an equal investment in a healthy bay.

A Row Crop Farmer's Difficult Task[36]

Corn, soy, and wheat are the staples of Maryland crop farming. Tommy Dodd, who was born on the Eastern Shore farm he currently operates, knows the environmental impacts of farming. Two streams run beside his property before feeding into the branch of the Wye River that runs directly behind his fields. Mr. Dodd enjoys the river, and misses having more time to fish and be out on the water. He knows that what he does on his farm directly impacts not just the Wye River, but also the Chesapeake Bay. And he has done what he can to help out.

Mr. Dodd started with a 20 foot buffer between their fields and the streams, most of which is now covered in dense woods. But he knew that this buffer was not enough to trap all the sediment and nutrients running off his fields, and when the state offered more money to expand that buffer he gladly set additional land aside. The farm now has almost 150 acres in grass and forest buffers.

When setting aside the land, Mr. Dodd had to plant specified buffer grasses at his own expense. The payment he gets from the state for having the buffers ranges depending on how critical each acre of land is for runoff control. He feels that the payments do not cover the costs. He said, "We're not making what we could make if we kept the land in production, but we're trying to help reduce runoff."

Mr. Dodd has installed other best management practices to help reduce his farm's impact on the river. Grass waterways and several ponds trap and filter runoff from the fields before it reaches the river. Although the ponds attract geese to the farm and help bring in hunting revenue, installing them was at the Dodd's expense. These changes don't profit the farm, but they do profit the bay. "They are hard to work around, but they do a good job catching the nutrients." Mr. Dodd also participates in the cover crop program, and tries to plant his winter crop as early as he can to benefit from early planting prices. "The cost is in fuel and wear and tear on your equipment." If those expenses are covered, the program is worth the reduction he can see in runoff from the fields.

Economies of scale make farming profitable, and every acre of a field not in farming decreases the farmer's ability to make a profit. "You have to have 4,000 to 5,000 acres to make a living off your farm." For Mr. Dodd, his 750 acre farm just cannot compete. He has to supplement his income with two additional jobs.

State cost-share programs and a desire to be environmentally responsible have helped Mr. Dodd significantly reduce the runoff from his farm. They have also helped him put half the farm into land preservation. Mr. Dodd used rural legacy money to purchase his neighbor's farm before it could be sold for development. He wants to preserve the rest of their land from development, and wish it were easier and more cost-effective to use state programs to do so. "There are a lot more hoops to jump through and a lot less money for what it could be worth to develop." He feels that there has been less money available from the state in recent years, and that has hurt his ability to set aside and preserve his land. "If there was more money in the program, I might pull more land [out of farming] for buffers along the river." But without additional state funds, the Dodds have done all they can afford to do.

Photo courtesy Olga Shelego.

Handling the Poultry Hotspot

While farmers across the state need assistance to reduce their runoff, assistance to poultry growers is particularly important. Half of the nitrogen and just over half of the phosphorous from agriculture come from animal manure, particularly from poultry production.[37] Production on the Eastern Shore is highly concentrated in just a few counties, creating areas of intense pollution and the growth of the industry has exacerbated the problem.

The Delmarva Peninsula is one of the top poultry producing areas in the nation, with Maryland alone raising over 284 million birds in 2004.[38] This growth has made the poultry industry one of the largest sectors of Maryland agriculture, comprising roughly a third of Maryland's farming income.[39] But the growth of the poultry industry has also caused a steady increase in nutrients from manure.[40]

By pound, the amount of animals produced in the bay region has not changed since the early 1980s, as dairy and beef cow production has actually decreased.[41] Furthermore, most beef and dairy cows in the watershed are still pasture-based, so their manure is spread naturally and is not recoverable. But pigs and poultry are now raised in confined areas,[42] so their manure accumulates rapidly and must be recovered, stored, and used in some fashion.[43] Because the poultry industry in Maryland has developed almost entirely on the Eastern Shore, the area has become a hotspot for excess manure.[44]

Poultry litter is much higher in nitrogen and phosphorous than are other types of animal waste, producing 3.5 times the nitrogen and 2.5 times the phosphorous as beef cattle per pound of animal.[45] Thus, while poultry produces only 15% of the manure in the watershed by weight, it comprises 64% of the total recoverable manure nitrogen.[46]

Phosphorous has also become a problem in the Delmarva Peninsula. This nutrient builds up in the ground until it reaches a certain concentration in the soil, and then starts running off into the waterways.[47] Because of the use of chicken manure as a fertilizer, phosphorous has accumulated heavily in the soils on the Eastern Shore.

The growth of the industry has unfortunately coincided with a decrease in the land available for farming. A farmer needs at least one acre of land to dispose of four tons of litter. That means a farmer with two chicken houses, roughly 40,000 to 60,000 birds, needs between 70 and 100 acres of land to dispose of his litter, yet most poultry farmers do not have this much acreage.[48]

In 2001, there were 792 poultry farms in Maryland.[49] Almost all of those farms—95% of them—held over 60,000 birds. Yet more than half—55% of them—were situated on less than 50 acres of land, with 20% housed on less than 10 acres.[50] Indeed, almost half, or 43%, of all poultry farmers did not use their land to grow crops.[51] As a result, in 2001 the Delmarva region produced 257,268 more pounds of manure than there was farmland to accept it.[52]

This imbalance between excess manure and available farmland will only grow more acute in coming years. Maryland loses approximately 90,000 acres of farmland to development every year. The Eastern Shore especially has seen the pressure to develop mount in recent years.[53] Between 2000 and 2004, Queen Anne's and Cecil grew by more than 8% and Caroline, Wicomico, Worcester, and Somerset saw their populations swell between 4% and 8%.[54]

The loss of farmland is compounded by the fact that, as nutrient management plans are fully implemented, the amount of animal waste that farmers can spread on their fields will decrease. Because of chicken litter's high phosphorous content, many nutrient management plans now limit its use as a fertilizer on the Eastern Shore.[55] Many best management practices, such as conservation tillage and enhanced nutrient management plans, also discourage the use of manure as a fertilizer.[56] As farmers switch to commercial fertilizers or reduce their use of fertilizer completely in compliance with their plans, the difficulties with manure management will become even more complex.

The hotspot on the Delmarva Peninsula produces 9% of the entire watershed's pollution into the bay, making developing strategies for manure management a critical investment.[57] Yet chicken growers cannot afford to shoulder this responsibility alone. According to the USDA, in 2001 the average grower in Maryland made just over $24,000 in net income.[58]

The high investment costs of a new chicken barn skew this income, however. A modern broiler house and equipment costs between $120,000 and $130,000.[59] Dr. Dan Cunningham of the University of Georgia estimates that the average income for a chicken grower is only $3,000 to $10,000 during the first 10 to 15 years of his operation, and rises to $28,000 to $35,000 only after the mortgage for the chicken house is paid off.[60] This low income leaves little room for manure management strategies.

The Tough Task of Raising Poultry[61]

Driving through the lower Eastern Shore, one cannot help but notice chickens. The long, low barns that checker the landscape are the cornerstone of Delmarva farming. Lee Richardson uses his barns to supplement the income from his crop farming operation. As he remarked, "In years when we don't make a profit from the farm, those chicken houses provide a stable income we can rely on." But chickens come with their own cost. Mr. Richardson's four chicken houses produce a massive amount of waste. He is fortunate to have a farm with over 250 acres on which to use the manure, but until recently he had nowhere to store it between applications.

"You need somewhere to keep it... you should only apply it twice a year." Leaving the manure in a pile meant leaving it exposed to the elements and possibly letting it leach into the waterways. But even basic manure sheds cost upwards of $20,000. Mr. Richardson applied for state cost-share funding, and with 87.5% of the funds provided by the state was able to build a shed that can house his waste. "It keeps it safe and out of the bay." He also relied on state funding to build a composter for chicken by-products other than litter. "Before the composter we had to bury them and hope they would break down, but they didn't. Now they break down fine and we can spread them with the manure."

The difficulty in dealing with the manure intensifies when the time comes to spread it on the fields. "Farmers used to think manure was a waste product. They would just spread it to get rid of it and apply fertilizer for the nutrients

they needed. Now we know that manure has most of the nutrients we need." But figuring out the correct nutrient ratios is a complicated task. Before applying poultry litter to a field the farmer must test the manure for its nutrient content, test the soil for its nutrient needs, and factor in slope, type of crop, and expected yield.

"The nutrient management planning process is intense. It takes a lot of time, and you need people to do it. It's always changing." Just deciding who should make the plan is complicated. "The county extension office will do a nutrient management plan for free, but if the farmer is certified [to do his own] then you can't get the free service. You can get state cost-share to have a private consultant make it for you, but that can still be expensive." State budget cuts have reduced the staff available at county extension offices, reduced the funding available to hire consultants, and closed the only soil testing lab in Maryland, forcing farmers to send their samples out of state to get the testing done. "I've let my certification expire, because I don't have the time to do my own nutrient management plan. I have to get a consultant to do it, because they can do all the testing I need."

Implementing nutrient management plans compounds the difficulty of dealing with chicken litter. Chicken litter is high in phosphorous, which breaks down and enters the soil over a three-year period. "The soil on the Eastern Shore is just phosphorous rich. You can only apply manure every three years, and have to supplement that with commercial nitrogen." Other best management practices can also inhibit the use of litter.

As more farmland is lost to development and the science behind nutrient management evolves, the options for the application of chicken litter dwindle. This puts more pressure on small growers who don't have the land to spread their litter on. And with phosphorous levels on the Eastern Shore rising, farmers need ways to get their litter off the peninsula. "People who don't have a plan for how they'll use their litter, they shouldn't get into this business." For poultry growers without a means to dispose of their waste, the costs are just too high.

Corporate Irresponsibility

Four integrated poultry companies—Perdue, Tyson, Montaire, and Allen—have driven the development of the poultry industry on the Delmarva Peninsula. These companies have revolutionized poultry production, making it a highly integrated process where the company provides every service and the grower simply raises the birds.[62] The companies own the breeder flocks, hatcheries, feed mills, and processing plants; they provide the growers with chicks, feed, medication, bedding, and technical support.[63] But these companies leave growers, who earn small profits, on their own to handle all the waste.

Growers work for the companies under a contract that dictates nearly every aspect of production. The contracts specify the type of house and equipment the grower must purchase, the type of litter to use and frequency of cleanouts, the delivery and removal dates of the flocks, and all aspects of payment.[64] The company pays the grower for the chickens based on how much weight they gain during the seven weeks the grower has them, and also pays incentives based on which growers see better weight gain for the amount of feed they use.[65]

The contract system leaves growers with little bargaining power and almost no ability to control their practices or payment.[66] The Rodale Institute, an international group focused on sustainable agriculture, says this system leaves growers open to abuse by the companies.[67] Producers can pressure growers to purchase expensive upgrades to their barns or keep growers from complaining by sending them poor quality birds or feed, so that the birds do not make weight, canceling their contracts, or withholding flocks of birds completely.[68] A 1997 survey of Delmarva poultry growers found that 43 percent said they did not trust their company's feed delivery weights, 41 percent don't trust the figures on their pay statements, and 57 percent believe the company will retaliate if they raise concerns.[69]

The grower is also left with complete responsibility for the waste produced by the company's chickens, including both poultry litter and dead birds.[70] Thus the contract system leaves growers with an expensive problem and little money to invest in the solution. While growers make only a 4% return on their investments, producers make returns of 16%.[71] And poultry producers have seen their profits skyrocket in the last few decades. According to the USDA, profits for poultry production doubled between 1987 and 1997 alone.[72]

Nationally, Tyson is the leading producer of chicken, with Perdue ranked fourth, Mountaire Farms seventh, and Allen nineteenth.[73] Tyson Foods alone saw sales of $26 billion in 2004, with overall profits of $925 million.[74] These profits made Tyson number 72 on the Fortune 500 list.[75] Its chicken sector produced $8 billion in sales and $548 million in income, a 13% increase from 2003.[76] And industry analysts expect that trend to continue, with over a 4% increase in production projected for 2005.[77]

Chicken production is slightly more expensive in Delmarva than in other regions of the country. Due largely to

Photo courtesy Maryland Department of Agriculture.

increased mortality and higher grain and electricity prices, it costs 9 cents more to produce a chicken in Delmarva than the industry average.[78] Even so, a 2003 study by the Maryland Center for Agro-Ecology found that the chicken industry on Delmarva was strong and profitable, and that processors could afford stricter environmental standards.[79] Furthermore, the costs of producing chickens in this area are offset by the savings from being closer to regional markets, with access to overseas markets from the Port of Baltimore.

The companies know that chicken growing is a messy business, and that growers cannot handle the problem alone. In June of 2005 the companies signed a Memorandum of Understanding with the Maryland Departments of Agriculture and Environment, pledging to provide their growers with education and technical assistance to help them manage their waste.[80] But although the producers agreed to research better ways to deal with the problem, they accepted no liability for the litter and did not pledge any financial assistance to help their growers manage it.

Contract Growers Fighting for Their Fair Share[81]

A poultry science graduate of Pennsylvania State University, Mark Skinner knows the science and the economics of contract growing. But watching his friends struggle through the contract system was enough to make him travel a different route, and he now oversees heritage breeds at the Accokeek Foundation National Colonial Farm.

"The poultry industry is the most integrated of all the meat industries," he said. "The company owns the genetic line of chicken, the hatchery, the feed mill, and the processing plant. The grower doesn't own the chicken, just the building and the waste." He argues that the integrated nature leaves the system open to abuses. "If the grower does not play nice, the company can give him bad birds or withhold the chickens."

Growers with thousands of dollars invested in their chicken houses can't just leave the business, and since there is no independent processor and few other companies to turn to, they must take whatever conditions their current company provides. Worse, company standards have often changed by the time the grower has paid off the mortgage on his chicken houses. Since the new standards require bigger houses or new technology, the current house becomes obsolete. The grower is then stuck with a useless building contaminated by ammonia and other toxics from the birds.

Dealing with manure makes the grower's life even more difficult. Growers need storage for their manure, which can accumulate to massive quantities depending on how frequently the company requires them to clean out their houses. "Some companies require the grower to clean and wash their houses between each flock. Other companies will just have them add a thin layer of bedding between flocks and clean out the house infrequently, once a year or even once every few years."

When those houses are cleaned out, the grower must dispose of large amounts of litter. Growers will first try to sell their litter to local farms. If oil prices are high, then commercial fertilizers are expensive and farmers are more willing to buy litter for their fields. But if growers can't sell it, they will try to give it away and pay the shipping fees to transport it. When even that isn't possible they are stuck with a problem that just continues to grow. "Growers need help to deal with the litter."

Getting Manure Where It's Needed

State cost-share programs give farmers options for how they use their manure, decreasing the build up in the hotspot. The tools to manage manure are varied, ranging from feed management to transport to alternative uses. But state assistance is needed for each of those options.

In the 1998 Water Quality Improvement Act, the state mandated that poultry companies add an enzyme called phytase to their chicken feed.[82] That enzyme helps chickens absorb more phosphorous from their feed and its use has resulted in a 16% decrease in phosphorous in poultry litter in just five years. Further feed modifications could cause another 30-50% decrease in nitrogen and a 30-40% decrease in phosphorous in animal manure. But these methods require investment for research and implementation.[83]

Alternative uses for poultry litter provide another mechanism to deal with surplus manure on the Eastern Shore, but these projects also require outside funding to be cost-effective. For example, Perdue and AgriRecycle jointly operate a pelletization plant in Delaware that takes chicken litter from neighboring farms and converts it into pasteurized granular fertilizer, which it then markets nationwide.[84]

The plant has the capacity to produce 150,000 tons of pellets but currently produces only 50-60,000 tons annually.[85] Construction of the plant cost about $12 million, $2 million of which was subsidized by the state of Delaware.[86] Perdue AgriRecycle pays chicken growers for their litter, but the company can use Maryland's Manure Transport funding to help with the cost of transporting it to the plant.[87]

Maryland's Manure Transport Program and Manure Matching Service provide immediate solutions to the chicken litter problem by simply removing excess manure from the Lower Eastern Shore. The Manure Matching Service links farmers who have excess manure with those who need it. And the Manure Transport Program assists farmers with the cost of moving the manure to another farm, paying shipping fees of up to $20 per ton.[88]

Although the program can be used for any type of animal waste, the poultry companies match what the state spends for poultry litter. This matching funding makes the Transport Program a valuable investment, as it doubles the impact of every dollar the state spends.

This service helps ship manure to farmland outside the hotspot and to alternative uses, such as mushroom farms or the Perdue AgriRecycle plant.[89] Indeed, 73-80% of the Transport Fund payments generally go for alternative uses and only 20-27% for land application.[90] Unfortunately, support for the Manure Transport Fund has been greatly reduced since its inception, decreasing from $750,000 in 1999 to less than $500,000 in 2002 and $250,000 in 2003. The program has a budget of just $200,000 for 2006.[91]

The Manure Transport Fund has great potential, but its small budget has kept its impact low. The Fund had a slow start, only using a fraction of its budget

Turning Waste Into Energy

Like spinning straw into gold, the possibility of converting chicken litter into energy offers the most hoped-for solution to the hotspot problem. But the difficulty with converting litter into energy is twofold—environmental impact and cost. The current approach, incineration, sends more pollution into the air than it keeps from the water.

Litter incineration produces more hazardous air pollution than coal-fired plants, including nitrogen oxide, sulfuric acid, hydrochloric acid, dioxin, copper, and arsenic.[100] In 2000, Delaware passed legislation that banned large incineration plants in response to these risks.[101] And when Fibrowatt Ltd, which operates three incineration plants in the United Kingdom, explored the possibility of building an incineration plant in the Delmarva region, community health concerns resoundingly defeated the proposal.[102]

Scientists believe that alternatives to incineration do exist. They are researching ways to turn litter into energy in an environmentally sound manner. Some examples include:

- The Gas Technology Institute, with a grant from the USDA, has successfully gassified chicken litter, producing enough hydrogen to power a fuel cell.[103] This energy has the potential to provide power to individual farms.
- Several projects are currently underway to analyze the feasibility of chicken litter in an anaerobic digester.[104] Digesters draw methane from the litter and use this as a fuel source. Given the low methane potential of poultry litter, this technology would utilize a large quantity of litter at a centralized power source.
- Flex Energy is developing a methane-powered microturbine generator that could run off fuels such as chicken litter that only generate low levels of methane.[105] This technology would provide generators for individual farms.[106]

These alternatives to incineration have the potential provide a sustainable income for farmers and ease one of the largest costs associated with the chicken industry, electric bills.[107] And the environmental benefits of a green source of energy from chicken litter are immense. But the costs of developing and implementing new technologies are prohibitive. These projects will not move forward without outside assistance.[108]

in its first few years.[92] In 2002 awareness had built and the program hit a high mark, shipping 43,000 tons of manure. But funding was cut just as the program started to take off, and the amount shipped each year has slipped to between 24,000 and 38,000 tons a year.[93] This reduction has occurred while the need has grown, as implementation of nutrient management plans have increased and more farmers find themselves unable to use the manure on their own land.

A lack of outreach to farmers has also hurt the program. Because the funding has been cut so drastically, the department is afraid to advertise too aggressively in case applications began to outstrip their budget.[94] As a result, few farmers are even aware of this program.[95] Funding at the original level would be necessary to run the program at its maximum level. The presence of guaranteed funding would also encourage private shipping companies to do more shipping.[96] If the state doesn't pay for the transport, the manure simply will not get moved.[97]

Worcester County in the Heart of the Hotspot[98]

Carole Morison knows how hard it is to manage manure in the phosphorous hotspot of Worcester County. Balancing her work as Executive Director of the Delmarva Poultry Justice Alliance with the needs of her two-house chicken farm, Ms. Morison experiences first-hand the difficulties of contract growing.

"We have 86 acres and two chicken houses, and can't use the litter on our land. We have enough phosphorous in the soil to last ten years," she explained. Fortunately, Ms. Morison is able to give her manure to a neighboring farmer. She notes that

most people don't have that outlet. "Most people can't figure out an option."

She had never heard of the Manure Transport Fund, and doesn't believe her neighbors have either. The AgriRecycle plant is able to process roughly 10% of the litter from the peninsula, but since it collects only from the area in close vicinity to the plant most growers in Worcester County are not included. To get rid of their litter, "some people have to spread it constantly." As land is developed and nutrient management plans are enforced, Ms. Morison fears this situation will only get worse.

Even without concerns over nitrogen and phosphorous, Ms. Morison worries that land application of chicken litter is not entirely safe. Company feed includes arsenic and high levels of antibiotics, intended to help the birds resist disease. Recent studies have found trace levels of bacteria in chicken litter resistant to the antibiotics the chickens are fed. And chickens only absorb about 0.5% of the arsenic they consume, excreting the rest into the litter. The high levels of arsenic in chicken litter have spurred a lawsuit by a group of concerned citizens in Arkansas, who claim that the arsenic in the soil has created a cancer-pocket in their area.[99]

The difficulty in dealing with litter has increased as companies have required larger flocks. While small growers like Carole used to have two to three houses with 20,000 chickens at a time in each, many growers now have ten to twenty houses that hold 35,000 chickens each. "A farm near me has eight houses on ten acres." Without assistance in dealing with the litter, growers in this concentrated area have few options for what they can do with their waste.

The contract situation compounds the problem, as the costs of environmental regulations get handed to the farmers. "The cost of anything that is enforced gets passed on to the growers." But with the majority of farmers unable to use the litter on their own land, some other option is necessary.

Providing Assistance to Cut Pollution

Whether paying farmers to plant cover crops, financing a manure shed, or funding research for new sources of energy, state cost-share programs for agricultural conservation are the wisest investment Maryland can make. The existence of these ready solutions makes agriculture the most cost-effective means to reduce nutrient runoff into the bay.

The Chesapeake Bay Commission estimates that, bay-wide, agriculture could achieve 54% of the nitrogen and 62% of the phosphorous reductions necessary to meet the goals of the Chesapeake 2000 Agreement.[109] And while agriculture has the potential to make the lion's share of reductions, it would have one of the lowest costs—only 8% of the total price tag required for all of Maryland's promised reductions.[110] Indeed, five of the six most cost-effective measures for cleaning up the bay are agriculture based.[111]

These reductions are possible because farmers are willing and the solutions exist. Only the funding is lacking. Maryland's ten tributary teams, working with the Department of Natural Resources, have developed a Tributary Strategy that analyzes the cost of meeting the state's water quality goals.[112] They estimate that the price tag for the agriculture portion of the strategy will be more than $800 million.[113] These strategies would reduce nitrogen pollution by 10.67 million pounds and phosphorous by 59,000 pounds a year, 55% and 62% of Maryland's total reduction goal.[114]

Funding for conservation programs helps farmers from every sector of agriculture, whether raising crops, chickens, or pastured livestock. Pastured animals create their own problems, as scattered manure leaches nutrients into soils and waterways and roaming animals degrade streams in their pasture. Farmers traditionally built their barns on the edge of waterways and let their animals roam through and drink from the streams in their pasture. They must now change their farming methods and move their animals away from the water.[115] The MACS program helps farmers build manure sheds, fence off streams, and install alternate sources for drinking water.

These state programs aren't any good, however, without technical assistance to help farmers understand and implement new practices on their farms. The MACS program grants are administered through twenty-four soil conservation districts located in each county across the state. Personnel in these offices build relationships with farmers in their region, help them identify ways to reduce their runoff, explain and expedite the state programs, and keep farmers informed of new technology and research.[116]

This technical assistance is vital to keeping farming viable in the state. The number of farms and acres of land in farming have dropped precipitously in the last few decades, as escalating land prices have made leaving farming more attractive than entering it.[117] Working with their county conservation district, farmers can learn about new technologies

and practices that make their streams cleaner, their soils more productive, and their routine easier. The initial costs are prohibitive for farmers on their own, but with MACS assistance they can install practices that pay off in a more sustainable and manageable farm.

When Cows and Streams Collide[118]

When Dan Vaughan first built his dairy barn, he was more concerned about how than where to start up his operation. To save costs he built the cow barn completely by hand, enlisting the help of his family to get the structure up and running. It wasn't until much later, with the operation settling into a productive routine, that he could turn his attention to other concerns like nutrient management. And then he realized he had a problem—the cows were producing a lot of manure, and it was starting to degrade the stream that ran through the farm.

Mr. Vaughan knew he needed to build a manure shed where he could store the manure without fear of runoff. Then during the spring and fall growing seasons he would have a cache of fertilizer ready to apply to his fields when the nutrients would be most valuable. But the cost of a manure shed was prohibitive. He noted, "This shed cost about $85,000. I couldn't afford that on my own."

Mr. Vaughan turned to the state soil conservation district for help. The shed qualified for MACS funding, so 87.5% of the costs were covered. Although a price tag of $10,600 was a major cost for a small dairy farm, Mr. Vaughan went ahead with the project. "The people in the soil conservation district were really helpful. They really encouraged this project along."

In the end, building the shed cost more than just money. From grading and building to cow-proofing, work on the shed moved slowly and required constant dialogue between the construction crew and Mr. Vaughan. And during this whole process the daily routine of the farm was severely limited.

In the end, though, the time, money, and stress were well worth it. The shed has concrete floors and low walls, keeping water out and nutrients in. The shed also operates as a composter when needed, solving another difficult management problem. "You throw waste products in there and by the time you need to spread it on the fields, it's just fertilizer." And the water quality in the stream has noticeably improved. "You used to be able to see the runoff. Now the stream's much cleaner."

Mr. Vaughan is now working with the soil conservation district on another project to further protect the stream, building a concrete crossing and installing fencing to prevent further deterioration and erosion of the stream banks. "I'm willing to do what I can to help the stream." But, like the manure shed, the existence and success of this project requires extensive funding and participation by the state. "I would not be able to do this alone."

Photo courtesy Alix Morse.

Policy Recommendations

When Maryland signed the Chesapeake 2000 Agreement, the state pledged to restore the Chesapeake Bay to a healthy state by 2010.[119] But half-way to that deadline we are not half-way to that goal.[120] The bay still suffers from crippling dead zones caused by an overload of nitrogen and phosphorous.

While nutrient pollution comes from many different sources, agriculture is the most efficient source for the state to focus on. Agriculture produces roughly a third of the nitrogen and phosphorous in the bay every year, but a smart investment in agriculture can produce nearly two-thirds of Maryland's required runoff reduction.[121] This makes agriculture the most cost-effective focus for state funding, since this reduction would be made for only 9% of the total cost to clean up the bay.[122]

Funding these programs helps not just the bay but farmers as well. Farmers in Maryland face immense challenges. The prices they receive for their produce cannot keep pace with the skyrocketing costs of farming, particularly land and energy costs. Environmental regulations add yet another layer of expenses to an already strained industry. By funding conservation practices the state makes it possible for farmers to make changes that protect the bay and preserve their land.

Maryland should take the following steps to reduce runoff pollution into the Chesapeake Bay and help the farming industry remain strong in the state.

Fund the Tributary Strategy recommendations for agriculture, providing funding for the MACS programs and the Manure Services. Whether planting cover crops, establishing buffers, or implementing manure management practices such as manure sheds or transport, these practices prevent nutrient runoff at its source. Giving farmers the ability to make these changes helps keep farmers on the land and nutrients out of the water.

Require poultry producers to provide more financial assistance to growers in managing their manure. Chicken growers are in a truly difficult position, left to handle an expensive problem with few financial resources. Producers can do more to help their growers safeguard the environment and stay profitable.

Fund the Soil Conservation Districts and the Agriculture Extension Service to provide technical and policy assistance to farmers for implementing conservation programs. Most farmers do not have the time to invest in researching new ideas or deciphering state policy. Having knowledgeable staff that can assist farmers in identifying and implementing new practices on their farms makes these programs work.

Invest in the development of clean energy sources from chicken litter. Storage, transport, and land application are only short-term solutions to a long-term problem. While incineration is not an option, developing clean ways to turn litter into energy provides a real solution to runoff while providing a new source of renewable energy.

Notes

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[3] Water Quality Improvement Act, Maryland House Bill 599 (1998).

[4] For a full list see the Maryland Department of Agriculture Office of Resource Conservation, "Maryland Agricultural Water Quality Cost-Share Program: Providing Grants to Help Farmers Protect Natural Resources," (Brochure, 2003 Revision).

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[6] Chesapeake Bay Program, "Chesapeake 2000 Agreement," downloaded from http://chesapeakebay.net/agreement.htm on October 24, 2005.

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[11] "Chesapeake 2000 Agreement," supra note 6.

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[13] "Cost-Effective Strategies for the Bay," supra note 7, p. 3.

[14] Id.

[15] Id.

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27 Chesapeake Bay Foundation, "Manure's Impact on Rivers, Streams, and the Chesapeake Bay: Keeping Manure Out of the Water," p. 6 (July 28, 2004).

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29 Lee Richardson, Maryland farmer, personal communication, August 24, 2005.

30 "Cost-Effective Strategies for the Bay," supra note 7, p. 12.

31 Id.

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43 Id.

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46 "Manure's Impact," supra note 27, p. 5.

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[90] Id.
[91] Id.
[92] Id. The program spent $36,000 its first year, $222,000 the second, and $390,000 the third, with half that funding in state money and the other half from the industry.
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[96] Norman Astle, supra note 89.
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[105] Edan Prabhu, President of Flex Energy, personal communication, October 5, 2005.
[106] Id. Early trials have not been successful, as the chicken litter has clogged the turbine, but the turbine itself has been very successful running off similar low-methane fuels and further research into chicken litter continues.
[107] John Vandiver, supra note 78.
[108] The Mississippi study alone has required a $1 million investment by the state, though the directors hope to recover this investment in 7-8 years (Sumesh Arora, supra note 104).
[109] "Maryland's Tributary Strategy," supra note 5, p. 9.
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[111] "Cost-Effective Strategies for the Bay," supra note 7, p. 3.
[112] "Maryland's Tributary Strategy," supra note 5, p. 1.
[113] Id., p. 9.
[114] Id.
[115] See "Vital Signs," supra note 33, p. 14.
[116] Dan Vaughan, Maryland farmer, personal communication, September 1, 2005.
[117] "Vital Signs," supra note 33, pp. 6-10.
[118] Dan Vaughan, supra note 116.
[119] "Chesapeake 2000 Agreement," supra-note 6.
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[122] Id.

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