

**REPORT OF THE
JOINT LEGISLATIVE AUDIT
AND REVIEW COMMISSION**

Review of Nutrient Management Planning in Virginia

**TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA**



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Preface

House Joint Resolution 72 of the 2004 General Assembly called for the Joint Legislative Audit and Review Commission (JLARC) to study the effectiveness of Virginia's nutrient management plans (NMPs). NMPs are site-specific documents that serve as planning tools for the efficient use of plant nutrients, such as nitrogen and phosphorus, to best meet plant needs while also minimizing the impact of these nutrients on water quality. Plants and crops need an adequate amount of nutrients to ensure healthy growth. However, an overabundance of nutrients can negatively affect aquatic habitats. The mandate directed JLARC staff to evaluate several areas, such as the current level of participation, compliance, and enforcement of the NMP program, the adequacy of the record-keeping requirements for animal waste transfers, the use and implementation of NMPs by State agencies and also in urban and rural settings, as well as examples of the effective use of NMPs, as applicable.

As of June 2004, nutrient management plans had been developed for approximately eight percent of all cropland and pastureland in the Commonwealth. JLARC staff found these NMPs to be generally well written. However, under the current regulatory structure, the effectiveness of NMPs in reducing nutrient losses may be diminished due to permissible adjustments to the recommended nutrient application amounts.

Several issues related to implementation and enforcement of NMPs that are required under State law are identified in this report. For example, 60 percent of farmers who are required to implement their NMPs indicated on a JLARC staff survey that they always implement the plan; however, only between eight and 14 percent of the surveyed State-certified nutrient management planners suggested likewise. Additionally, the State's current approach to inspecting permitted agricultural operations and enforcing the conditions in the permits has been weak. Moreover, instances of serious and repeated violations of plan conditions were found in which the Department of Environmental Quality (DEQ) took no enforcement action. DEQ has also not adequately tracked the transfer of poultry waste as required by State law.

Virginia's attempts at initiating a poultry waste transport program and developing alternative uses for poultry waste have not been overly successful, although some progress has been made. Opportunities also exist to increase the use of nutrient management planning on State-owned or leased land and in urban settings. Three options are presented in the study concerning potential approaches to nutrient management in the State, including increasing the amount of acreage managed by a NMP. These options include: maintaining the status-quo but implementing phosphorus-based planning, increasing the level of mandatory NMP development, and encouraging the voluntary adoption of more NMPs by enhancing or augmenting current incentive programs.

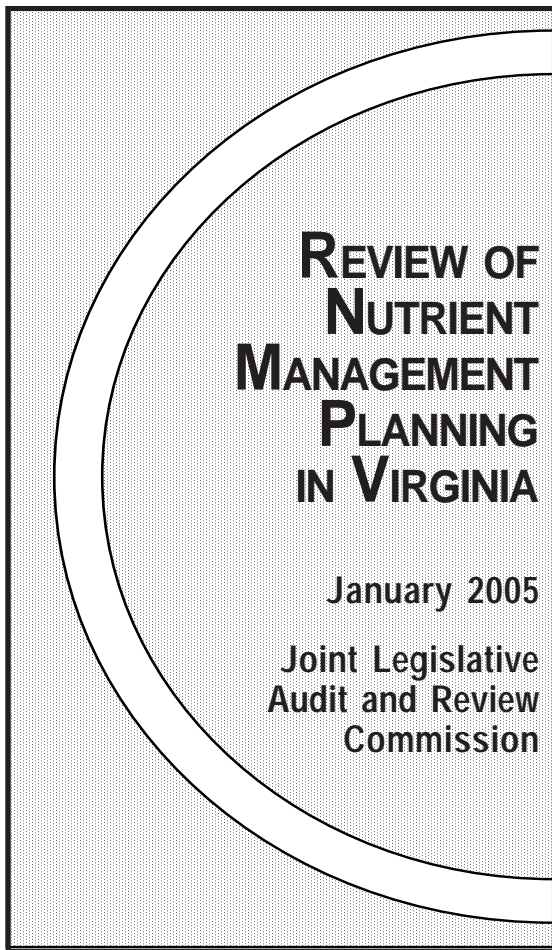
On behalf of the JLARC staff, I would like to thank the staffs of the Department of Conservation and Recreation and the Department of Environmental Quality, as well as the members of the agricultural community that provided assistance during our review.



Philip A. Leone
Director

January 6, 2005

JLARC Report Summary



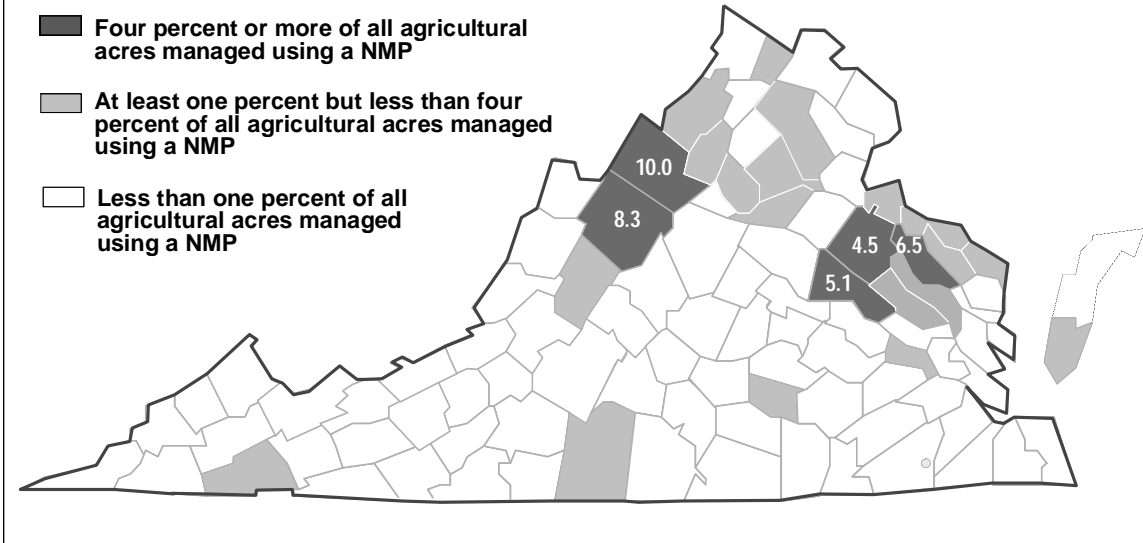
Nutrients such as nitrogen and phosphorus are essential as raw materials for organism growth and development, and are present in nature. Nutrients found in fertilizer or manure are used in agricultural production to ensure healthy crop growth, and are also used by homeowners and lawn care companies to ensure the quality of lawns, golf courses, and other settings. However, an overabundance of nutrients can negatively impact water quality. Excess nutrients relative to human activity stem from point sources (for example, wastewater treatment discharges) and nonpoint sources (for example, fertilizer or manure nutrients that

are lost through runoff, leaching, or erosion). High nutrient levels in water can lead to algal blooms and low levels of dissolved oxygen which have a negative impact on water quality and aquatic life.

Nutrient management planning is a method for increasing the efficiency of all nutrients used for crop and plant production, while reducing environmental risks. Nutrient management plans (NMPs) are written by specialists and document the activities that will accomplish these goals. In Virginia, some farms are required by law to have and follow NMPs (farms with a large number of confined animals), and some farms have adopted NMPs voluntarily, but most farms do not have NMPs. Nutrient management plans cover approximately 522,000 acres of agricultural land in Virginia, almost 40 percent of which are located in six counties (see figure, next page).

House Joint Resolution (HJR) 72, approved by the 2004 General Assembly, directs the Joint Legislative Audit and Review Commission (JLARC) to study the effectiveness of the nutrient management plans in the Commonwealth. HJR 72 specifically directs JLARC staff to study the effectiveness of the implementation, performance, and enforcement of the NMPs in Virginia through a review of the current level of participation, compliance, and enforcement of the NMP program. In addition, JLARC is directed to assess the adequacy of Virginia's requirements for collecting data on animal waste disposal and transfer. NMP use by State agencies is also to be reviewed, as is the use of and need for nutrient management practices and related educational efforts in urban and rural environments. Additionally, HJR 72 requires JLARC to provide examples, as applicable, reflecting the effective use of nutrient management practices in Virginia and other states.

Almost 40 Percent of 522,000 Planned Agricultural Acres Are Located in Six Virginia Counties



Virginia has an estimated surface area of more than 42,000 square miles, of which more than 39,500 square miles is land area. Land used for agricultural purposes accounts for approximately 24 percent of the Commonwealth's total area, while urban land uses constitute another seven percent. Farmers and other land users apply nutrients to the land for purposes such as growing crops or obtaining grassy lawns. Farm animal manure and commercial fertilizer are two major sources of nutrients. USDA estimates that manure and litter from Virginia's farm animals contained over 250 million pounds of nitrogen, and more than 79 million pounds of phosphorus in 1997. In FY 2003, about 189 million pounds of nitrogen and about 47.3 million pounds of phosphorus were sold in commercial fertilizers in the State.

Virginia also has nine major river basins, with an estimated 50,500 miles of perennial rivers and streams and approximately 2,500 square miles of estuaries. Four of the nine water basins drain to the Chesapeake Bay, which is on EPA's list of impaired waters. According to DCR's 2002

Biennial Nonpoint Source Pollution Water Quality Assessment Report, a State watershed model indicates that about 70 percent of the State's total nonpoint source nitrogen load and 60 percent of the State's total nonpoint source phosphorus loads are reported to come from agricultural land uses.

Nutrient management planning involves finding effective ways to meet agricultural needs to promote plant growth through the use of nutrients on land, while also pursuing State commitments to improve water quality. This balancing act is especially important for Virginia, where: (1) agricultural activity on more than 6.2 million acres accounted for greater than \$1.8 billion in cash receipts in 2002, and (2) the State is actively involved in significant efforts to protect and improve water quality in the Chesapeake Bay and other State waters. The implementation of more nutrient management plans in Virginia has been seen by State strategy planners as a potentially cost-effective means to achieve agricultural objectives and water quality goals.

The JLARC staff assessment of the effectiveness of nutrient management plan-

ning in Virginia has resulted in several findings.

- NMPs that are written in Virginia appear to be generally good in quality. They are typically complete and consistent with requirements established in the *Code of Virginia* and regulations. However, adjustments permitted under the current regulatory language raise some concern that nutrient applications can deviate too far from plan recommendations.
- Survey data from farmers and nutrient management planners present a somewhat mixed picture regarding the implementation of NMPs. Sixty percent of farmers who are required to implement their NMPs indicate that they always implement their plan. On the other hand, only between eight and 14 percent of the certified nutrient management planners indicate their view that farmers always implement their plan. Both groups, however, indicate that farm operators are following their required plans at least most of the time.
- Virginia's approach to nutrient management planning and enforcement of the plans relies heavily on the good will and honest reporting of farmers. The State's inspection and enforcement activities for required NMPs have been weak. Inspections are announced, and compliance checks mostly involve a review of the records kept by farmers. Department of Environmental Quality (DEQ) inspectors are rarely present when farmers are in the process of applying nutrients to their crops. Furthermore, four of the five DEQ regional offices visited by JLARC during this review were unable to meet a *Code of Virginia* requirement to perform annual inspections of the confined animal and poultry feeding operations. DEQ inspections

of these operations have found some compliance problems, such as the over-application of nitrogen and phosphorus. In these cases to date, DEQ staff have focused on compliance assistance rather than enforcement actions. For farmers using required NMPs for the first time, this focus may be appropriate. However, most inspections that DEQ now conducts are repeat inspections, and to this point, DEQ has had weak enforcement. The degree of rigor that is appropriate for the State's inspection and enforcement program for NMPs is a policy choice. However, the State may wish to consider whether DEQ staff should proceed more vigorously in instances where there are serious or repeated violations of NMP conditions.

- Virginia's attempt at initiating a poultry litter transfer program has not been as successful as originally hoped. Additionally, DEQ has not been adequately tracking where the poultry litter is being transported to, as is required by statute, and end users of the litter are not required to have NMPs. There has been little movement towards developing alternative methods for using poultry litter, although a feed additive has shown promise for reducing poultry litter phosphorus levels.
- There are opportunities to increase the use of nutrient management planning in urban areas and on State-owned lands.
- The report discusses several potential changes to nutrient management planning that are already underway, or that could be considered, to improve the plans or the process and increase the protection of water quality. A major change that is underway is a movement to "phosphorus-based" NMPs. Some

other potential changes, such as increasing the acreage covered by NMPs, could entail additional resources from the State, depending on the policy choices that are made.

The degree to which nutrient management plans are effective at reducing nutrient losses relies heavily on the degree to which people using the land implement and comply with the requirements of the plan. State oversight of the extent to which required and voluntary NMPs are implemented and complied with is limited. The Commonwealth has set ambitious goals for NMP coverage through its efforts to improve water quality in the Bay watershed, and it appears that achieving those goals will require some substantial measures to further promote nutrient management planning activity in Virginia.

Nutrient Management Plans Written for Agricultural Land Are Generally Good

Virginia's nutrient management program has largely focused on controlling nutrient losses from agricultural operations. Findings published by the federal and State governments point to agriculture as the primary source of nutrient loss. In fact, the Department of Conservation and Recreation (DCR) has reported that between 60 and 70 percent of the nonpoint source pollution nitrogen and phosphorus loads to the Chesapeake Bay are the result of farming activities. Beginning in 1994, the Commonwealth has sought to control those losses by requiring confined animal and poultry feeding operations that meet certain State regulatory requirements to develop and implement NMPs. Currently, more than 1,000 confined animal and poultry feeding operations are administering their use of animal wastes under a NMP on more than 155,000 acres. Another 366,000 acres are managed under NMPs that have been developed for reasons

other than meeting the requirements governing confined animal and poultry feeding operations.

Plans written to comply with the State's regulatory program for confined animal and poultry feeding operations must be approved by DCR prior to DEQ permitting the facility. DCR staff indicated that for the most part, plans they receive as part of this process are written in conformance with the State's requirements. In addition, JLARC staff reviewed a sample of NMPs that were written for regulated facilities as well as voluntary plans to assess the extent to which these plans contained the information required under the *Code of Virginia* and in State regulations. The vast majority of plans that were reviewed did contain the required items.

Nonetheless, some concerns exist regarding the extent to which written plans may allow for nutrient applications above the needs of plants. The nutrient reduction benefits of NMPs are expected to typically result from achieving relatively modest reductions in the total nutrients applied by farmers to fields, compared to what farmers might otherwise apply. To the extent that standard NMP recommendations are relaxed, the benefits of NMPs can be compromised.

Virginia's approach establishes certain application rates, or the rates at which nutrients can be applied to specific crops to ensure certain yields, based on the past productivity of soils found in Virginia. Then, in order to reduce the risk of diminished crop yields, application rates established by the State allow for an increase in nitrogen loads between 13 and 31 percent for corn grain greater than the crop can actually use, depending on the soil productivity. In addition, under current regulations farm operators are allowed to make upward adjustments to the application rate recommended in the plan on 20 percent of their fields without documentation to indicate that productivity is bet-

ter on those fields than elsewhere. DCR regulations state that these be “reasonable adjustments,” but there is no way to verify that such an approach is used. There is reason for concern that overly generous allowances and adjustments to the original application rates in the NMPs themselves may jeopardize the ability of plans to reduce nutrient levels from historical rates of application.

Recommendation. *The Department of Conservation and Recreation’s regulations should reflect statutory requirements that NMPs include a site map indicating the location of waste storage facilities and fields where waste will be applied. In addition, the department should consider requirements that NMP maps identify environmentally sensitive sites and buffer areas in the acreage to be managed. Finally, the department should consider the potential need for a more stringent approach with regard to the permissible extent of deviation from typical assumptions about crop yields and application rates that planners can build into a NMP.*

Survey Data Presents a Somewhat Mixed Picture Regarding the Implementation of NMPs

To assess farmer attitudes and implementation levels regarding NMPs, JLARC staff conducted a survey of farmers and certified nutrient management plan writers. Results from the surveys suggested that most farmers find their plans to be realistic most or all of the time. Farmers report a substantial level of implementation and compliance with required NMPs. For example, 60 percent of farmers reported that they implement their required NMPs all of the time, and few farmers indicate that they disregard their NMPs.

On the other hand, about 40 percent of farmers with required NMPs who responded to the survey reported that they think that their NMP is only sometimes or rarely realistic. Most of these farmers think that their

NMP is unrealistic because it does not provide for the application of the quantity of nutrients that they think is appropriate for their crops. Also, about 40 percent of farmers responding to the survey indicated that they do not always implement their required NMP. Moreover, nutrient management planners had a more guarded perspective regarding NMP implementation than the farmers. The majority of these planners indicate that farmers with required NMPs implement their NMPs most, but not all, of the time.

Virginia’s Approach to NMPs Relies Heavily on the Good Will and Honest Reporting of Farmers, and Enforcement of NMPs Is Weak

The Department of Environmental Quality is statutorily responsible for annually inspecting confined animal and poultry feeding operations that have received a State operating permit. DEQ inspections are announced in advance, and inspectors are seldom present when farmers are in the process of applying nutrients to their crops. Inspections largely focus on reviewing records kept by the farm operators indicating how much nutrients were used, when the nutrients were applied, and the nutrient content of the animal wastes used. Inspectors also visually evaluate certain fields on the farm for problems with runoff, leaching, or erosion. However, it is difficult for inspectors to catch problems unless those problems are reflected in the records that the farmers provide. DEQ inspectors are not typically in a position to identify a compliance problem if farmers under-report the amount of fertilizer or manure that they have applied in the records they provide.

In cases where farmer records indicate that the NMP recommendations have not been followed, the inspector cites these instances as deficiencies and may or may not require corrective action to be taken. The type of corrective action and the timeline in which that action must occur is decided

upon by the inspector, and is based on the impact to water quality of the deficiency and the prior history of the operation.

JLARC staff conducted a file review of inspection reports in five DEQ regional offices to assess the extent to which deficiencies were noted and corrective actions were taken. As noted, the extent to which DEQ inspectors are in a position to detect NMP fertilizer application violations is limited. Still, JLARC staff found that of the 209 inspection reports reviewed, approximately one-third of the inspections found a recorded deficiency requiring corrective action, such as applying nutrients at a rate greater than prescribed in the plan or spreading out of season. (Not all observed deficiencies would have resulted in an immediate threat to water quality.)

While DEQ inspectors are required by the *Code of Virginia* to annually inspect all permitted confined animal and poultry feeding operations in the State, JLARC staff found that four of the five regions were not able to meet that requirement at different times during the past several years. One regional office performed only a small amount of inspections over an 18 month period. Another regional office did not conduct inspections during FY 2001 through FY 2003 unless a specific problem was reported at a particular operation. Because the inspection process is the only means of checking to see whether NMPs are being properly followed, it appears that the State needs to do a better job of inspecting every permitted operation, as currently required by law.

Recommendation. *The Department of Environmental Quality should develop inspection and enforcement guidelines for the use of regional offices. These guidelines should indicate the agency's policy for inspections, and provide guidance for corrective action, and punitive action as necessary, in the event of noncompliance. The department should consider more formal en-*

forcement actions in cases of serious or repeated instances of noncompliance. The department should also ensure that its regional offices are meeting the Code of Virginia's annual inspection requirement.

Virginia's Attempt at Initiating a Poultry Litter Transfer Program Has Not Been as Successful as Hoped, But a Feed Additive Has Shown Promise

Poultry litter has a higher phosphorus content than animal manure in part because chickens and turkeys do not process the phosphorus components of their feed as well as cattle and hogs. This has a substantial impact on where and how litter can be used. In general, poultry litter has the same amount of nitrogen as it does phosphorus. However, plants use only about half as much phosphorus as they do nitrogen. As a result, while a crop may use all of the nitrogen available to it from poultry litter, it will leave behind about half of the phosphorus. This leftover phosphorus will either bind with the soil, at which point it becomes a candidate for loss from erosion, or, if the soil is already highly saturated with phosphorus preventing binding with the soil, the excess phosphorus becomes a candidate for loss by means of runoff. In 1997, USDA identified five Virginia counties (Amelia, Augusta, Page, Rockingham, and Shenandoah) that are particularly likely to have a problem with excess phosphorus, as there is more phosphorus in the manure of the farm animals in those counties than can be utilized by the crops and pasture land in those counties.

According to DCR, 411,000 tons of poultry are being transferred annually in Virginia. However, the majority of that litter appears to be transferred within high poultry production areas, such as the Shenandoah Valley. Because of the relatively high phosphorus content in poultry litter and the inability of crops to utilize as much phosphorus as nitrogen, repeated applications of poultry

litter to fields can result in elevated levels of phosphorus in the soil and increased risk for phosphorus loss through runoff or soil erosion.

In light of the problem of excess phosphorus production in animal manure, and particularly poultry, DCR and the Virginia Poultry Federation jointly funded a pilot litter transport project in an attempt to entice farm operators outside of the Shenandoah Valley to accept poultry litter produced in the Valley for field application. Initially, the program was designed to pay for as much as 16,000 tons of poultry litter to be transferred. However, over the two years the program was operational (2003-2004) only about 5,000 tons was actually moved. In addition, it does not appear that the project will be continued.

The *Code of Virginia* requires that DEQ track and account for poultry litter that is being transferred off poultry operations. DEQ created a poultry litter tracking and accounting sheet to assist the department in identifying trends in where the litter is going. These sheets are collected by DEQ staff at the time of each poultry facility's annual inspection. Nonetheless, DEQ has not adequately been performing this task. While DEQ field staff appear to be collecting this information, there is no statewide assessment of the places in the State to which the litter is being transferred. The department is also unable to determine, as is required by law, the amount of poultry litter that is being transferred to individuals or groups for the sole purpose of being transported to other farming operations. These entities, known as brokers, are required to report their activities to DEQ annually, but without the appropriate information from the transferring farmers or a statewide assessment, the department cannot identify how many brokers are actually operating in Virginia.

Virginia and other states are also trying to identify alternative uses for poultry litter besides land application as a fertilizer.

Some of these uses include transforming the litter into a pellet or granule that can be used as a commercial fertilizer or burning the litter to generate energy. To this point, however, Virginia has not been successful in implementing such an alternative use. However, a feed additive that reduces the amount of phosphorus that chickens and turkeys excrete in their litter has been developed and has been shown to reduce phosphorus content by as much as 30 percent in some cases. The additive, known as phytase, is currently being used by the five processors, but to varying degrees, and as a result, phosphorus reductions also vary.

Recommendation. *DEQ should implement a statewide accounting system for identifying poultry litter transfers and potential trends. DEQ may want to consider requiring the name and address of the litter recipient as a means of preventing potential misuse of litter transfers. Furthermore, poultry litter brokers should be required to provide an updated nutrient analysis of the litter if they combine litter from more than one farm during transport or storage. In order to reduce the potential water quality impacts of excessive poultry litter, the State may wish to consider regulatory requirements for and/or financial incentives to poultry processors to ensure the maximum use of phytase in their feeds.*

There Are Opportunities to Increase the Use of Nutrient Management in Urban Areas and Among State Agencies

HJR 72 required that the study review the use of NMPs in non-farm settings and on State lands. The proportion of nitrogen and phosphorus in commercial fertilizer that is accounted for by non-farm uses is a relatively low proportion of the total in all fertilizer sold (about 6 and 12 percent, respectively). Still, in light of challenging Chesapeake Bay nutrient reduction goals, as well

as equity concerns with regard to non-farmers as well as farmers sharing in the effort to achieve nutrient reductions, there is reason to consider opportunities to increase the use of nutrient management principles in the application of fertilizers on non-farm (urban) lands.

Use of nutrient management principles in the application of fertilizers is not currently required on urban land. The Department of Conservation and Recreation has so far focused its efforts on the large lawn care companies in the State, as a way to cover as much acreage as quickly as possible. DCR has developed a Water Quality Improvement Agreement (WQIA) program that relies on negotiated agreements between the lawn care companies and the department that establish guidelines for how the companies will administer their nutrient usage. In 2003, DCR signed WQIAs with about 30 companies covering 19,000 acres. Companies most willing to enter into agreements, however, may be those who already are applying nutrients most closely to the DCR guidelines.

With regard to State-owned lands, of the total of approximately 658,000 acres of land reported for this study by State agencies and institutions, only a small portion (about 25,000 acres) is agricultural land. Most (94 percent) of that agricultural land is managed under a NMP (even though a NMP is only required for 2,800 acres at the confined animal feeding operations located at the Southampton Correctional Institution and Virginia Tech). Also, about half of the reported 633,000 acres that is not agricultural is State park, forest, or marsh land where no nutrients are being applied.

However, it appears that there are opportunities for the increased use of NMPs on Virginia Department of Transportation land, and on up to about 10,000 acres of other State-owned land. The transportation department, responsible for about 300,000 acres of land, reports using nutrient man-

agement principles when engaging in land-disturbing activity, but does not fully engage in nutrient management planning. The department has proposed to undertake a NMP project in FY 2005 to guide, train, and educate its personnel in applying appropriate levels of fertilizer. Some State agencies and institutions with relatively small land holdings also appear to be candidates for NMP use.

At this point, State tributary strategies to meet Chesapeake Bay and other water quality goals call for a substantial increase in both agricultural and non-agricultural use of NMPs. If the State wishes to pursue these goals, it can set a better example if NMPs are used on all State and institutional lands that are agricultural or upon which fertilizer is actively applied.

Recommendation. *The Governor should consider issuing an executive order that requires nutrient management plans for State agencies and institutions with agricultural land, or non-agricultural land upon which fertilizer is actively applied.*

Several Potential Changes Are Underway, or Could Be Considered, to Improve the NMP Process and Reduce Nutrients

The last chapter of the report discusses several activities that are currently underway, or that could be considered, to bring improvements to nutrient management planning. The magnitude of the cost that may be associated with these changes depends in part on State policy choices regarding their implementation.

For example, DCR is in the process of promulgating regulations in order to implement nutrient management plans that focus on phosphorus as the main limiting factor. The phosphorus index that DCR is considering has been developed by Virginia Tech and has the potential benefit of facilitating a more rigorous assessment of where and to what extent nutrients may be applied to particular farm fields, and is likely to reduce

phosphorus applications on fields that are already highly saturated with phosphorus. However, it also entails some additional time and expense for plan development.

In addition, the State's provisional "tributary strategy" documents contemplate major increases in the amount of agricultural and other land that will be covered by nutrient management by 2010. Difficulties associated with achieving these goals include:

- (1) the amount of acreage that the strategies assume can be sustained within existing resources appears to be overstated, and
- (2) achievement of a greatly increased voluntary NMP acreage by 2010 is likely to require a level of financial inducements or assistance to land users that is not currently available.

The report discusses three approaches or policy options for consideration by State policymakers. These approaches are not mutually exclusive; each contains at least some element that could be utilized in combination with the others. The three primary approaches discussed in the report include:

- **Largely maintaining the status quo, but with the use of phosphorus-based plans** – While continuing with the current approach is not likely to generate large increases in additional acreage being planned under a NMP (such as those called for in the tributary strategies), it may allow the State and farm operators to adjust to the changes brought on by the introduction of phosphorus-based planning.
- **Making the NMP effort more rigorous** – The NMP effort could be made more rigorous by requiring more acreage to be managed under a plan, and by making changes in the DEQ inspection process and follow-up enforcement practices. To increase acreage under

plans, the State could mandate that more planning occur on agricultural and non-farm acreage. This is an approach that is being taken in Maryland, for example. In addition, modifying DEQ's current inspection approach to focus more on monitoring the actual land application of nutrients and somewhat less on record-keeping would provide more assurance that plans are followed. DEQ could be encouraged to have a more rigorous enforcement program, including some unannounced inspections and inspection visits at times when nutrients are being applied to fields, the collection of random soil and waste samples for comparison with analyses contained in NMPs, and stronger enforcement actions when there are egregious or repeated violations of NMPs.

- **Encouraging more NMPs, by aggressively pursuing tributary strategy goals for placing an increased amount of acreage under voluntary NMPs, and by making the NMP process less cumbersome** — Increasing the amount of acreage that is covered by voluntary NMPs could be accomplished by measures such as: (1) contracting directly with certified private nutrient management planners for the development of plans, (2) paying the same rate for the development of revised and new plans, (3) increasing DCR's capacity to write plans for which farmers will not be charged (by increasing the number of positions in DCR regional offices), and (4) increasing efforts to inform farmers without NMPs of the basis and appropriateness of the agronomic fertilizer recommendations that are used in NMPs, coupled with incentive programs. The incentive programs could include crop insurance to compensate farmers in those in-

stances in which there is any reduction in their typical crop at NMP-recommended nutrient application levels, or compensation payments to farmers who are willing to reduce fertilizer use levels to rates that are no more than crops can use. While the items included in this approach have cost implications for the State, farm operators are likely to view this approach more favorably than mandating that more acreage must be covered by NMPs, and they benefit under the approach by having to pay little or nothing to obtain the plans, and / or by potentially receiv-

ing some incentive or insurance payments. To make the process for modifying NMPs during the life of the plans less cumbersome, allowing certified planners to make legitimate modifications to NMPs without waiting for DCR approval could make farmers more receptive to NMPs, by making the process more responsive to changing conditions. The certified planners can then submit the modifications to DCR, so that DCR has current records, and the department can notify planners if they see any problems with modifications that have been granted.

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I. Introduction

House Joint Resolution (HJR) 72, approved by the 2004 General Assembly, directs JLARC to study the effectiveness of the Commonwealth's nutrient management plans. Nutrient management plans are documents that identify practices for minimizing adverse environmental effects that result from the over-application of nutrients such as nitrogen and phosphorus, while also improving crop production through the efficient use of nutrients. A majority of states have some type of nutrient management planning program.

Nutrients such as nitrogen and phosphorus are essential as raw materials for organism growth and development, and are present in nature. Nutrients are used in agricultural production to ensure healthy crop growth and also by homeowners and lawn care companies to enhance the quality of lawns, golf courses, and other settings. However, in excess, nutrients can negatively impact water quality. High nutrient levels in water can lead to algal blooms and low levels of dissolved oxygen, which have a negative impact on the ecology of State waters. Nutrients that are related to human activity stem from point sources (for example, wastewater treatment discharges) and nonpoint sources (for example, fertilizer or manure nutrients that are set in motion by rainfall or snowmelt moving over and through the ground as well as erosion).

Nutrient management planning is a means by which all nutrients are accounted for and their use carefully planned so they can be used efficiently by crops without resulting in excess nutrients in the soil. As such, nutrient management is a balancing of the agricultural requirements for plant growth against the effects of excessive nutrient enrichment on water quality. This balancing act is especially important for Virginia because (1) agricultural activity on more than 6.2 million acres of cropland, hayland, and pastureland accounted for greater than \$1.8 billion in cash receipts in 2002, (2) there were an estimated 1.4 million acres of turfgrass in 1998, and (3) the State is actively involved in significant efforts to protect and improve water quality in the Chesapeake Bay and other State waters.

Other characteristics also make nutrient management planning in Virginia particularly relevant. For example, land used for agricultural purposes accounts for approximately 24 percent of the Commonwealth's total area, while urban land uses constitute another seven percent. Animal manures and commercial fertilizers are used on these settings to promote plant growth. The United States Department of Agriculture (USDA) estimates that Virginia's farm animals produced over 5.4 billion pounds (or over 2.7 million tons) of animal manure and poultry litter in 1997, which contained over 250 million pounds of nitrogen and more than 79 million pounds of phosphorus. More than 770,000 tons of commercial fertilizer, were sold in the State during Fiscal Year (FY) 2003, containing about 188 million pounds of nitrogen and about 47.3 million pounds of phosphorus. All of these nutrients, if managed improperly, have the potential to negatively impact water quality in the State.

In addition to its land uses, Virginia also has nine major river basins, with an estimated 50,500 miles of perennial rivers and streams and approximately 2,500 square miles of estuaries that are or could become contaminated by nutrients. Four of the nine water basins drain to the Chesapeake Bay, which is on the Environmental Protection Agency's (EPA) list of impaired waters. Balancing the application of nutrients on land against the State's commitments to improving water quality has been a goal of Virginia's involvement with nutrient management planning.

Excessive amounts of nitrogen and phosphorus entering the Chesapeake Bay (Bay) watershed from agricultural and nonagricultural sources have resulted in nutrient enrichment, adversely affecting living conditions in the Bay. Since 1985, Virginia and the other states in the Bay watershed have been trying to reduce those levels through efforts such as the Chesapeake Bay Agreement. Despite commitments of time and money from five states, the District of Columbia, and the Environmental Protection Agency, the Bay's water quality is at best slightly better but mostly unchanged since the states' efforts began.

Two trends have helped to account for some of the difficulty in reducing nutrient amounts going to the waters in the Bay basin. First, there has been substantial population growth in the basin. This population growth has led to increased land development resulting in more impervious surfaces (for example, buildings and parking lots) that are unable to filter nonpoint source pollution. Population growth and development also result in greater pressure on the region's wastewater treatment plants and septic tanks to handle additional point source pollution. Second, during the 1980s and 1990s, agricultural production of livestock and poultry in Virginia became more concentrated, with more animals confined over smaller amounts of land. The increase in animals has led to an increase in the amount of organic nutrients, particularly nitrogen and phosphorus.

A nutrient management plan (NMP) provides detailed recommendations about the amount and types of fertilizers that should be applied to a piece of land, such as a farm field, and the conditions (for example, the times of year) when the fertilizer should be applied. In Virginia, the use of NMPs has largely focused on agricultural activities. Virginia's nutrient management program is administered through the Department of Conservation and Recreation (DCR), the State's lead agency for nonpoint source pollution. The Department of Environmental Quality (DEQ) inspects regulated farming operations that are required to implement NMPs.

HJR 72 specifically directs JLARC staff to study the effectiveness of the implementation, performance, and enforcement of the NMPs in Virginia through a review of the current level of participation, compliance, and enforcement of the NMP program. In addition, JLARC is directed to assess the adequacy of Virginia's requirements for collecting data on animal waste disposal and transfer. NMP use by State agencies is also to be reviewed, as is the use of and need for nutrient management practices and related educational efforts in urban and rural environments. Additionally, HJR 72 requires JLARC to provide examples reflecting the effective use of nutrient management practices in Virginia and other states. A copy of HJR 72 is provided as Appendix A.

OVERVIEW OF VIRGINIA'S WATERSHEDS, AGRICULTURAL ACTIVITIES, ANIMAL WASTES, AND COMMERCIAL FERTILIZER USE

The rivers, streams, and creeks that drain the more than 42,000 square miles of the Commonwealth of Virginia flow through nine major watersheds. Water quality is affected by the activities that occur in and around those watersheds, particularly agricultural activity. Agriculture is an important industry in Virginia, comprising approximately one-quarter of all State land, and accounting for more than \$2.2 billion in cash receipts in 2003. The use of both organic and inorganic nutrients and other elements are important for healthy crop production. Sources of organic and inorganic nutrients in the State include substantial quantities of animal wastes generated by Virginia agriculture, and commercial fertilizer purchased and applied by farmers and other land users.

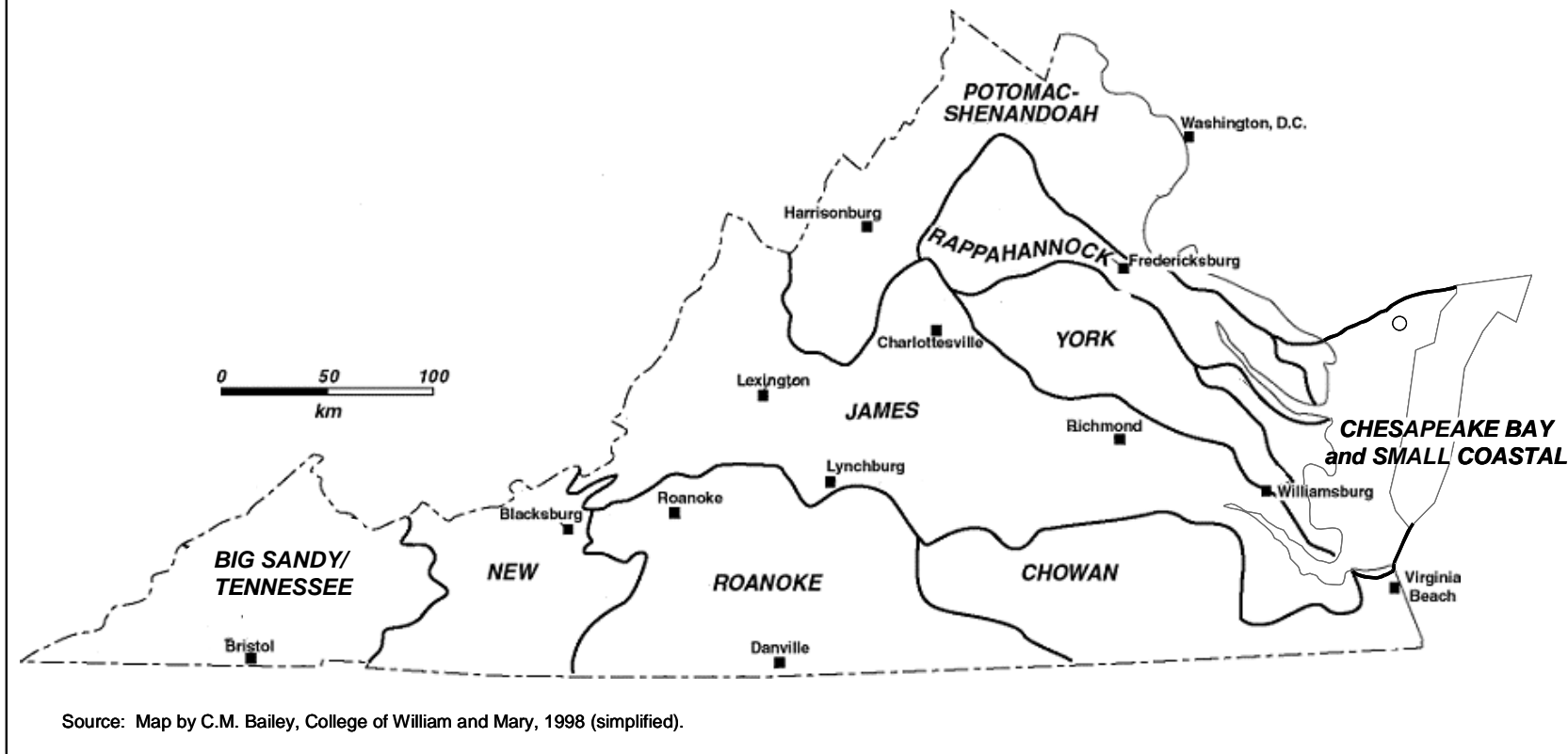
Virginia's Watersheds

A watershed is a drainage basin, and consists of the land area that water flows across, or through, as it drains into a common body of water such as a stream, river, lake, or ocean. Watersheds provide habitats for fish and other wildlife, and food sources and drinking water for animals and humans.

Virginia is composed of nine major watersheds that encompass 50,537 miles of perennial rivers and streams (Figure 1). The State's watersheds drain to the Atlantic Ocean, and waterbodies in North Carolina and Tennessee. In addition, waters from New York, Pennsylvania, West Virginia, and Maryland flow through and join watersheds in Virginia. The State's three largest watersheds are the James, the Roanoke, and the Potomac-Shenandoah, draining about 55 percent of Virginia, combined. The James watershed is the State's largest, stretching from the West Virginia border to the Chesapeake Bay and draining 10,206 square miles of land across central Virginia, or about 25 percent of the State's total land area.

Looking at watersheds more broadly, it should also be noted that Virginia is one of six states in the "Chesapeake Bay Watershed." The Chesapeake Bay is North America's largest estuary (an area where fresh and salt water mix). About half of the Bay's water volume comes from the Atlantic Ocean, while the other half drains from the streams and rivers of Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia (the District of Columbia is also part of the watershed). The Bay estuary is 200 miles long, reaching from Havre de Grace in Maryland to Norfolk, Virginia, with about 5,600 miles of shoreline and an average depth of 21 feet. By some estimates about 60 percent of the land area in Virginia drains into the Chesapeake Bay. The watershed in Virginia with the greatest impact upon the water quality of the main stem of the Bay is the Potomac-Shenandoah watershed.

Figure 1
Major Watersheds in Virginia



Virginia's Agricultural Activities

The 2002 Census of Agriculture reported that Virginia has approximately 47,600 farms and 6.2 million acres of cropland, pastureland, and hayland. (The United States Department of Agriculture defines a farm as any place from which the value of agricultural products produced equals \$1,000 or more per year.) A wide assortment of crops and livestock are produced throughout the State.

The State's principal agricultural commodities are presented in Table 1. These commodities generated approximately \$2.2 billion in cash receipts for the State during 2003. As this information illustrates, broilers (chickens) accounted for the largest share of agricultural output in Virginia, generating approximately \$442 million in cash receipts for the State's economy. The second largest agricultural commodity produced in the State was cattle and calves, accounting for roughly \$339 million. Overall, animal and poultry products comprised 69 percent of agricultural cash receipts in the State, totaling more than \$1.5 billion.

In 2002, one county – Rockingham – accounted for almost one-fifth of the market value of the agricultural sales. Five counties accounted for about three of every eight dollars of sale market value during that year (Table 2).

Table 1
Leading Virginia Agricultural Commodities
for Cash Receipts, 2003

Commodities	Cash Receipts	Percentage
Broilers	\$441,660,000	19.8%
Cattle and calves	339,260,000	15.2
Dairy products	244,666,000	11.0
Greenhouse/Nursery	189,574,000	8.5
Turkeys	177,192,000	8.0
Horses/mules	101,400,000	4.6
Tobacco	89,521,000	4.0
Soybeans	81,011,000	3.6
Chicken eggs	73,160,000	3.3
Corn	62,286,000	2.8
Subtotal	1,799,730,000	80.8
All Commodities	\$2,227,292,000	100.0%

Source: United States Department of Agriculture Economic Research Service.

Table 2		
Top Five Virginia Localities in Market Value of Agricultural Sales, 2002		
Counties	Market Value of Sales	Percentage
Rockingham	\$446,700,000	18.9%
Augusta	143,900,000	6.1
Accomack	109,100,000	4.6
Page	108,700,000	4.6
Shenandoah	69,700,000	3.0
Five Localities Combined	878,100,000	37.2
State Total	\$2,360,900,000	100.0%

Source: Virginia Agricultural Statistics Service.

Farmers Apply Nutrients to Crops to Promote Crop Growth

Good crop yields are dependent on an adequate supply of nutrients and other elements in the soil. For example, plants that lack sufficient nitrogen usually become yellow with stunted growth and have smaller than average flowers and fruits. Adequate phosphorus is needed for root formation and growth, and seed formation. Research documents that applying fertilizers containing nitrogen and phosphorus to soils that are low in these nutrients can increase crop growth and yields. According to an article published by the Cooperative Extension Service at Cornell University, “without nitrogen fertilizers, an estimated one-third of [the U.S.’s] current agricultural production would be lost.”

Despite the economic benefits of applying nutrients to crops, excessive nutrient applications can be detrimental. Good soil management means that the nutrient requirements of crops are met, but not greatly exceeded, during each stage of crop growth. Nutrients applied in excess of what crops need to grow can be lost to the environment through surface and ground water. Furthermore, crops will not respond to additional nutrient applications beyond certain amounts. This fact is reflected in DCR’s *Nutrient Management Handbook* when it states:

applying incremental amounts of a given input will at some point result in a smaller gain in output per unit of input. For example, small amounts of nutrients applied to deficient soils may increase corn yields substantially; however, as greater amounts of nutrients are applied, yield increases will be less dramatic and eventually level off or even decline.

To maximize the economic return of farming, farming decisions can be based on a consideration of what practices will return the highest level of expected profits. To ensure a maximum economic yield in a given year, the level of nutrients applied will

take into account the incremental cost of adding more fertilizer compared to the incremental increase in the crop yield that can be expected.

DCR's *Nutrient Management Handbook* also indicates that applying this principle when making farming decisions involves inherent risk for farm profitability and water quality. For example, the yield amounts that a farmer can expect when applying a given amount of nutrients is not known with certainty at the time the fertilizer is applied, since crops respond differently to nutrients depending on weather conditions. According to DCR:

if enough nutrients were applied to insure that the nutrients were never the limiting factor to maximum yields, at least two adverse effects would occur. First, farmers would not be managing yields for maximum profits since money would be wasted on nutrients not fully utilized in most years. Second, excessive losses of nutrients to the environment would occur.

In order to minimize these possibilities, planning yields should generally be realistic, but somewhat optimistic. This is the concept on which the Virginia Agronomic Land Use Evaluation System (VALUES) is based. VALUES is a system designed by researchers at Virginia Tech that uses actual farming data to determine expected crop yields on most of Virginia's soil types. VALUES provides guidance concerning the appropriate amount of nutrients needed for a given crop to ensure a yield that should be above average for a given year.

The concept just described assumes that applying excessive nutrients above crop needs will result in wasted money for farmers. Farmers can apply nutrients to their fields in the form of animal manure produced on their farm (or purchased from nearby farms) or commercial fertilizers. Farmers who purchase commercial fertilizer or sell their animal waste for a profit could potentially lose money if they apply nutrients above the level needed to ensure a maximum yield. In Virginia, however, farmers in certain areas of the State are faced with excess animal manure that they cannot sell for a profit. In this scenario, it appears that applying excessive nutrients does not entail the same economic risk. As discussed in the next section, this distinction may be particularly relevant given the amount of nutrients that come from animal manure versus commercial fertilizer in Virginia.

Virginia's Animal Wastes and Commercial Fertilizer

Farm animal wastes and commercial fertilizer are two major sources of nutrients needed for plant growth that can result in nonpoint source pollution. Table 3 provides an estimate of the pounds of nitrogen and phosphorus in farm animal manure, commercial fertilizer, and sewage sludge that was produced, purchased, or applied in Virginia in 1997. The fertilizer figures show estimated farm versus non-farm sales. As indicated in the table, farm animal manure accounts for more nitrogen and phosphorus than commercial fertilizer. The nitrogen and phosphorus content in farm animal manure and farm commercial fertilizers accounts for over 90 percent of the total.

Table 3
Nitrogen and Phosphorus Content in Animal Manure and Commercial Fertilizer, Produced or Purchased in Virginia, 1997

<u>Category</u>	<u>Nitrogen Pounds</u>	<u>Nitrogen, Percent of Total</u>	<u>Phosphorus Pounds</u>	<u>Phosphorus, Percent of Total</u>
Farm Animal Manure	250,500,000	53.6%	79,100,000	55.9%
Farm Fertilizer	188,300,000	40.4	48,900,000	34.5
Non-Farm Fertilizer	11,600,000	2.4	6,400,000	4.5
Sewage Sludge	16,600,000	3.6	7,200,000	5.1
Total	467,000,000	100.0%	141,600,000	100.0%

Source: Pounds of nitrogen and phosphorus in animal manure are based on a JLARC staff aggregation of 1997 data as reported by the USDA Economic Research Service in its Confined Animal and Manure Nutrient Data system. As of October 2004, USDA had not yet updated this data system based on the 2002 Agriculture Census data. The manure quantities shown are pounds excreted, and not just recoverable manure, as manure that is not accounted for also has the potential to negatively affect water quality. The Virginia Department of Health provided JLARC staff with the estimate of 200,000 dry tons of biosolids applied annually, and DCR supplied the nutrient analysis of the biosolids.

Fertilizer data are based on summing data from the 1996-97 and 1997-98 Fertilizer and Lime Usage and Inspection reports of the Virginia Department of Agriculture and Consumer Services and dividing by two. Phosphate quantities shown in the reports were multiplied times a factor of 0.437 to obtain phosphorus quantities.

On a statewide basis, nitrogen and phosphorus quantities from animal waste in Virginia trended upward during the years from 1982 to 1997, largely due to increases in poultry waste. Nitrogen in the fertilizer sold trended downward from the early to late 1980s, and then moved to higher levels in the 1990s that have generally persisted to the present time. Fertilizer phosphorus has mostly varied over these years within a fairly narrow and predictable range. It should also be noted that in some Virginia counties, nutrient management issues may be particularly acute, due to the fact that there is a greater quantity of nutrients in the recoverable animal wastes than can be used by all the county's cropland and the pastureland that is available for nutrient application.

Animal Wastes. Every five years, the United States Department of Agriculture (USDA) collects and publishes State-level agriculture statistics data. The Economic Research Service arm of the USDA uses the data that are collected to estimate animal manure and manure nutrient quantities by state and by broad categories of animals. The currently available data series on these quantities covers 1982, 1987, 1992 and 1997.

An examination of Virginia agriculture statistics trends from 1982 to 1997 reveals that the number of farms in Virginia declined from 51,859 to 41,095 during these years – a decrease of about twenty percent (based on the U.S. Census of Agriculture methodology that was used until 2002). However, the number of animal units on the farms increased. The quantity of manure produced increased (up 13.7

percent), as did the quantity of nitrogen (up 20.2 percent) and the quantity of phosphorus (up 26.9 percent) in the manure.

These increases in manure and manure nutrients were almost exclusively due to the increased contributions of poultry. USDA data indicate that the number of poultry animal units in Virginia more than doubled from 1982 to 1997, going from 136,232 to 291,686. (The use of animal units helps to standardize the calculation of manure and nutrients produced by different species. For example, in Virginia, 200 animal units of poultry equates to 20,000 chickens or 11,000 turkeys.) Meanwhile, the number of animal units in the category of “cattle other than milk cows and feedlot beef” (beef confined for feeding) grew by only 7 percent; and the number of animal units for swine, milk cows, and feedlot beef actually decreased, by about 16, 30, and 50 percent respectively. As a result, poultry accounts for an increasing percentage of manure and manure nutrients in Virginia.

In addition, USDA data suggest that confined animals, or animals that are limited to an area without vegetation, such as a feedlot or poultry house, account for an increasing proportion of the manure and its nitrogen and phosphorus content. Confined animals in Virginia accounted for about 36.6 percent of dry-state manure in 1982; this percentage was about 44 percent by 1997. In 1982, confined animals accounted for about 40 percent of nitrogen and phosphorus in the manure; by 1997, the corresponding percentage was about 50 percent.

These Virginia trends appear to mirror some trends that have occurred nationally. A recent document of the USDA’s Natural Resources Conservation Service notes that:

... the structure of animal agriculture has changed dramatically over the last two decades. Small and medium-sized livestock operations have been replaced by large operations at a steady rate. The total number of livestock has remained relatively unchanged, but more livestock are kept in confinement... A significant shift in the mix of livestock types occurred as dairy cattle decreased in number and poultry and swine populations increased. Livestock populations have become more spatially concentrated in high-production areas.

The USDA has not yet produced manure quantity estimates for 2002. However, there are some indications that the quantity levels may have leveled off somewhat between 1997 and 2002. The quantity of broilers and other meat-type chickens sold only increased by about 2.6 percent, while the quantity of cattle and calves decreased by 4.7 percent. In addition, a product called phytase was increasingly added to poultry feed, reducing the amount of phosphorus that is found in poultry litter.

Still, the types of changes that have occurred overall over the last few decades have brought an increasing level of challenge for nutrient management. The USDA has stated that “nutrients from livestock and poultry manure are key sources of water pollution.” USDA documents also note that:

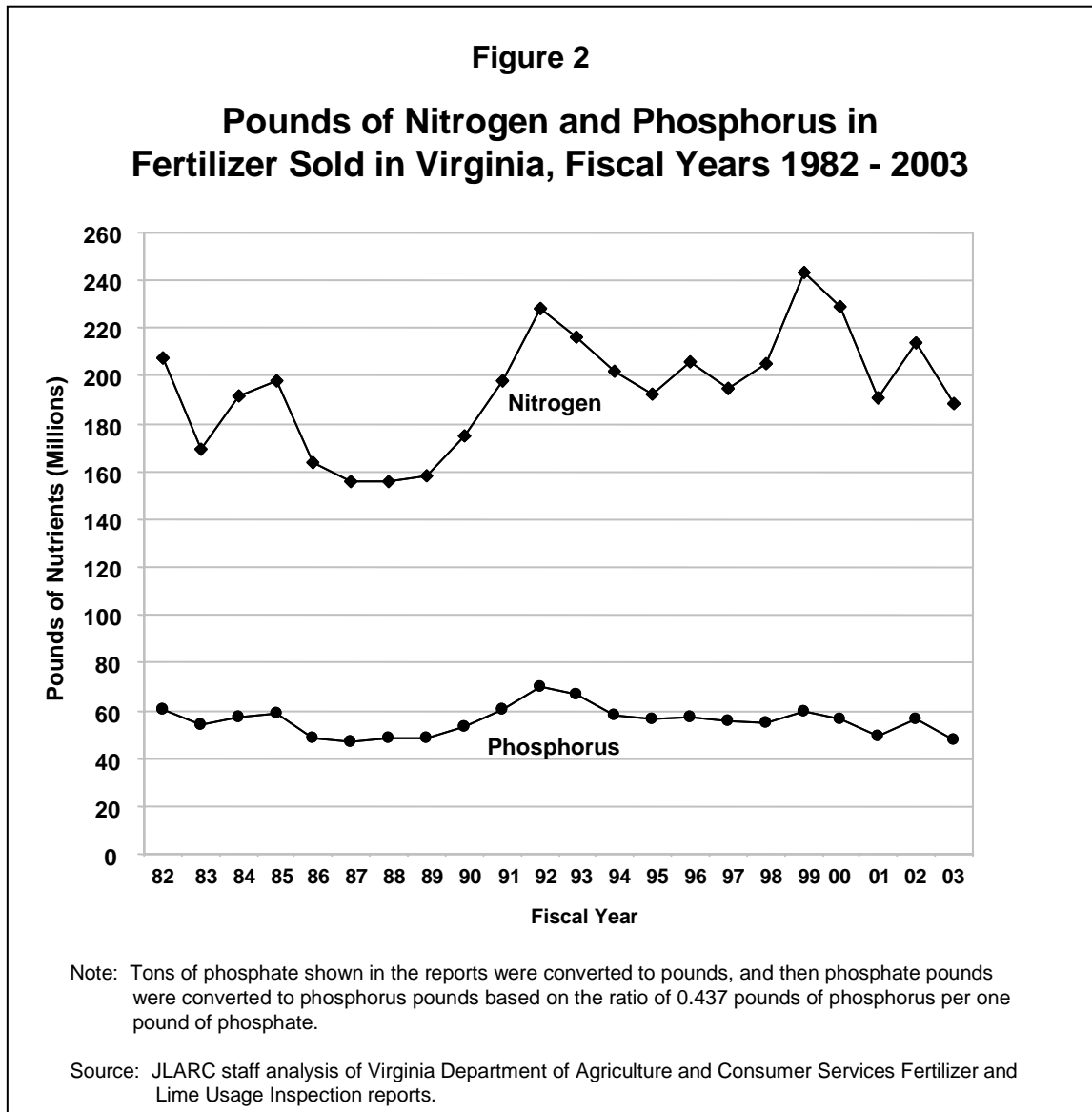
... changes in animal agriculture have resulted in increased problems associated with the utilization and disposal of animal waste. As livestock production has become increasingly spatially concentrated, the amount of manure nutrients relative to the assimilative capacity of land available on farms for application has grown, especially in high production areas. Consequently, off-farm export requirements are increasing. In some counties the production of recoverable manure nutrients exceeds the assimilative capacity of all the cropland and pastureland available for manure application in the county. The number of these counties has significantly increased since 1982....

USDA has developed a measure comparing the quantity of a recoverable manure nutrient in a county to the capacity of county-wide cropland and pastureland to utilize that nutrient. Across the nation, 73 counties in 1997 were estimated by USDA to have more recoverable animal manure nitrogen in the county than can be utilized by all the farmland in the county that is available for nutrient applications. Two of those counties were in Virginia: Page County (with recoverable manure nutrients exceeding crop capacity by a ratio of 1.92 to one) and Rockingham County (a ratio of 1.63 to one). By comparison, in 1982, there were no Virginia counties with a ratio above 1.00; the figures for Page and Rockingham in that year were an estimated 0.56 and 0.76, respectively.

In addition, across the country, there were 160 counties in 1997 estimated by USDA to have phosphorus quantities from recoverable animal manure in excess of the capacity of crop and pastureland of the county to take in these nutrients. Five Virginia counties were in this group: Amelia County (a ratio of 1.08), Augusta County (a ratio of 1.06), Page County (a ratio of 2.86), Rockingham County (a ratio of 3.52), and Shenandoah County (a ratio of 1.14). In 1982, only Rockingham County had this situation (a ratio at that time of 1.79).

According to USDA materials, the result of such situations can be heavy applications of manure on fields near where the manure is produced, regardless of whether crops can use the available nutrients. USDA has noted that “many livestock and poultry operations do not use all of the land they do have for spreading manure,” and that “manure is heavy and costly to transport, so producers often apply more manure than crops can use on fields nearest the production facility.”

Statewide Data on Trends Over Time in Commercial Fertilizer Nutrient Quantities. Figure 2 shows the quantities of nitrogen and phosphorus in the fertilizer sold in Virginia during the years from 1981-82 to 2002-03. The data show that nitrogen in the fertilizer sold trended downward from 1981-82 to 1990-91, and then moved to a higher level in the early 1990s. Since the early 1990s, statewide fertilizer nitrogen quantities have typically been within a range of 190 to 210 million pounds. Phosphorus in fertilizer has not had a clear long-term trend, with quantities varying over the last 20 years or so within the general range of about 45 to 60 million pounds per year.



NONPOINT SOURCE POLLUTION AND EFFECTS OF NUTRIENT LOSS

Nonpoint source pollution (NPS) originates from diffuse sources instead of a single point source, such as a sewage outfall or an industrial discharge pipe. According to the Environmental Protection Agency (EPA), nonpoint source pollution is the nation's largest source of water quality impairment, affecting approximately 40 percent of the nation's surveyed rivers, lakes, and estuaries.

NPS pollution is caused by water from rainfall or snowmelt moving over (*runoff*) or through the ground (*leaching*). As runoff moves over the ground, it picks up and carries away natural and artificial pollutants and deposits them into streams, rivers, lakes, wetlands, and coastal waters. Leaching occurs when soluble nutrients mix with water and flow downward through the soil into ground water sources or are discharged into streamflows.

DCR describes four major sources of NPS pollution: nutrients (nitrogen and phosphorus affect water quality the most), sediments, toxic substances, and pathogens. These pollutants wash into waterways from agricultural land, suburban lawns, forestry, urban streets, and other areas of land disturbance whenever precipitation occurs. The amount and velocity of runoff that occurs from agricultural areas is influenced by precipitation, surface textures, soil types, and slopes, while the amount of leaching that occurs is influenced by soil types and subsurface formations. Nonporous landscapes, such as roads, bridges, parking lots, and densely compacted soils tend to exacerbate urban NPS runoff problems. The volume and velocity of water running off these surfaces can be nine times greater than that for forests.

Excessive amounts of nutrients and sediments may produce harmful water quality conditions. A description of how nutrients and sediments reach the Bay and the resulting impact of these nutrients follows:

One of the bay's biggest problems is that its waters have become overfertilized, or *eutrophic*. Too much nitrogen and phosphorus are entering the bay. They fuel explosive growth of suspended solids, drifting plant life, or algae, that is so extensive that these tiny, single-celled plants cloud the water and block out light needed by the bay's underwater grasses for growth. Then when the algae die, they sink to the bottom where the bacteria decomposing them consume large quantities of oxygen.

Of all the nitrogen and phosphorus polluting the bay, more than two-thirds is carried in runoff from the 41 million acre watershed. And agriculture is by far the dominant source of this runoff from the landscape. (*Turning the Tide: Saving the Chesapeake Bay*, 2003)

According to DCR's 2002 *Biennial Nonpoint Source Pollution Water Quality Assessment Report*, current assessment model results suggest that about 70 percent of the State's total nonpoint source nitrogen load and 60 percent of the State's total nonpoint source phosphorus loads are reported to come from agricultural land uses. JLARC's 1997 review of *Virginia's Progress Toward Chesapeake Bay Nutrient Reduction Goals* found that controlling nonpoint source pollution presented special challenges because of its diffuse sources. The report included information documenting successful efforts to control NPS pollution through small-scale best management practices. However, on a larger scale, such as a county or watershed, the report said that the impacts of nonpoint source best management practices have been variable, and that it appears that the outcomes are often characterized as small or moderate.

NUTRIENT MANAGEMENT PLANNING IN VIRGINIA

Nutrient management is defined as identifying how the major plant nutrients are to be annually managed for expected crop production and for the protection of water quality. Since the Department of Conservation and Recreation began providing nutrient management planning assistance to agricultural operations in 1989,

the Commonwealth has specifically required the use of formal nutrient management plans under certain conditions, such as large confined animal operations including poultry, land application of bio-solids, and land disturbances in environmentally sensitive areas in the Bay watershed. The State has also encouraged voluntary nutrient management plan development.

The State has “tributary strategies” that address water quality issues in various tributary rivers and the Chesapeake Bay, and that contain certain assumptions about nutrient reduction activities. To achieve nutrient reduction goals under the Chesapeake Bay Agreement, Virginia, Maryland, and Pennsylvania each have tributary strategies that call for substantial voluntary nutrient management planning activity in the Chesapeake Bay watershed. Criteria that must be included in NMPs include a physical description of the farm and its location, a summary of the nutrient management recommendations, application rates and a schedule for applying nutrients, among other attributes.

Some State agencies use NMPs to regulate their use of nutrients. Certain agricultural operations at the Department of Corrections and Virginia Tech, for example, function under regulated and voluntary NMPs, respectively. The Virginia Department of Transportation (VDOT) and the Department of General Services have chosen not to address their nutrient usage with NMPs, although VDOT staff indicate that they have been working with DCR to develop nutrient management practices for the department’s maintenance and construction operations.

Objectives of Nutrient Management Planning

The actual use of a written plan to control nutrient usage in the Commonwealth has focused primarily on agricultural activities. Nutrient management attempts to balance two, sometimes competing goals, the most efficient use of nutrients to produce the greatest crop yield versus the protection of water quality from the harmful effects of nutrient enrichment. DCR’s *Nutrient Management Handbook* states that:

the goals of farm nutrient management planning are to minimize adverse environmental effects, primarily upon water quality, and avoid unnecessary nutrient applications above the point where the long-run net farm financial returns are optimized.

While not all nutrient loss is expected to be eliminated as the result of plan adoption, the expectation is that a decrease in the amount of nutrients reaching a waterbody will occur. Farm profitability is expected to benefit from a more productive use of fertilizer and from savings resulting from the purchase of smaller amounts of commercial fertilizer.

Controlling improper or excessive lawn fertilization in urban settings is another nutrient management objective. To accomplish this goal, the State relies on nutrient management strategies to limit the over-application of nutrients by both

lawn care professionals and homeowners through water quality agreements and educational programs.

Nutrient Management Planning Is Used to Help Implement Several State Policies and Programs

Article XI of the *Constitution of Virginia* states that it shall be the policy of the Commonwealth to “conserve, develop, and use its natural resources,” and “protect its atmosphere, lands, and water from pollution, impairment, or destruction, for the benefit, enjoyment, and general welfare of the people of the Commonwealth.” HJR 72 points out that the goal of nutrient management plans is to address non-point source pollution “in order to protect and improve Virginia’s water quality,” and that these plans are required by several State programs, including regulatory programs for confined animal and poultry feeding operations and certain activities under the Chesapeake Bay Preservation Act (Bay Act). Additionally, reductions in the concentrations of nutrients in the Bay and its tributaries through the use of best management practices such as nutrient management planning are a major part of Virginia’s commitment to the Chesapeake Bay Agreement.

DCR began assisting farm operators in the Chesapeake Bay watershed with nutrient management in 1989. In 1994, the General Assembly enacted the Voluntary Nutrient Management Training and Certification Program (Training and Certification Program) that required DCR to establish criteria for developing nutrient management plans (NMPs) for various agricultural and urban agronomic practices. DCR promulgated regulations for the program in 1996. Also in 1994, the General Assembly required nutrient management plans for confined animal feeding Operations (CAFOs). Since that time, nutrient management planning requirements have also been codified for the permitting and operation of confined poultry feeding operations, land application of bio-solids, and land disturbances within environmentally sensitive areas in the Bay watershed.

In addition to State requirements, farm operators can choose to develop nutrient management plans on a voluntary basis. There are studies that have indicated that nutrient management planning can provide economic benefits to the farmer as well as offer some water quality benefits. These potential economic benefits have caused some farmers to have plans developed for them on a voluntary basis. Research performed at Virginia Tech has indicated, for example, that:

Adoption of nutrient management practices on four Virginia livestock farms reduced average annual nitrogen losses by 23 to 45 percent and phosphorus losses on three farms by 23 to 66 percent, while farm incomes were increased by \$395 to \$4,592. (*Nutrient Management Planning on Four Virginia Livestock Farms*, 1999)

DCR administers the State’s Training and Certification Program pursuant to section 10.1-104.2 of the *Code of Virginia*. Language in the *Code* and the department’s associated regulations establish the criteria used by DCR to certify the competence of persons preparing nutrient management plans to assist land owners and

operators in the management of land application of fertilizers, municipal sewage sludges, animal manures, and other nutrient sources for agronomic benefits and for the protection of the Commonwealth's ground and surface waters. The regulations impose a level of uniformity on the plans that are written in the State. Certified nutrient management planners (specialists) include DCR staff, as well private planners (non-DCR staff) from the fertilizer and biosolids industries, Soil and Water Conservation Districts, and the National Resource Conservation Service. Farm operators in the State can have their plans developed by certified or non-certified plan writers. Plan writers may choose to become certified by DCR because the certification process offers them an opportunity to familiarize themselves with the NMP requirements for permitted facilities. In addition, some plan writers may see the certification process as an opportunity to improve their marketability.

NMPs are required in the *Code of Virginia* in order to obtain a permit for a confined animal feeding operation. Under the permitting process, confined animal feeding operations as defined by §62.1-44.17:1(B) with 300 or more animal units must obtain a Virginia Pollution Abatement General Permit (VPG Permit) from the State Water Control Board (SWCB). To obtain a VPG Permit, the owner or operator must submit a registration statement to DEQ that includes a copy of (1) DCR's letter approving the nutrient management plan for the operation, and (2) the approved nutrient management plan itself.

The 1999 General Assembly enacted the Poultry Waste Management Act, which amended the *Code of Virginia* section dealing with permits for confined animal feeding operations. As with confined animal feeding operations, regulations promulgated under the Poultry Waste Management Act require that a copy of DCR's letter approving the nutrient management plan and a copy of the plan itself be included with the registration statement provided to DEQ prior to the facility obtaining a VPG Permit to operate. Under the Poultry Waste Management Act, farm operators who transfer more than 10 tons of poultry litter to another person in a 365-day period must report to DEQ the nutrient content of that waste in addition to other information.

Some agricultural activities that occur under the Chesapeake Bay Preservation Act also require farm operators to develop nutrient management plans. The Bay Act, which is administered in 84 of Virginia's eastern-most localities, seeks to ensure sound local land use and development in environmentally sensitive areas. In some of these areas, known as Resource Protection Areas (RPAs), agricultural activity that occurs within 100 feet of a waterbody (1) may require the implementation of a nutrient management plan if nutrient problems are determined to be the predominant water quality issue and, (2) does require nutrient management plan implementation if the activity encroaches more than 50 feet into the 100 foot buffer. Such a NMP must be developed consistent with DCR's Training and Certification regulations. In addition, agricultural activity that occurs outside the RPAs, but within the larger Chesapeake Bay Preservation Areas, is required to have a soil and water conservation assessment to identify the effectiveness of existing practices, including nutrient management. Any practices with identified deficiencies are supposed to be amended and approved by the local Soil and Water Conservation District Board (SWCDB).

Farm operators may also develop and implement nutrient management plans on a voluntary basis as part of the State's Agricultural Best Management Practices (BMP) Cost-share program or tax credit program, which will be discussed later in this chapter. Nutrient management plans developed for the tax credit program must be approved by the SWCDB.

State Acknowledges Effective Nutrient Management Planning

In order to acknowledge individual efforts to protect the environment, DCR awards farmers who fully implement their nutrient management plans with Clean Water or Bay Friendly Farm Awards. These awards recognize farmers who are exceptional stewards of the land. They are given to farms located in areas of Virginia outside or within the Chesapeake Bay watershed. DCR recognized 35 farms with these awards in 2003. In addition to these awards, each year one farm or farmer from each major watershed in the State is recognized as a Basin Grand Winner. Examples of good nutrient management and conservation practices that qualify farms for this award include adequate buffers, cover crops, no-till to reduce soil erosion, fenced-off waterways, and split-applications of nitrogen.

Coverage of Farm Acreage by Nutrient Management Plans

Based on statewide USDA Census of Agriculture statistics for 2002, farms account for approximately 8.6 million acres of land in Virginia. Of this acreage, about 6.2 million acres are cropland and pastureland.

Nutrient management plans are written for cropland, hayland, and pastureland in Virginia. DCR staff have indicated that most NMPs in Virginia have a life span of about three years, and therefore total up-to-date NMP acreage can be estimated by summing the new and revised NMPs developed in the last three years. Based on an analysis of DCR data on nutrient management planning activity done by its own staff and by other nutrient management planners certified by the State, an estimate for the acreage of Virginia farm land that is covered by "current" nutrient management plans is about 522,000 acres, covering about 8.4 percent of crop and pastureland statewide (Figure 3). This figure is based on the number of plans that were written or revised during 2001, 2002, and 2003. About 30 percent of the acreage is covered by plans that are required of farms with large confined animal or poultry feeding operations, while the other 70 percent is covered for other reasons, such as the voluntary use of plans.

Agricultural census data indicates that more farm land is used as pastureland than is defined and used as cropland. However, due to the fact that cropland is the land that more typically receives substantial applications of commercial fertilizer or manure, most acres of farm land covered by nutrient management plans are cropland acres. As can be seen in Table 4, the proportion of cropland acres covered by nutrient management plans in Virginia is substantially higher than the proportion of pastureland.

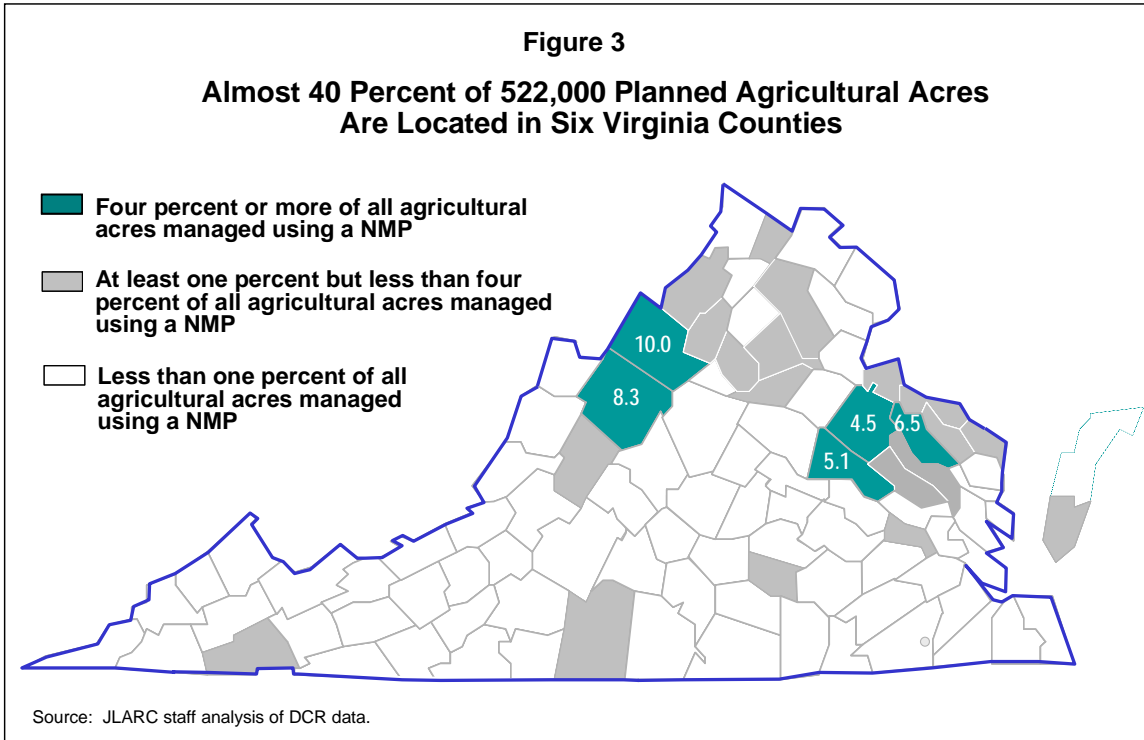


Table 4
**Nutrient Management Planning on Cropland and
 Pastureland Acres**

Type of Acreage	NMP Acres	Total Acres	Percent
Cropland	428,333	2,926,995	14.6
Pastureland	89,179	3,316,882	2.7
Specialty Acres	4,413	--	--
Cropland, Pasture, and Specialty	521,925	6,243,877	8.4

Source: JLARC staff analysis of DCR NMP data and 2002 USDA Census of Agriculture data.

Coverage of Acres by NMPs Required at Farms Permitted as Confined Animal and Poultry Feeding Operations. NMP use is required under several Virginia statutes and regulations, including State water control laws for confined animal and poultry feeding operations. According to DCR data, there were more than 1,000 permitted farm operations with DCR-approved nutrient management plans for confined animal and poultry facilities as of June 30, 2004 (Table 5). The NMPs written for these facilities account for more than 155,000 acres. Thus, these NMPs account for slightly less than one-third of the previously described estimated total NMP acreage of 521,925.

Table 5		
Number of CAFOs Required to Have a Nutrient Management Plan, and the Resulting Acreage Planned		
<u>Type of Operation</u>	<u>Number of Operations</u>	<u>Acreage Planned</u>
Poultry	940	91,671
Dairy	74	48,981
Swine	59	10,102
Beef	7	4,749
TOTAL	1,080	155,503
Note: These figures exclude facilities that were identified as being closed or having expired plans as of June 30, 2004. Source: DCR dataset of approved NMPs for regulated confined animal and poultry feeding operations.		

Figure 4 shows the 59 counties that had acres covered by required NMPs. Four counties account for over half of all acreage operated under required NMPs: Accomack, Augusta, Page, and Rockingham. Most counties have relatively little acreage under required NMPs, and account for a relatively low proportion of required NMPs statewide. Regulated farms account for less than three percent of the 47,600 farms in Virginia, and less than three percent of the approximately 6.2 million crop and pastureland acres in the State.

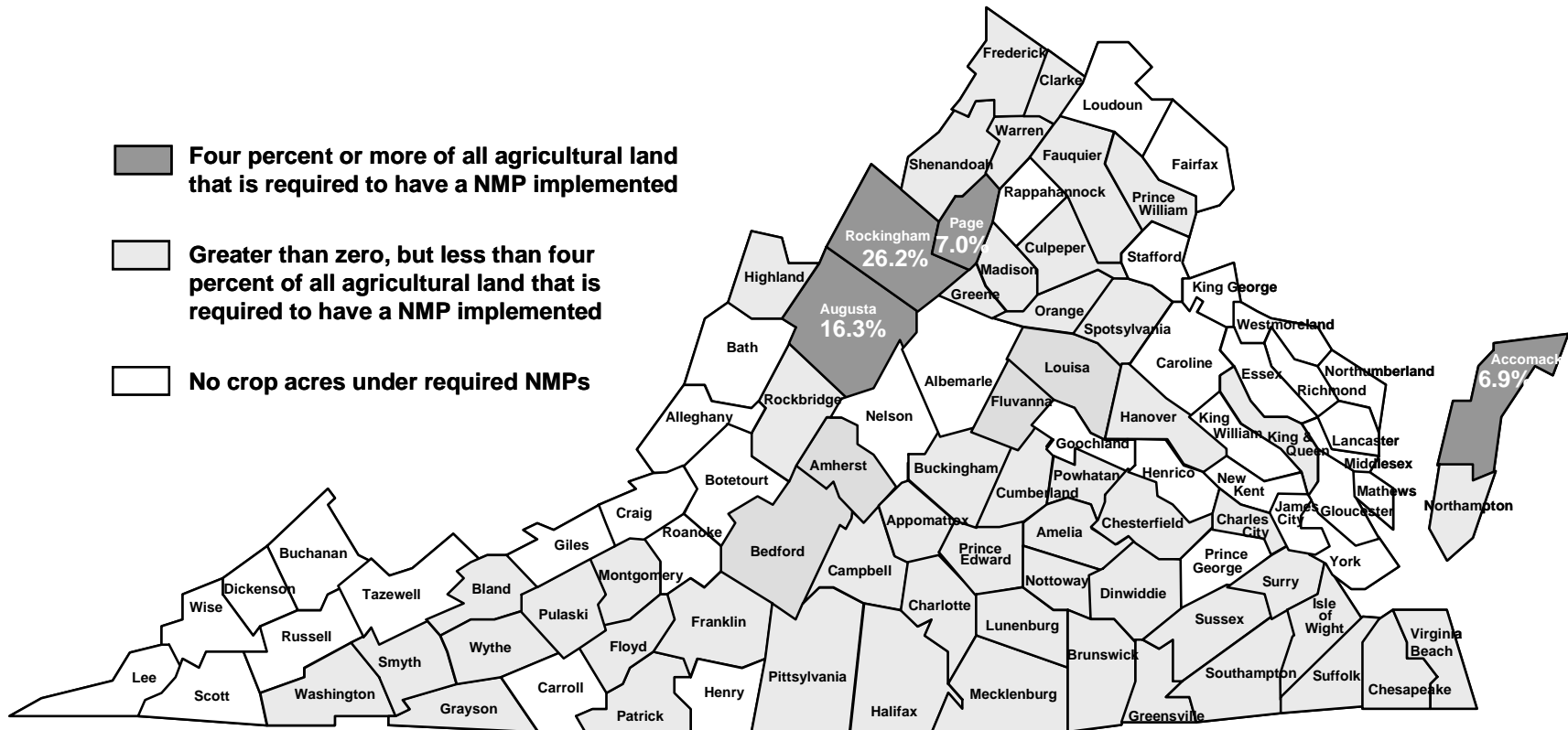
Variations in Geographic Coverage of Acreage by All NMPs (NMPs At Permitted Facilities, and NMPs Adopted for Other Reasons). Figure 5 shows some of the variation that exists geographically in Virginia in the proportion of farmland acreage addressed by nutrient management practices (NMP). For various watersheds or portions of watersheds, the figure provides data on the proportion of cropland that is covered by crop NMPs, and the proportion of total acreage (here defined as cropland plus pastureland) that is covered by all NMPs. As can be seen in the figure, one area with a relatively high proportion of farmland that is addressed by NMP activity is the Southern Shenandoah region, where NMPs due to the confined animal facility requirements are prevalent.

Also, a relatively high proportion of acreage is covered by new or recently revised NMPs in the lower portions of Virginia's tidal rivers in the Chesapeake Bay watershed. As can be seen in Figure 6, all fifteen of the localities with the highest proportion of cropland plus pastureland acreage covered by voluntary NMP activity during the last three years are located near the Chesapeake Bay.

DCR staff suggested that two factors may account for the higher proportion of acreage covered near to the Bay. First, during this time, there was substantial plan development by private planners in this area, spurred by a DCR initiative to directly pay planners for plan development. Second, this area contains many cash grain farms that can be more easily planned than other more animal and crop intensive operations.

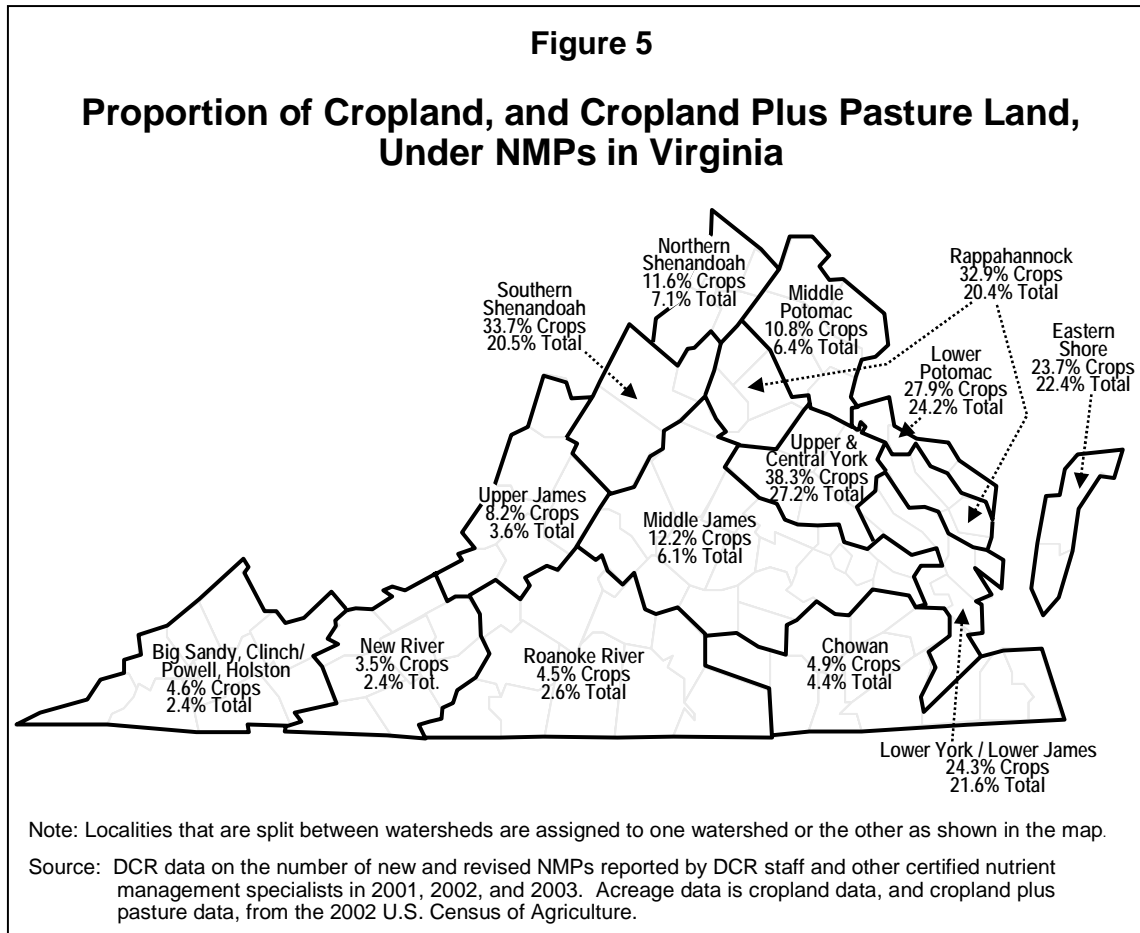
Figure 4

Percentage of All Agricultural Acres Administered by a Required NMP, by County



Notes: This data excludes permitted operations that were closed or had expired NMPs as of June 30, 2004. As of June 30, 2004, there were 155,503 planned crop acres in Virginia. This accounted for less than three percent of all cropland and pastureland in the State. Therefore, more than 47,000 acres of crop and pastureland are planned under NMPs in Rockingham County.

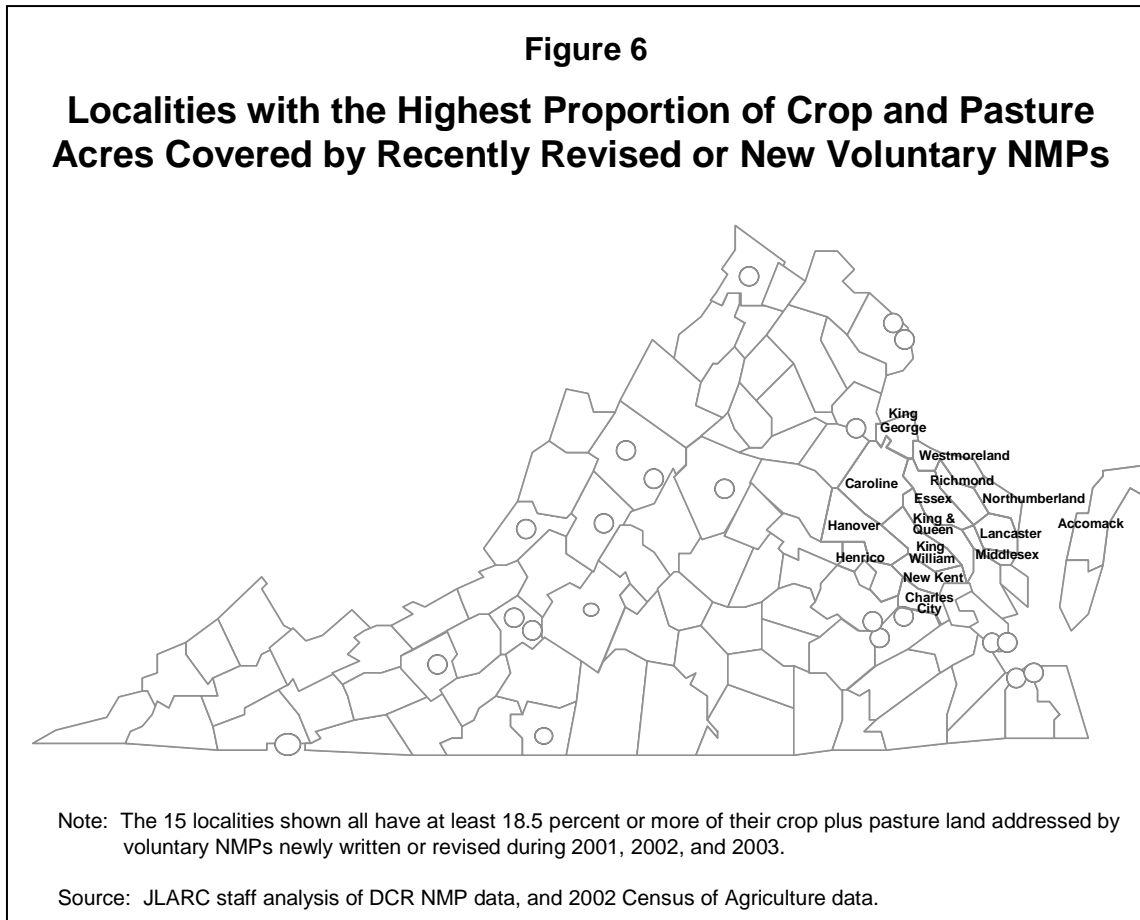
Source: JLARC staff analysis of DCR data.



Farmers Develop Voluntary NMPs for Different Reasons

Nutrient management plans can be written for several reasons including for the purpose of obtaining a VPG Permit to operate a confined animal or poultry feeding operation or to meet Chesapeake Bay Act requirements. However, in Virginia the majority of acreage has been planned under voluntary NMPs rather than these required reasons. For example, a farmer may choose to have a NMP developed for his or her facility simply because that farmer wishes to improve nutrient management and also wishes to reduce the amount of nutrient runoff. Farmers may also choose to have voluntary plans developed in order to participate in Virginia's Agricultural BMP Cost-share Program that makes funding available through the Soil and Water Conservation Districts (SWCD) to assist farmers with the cost of developing a nutrient management plan. The State also administers a tax program that provides credit for adopting certain best management practices, including a nutrient management plan. DCR also categorizes plans written to meet certain local ordinances as voluntary plans.

The federal government, through the National Resource Conservation Service (NRCS), also provides cost-share funding for the development of nutrient management plans through its Environmental Quality Incentives Program. In Federal



Fiscal Year (FFY) 2004, NRCS had more than \$960,000 available for nutrient management planning in Virginia.

State Tributary Strategies Indicate that Virginia's Chesapeake Bay Goals May Require Substantially More Nutrient Management Planning Activity

Tributary strategies are basin-wide water quality attainment plans developed to reduce the flow of nitrogen, phosphorus, and sediment into local waters, and ultimately the Bay. They are part of the State's Chesapeake Bay Program commitment and cover the Shenandoah-Potomac, Rappahannock, York, James, and Eastern Shore watersheds. The goals of these plans directly specify both nonpoint source nutrient load reductions needed for water quality attainment and the attainment measures that are expected to produce those results.

As part of *Chesapeake 2000*, the Bay states and the District of Columbia have agreed to improve water quality and remove the Bay from EPA's list of impaired waters by 2010. If substantial progress is not made to reduce nutrients and sediments by 2010, EPA could use its regulatory power under the Clean Water Act to require Bay states to identify and address the water quality conditions of state waters. States would be required to calculate and allocate only the maximum amount of pollutants that a waterbody can receive and still meet water quality stan-

dards. The goal of *Chesapeake 2000* is to meet the same standards without the need for regulations.

Chesapeake 2000 resulted in revised and updated water quality goals. States had until April 2004 to develop new tributary strategies that reflected the agreed upon water quality improvements that needed to be made in order to sustain the Bay's aquatic habitats and living resources. Virginia's draft strategies seek to meet Bay water quality objectives in part through very ambitious goals related to nutrient management planning. Historically, Virginia's tributary strategy planning efforts have relied primarily upon voluntary adoption and implementation of best management practices by land users, including the adoption and implementation of nutrient management plans. Costs for implementing all the NMPs identified in the tributary strategies are expected to be more than \$26 million.

The tributary strategies are being revised currently to reflect new assessments of the water quality needed to sustain aquatic habitats and living resources in the Bay by the Chesapeake Bay Program (CBP). According to the State's Assistant Secretary for Chesapeake Bay Coordination, findings from the update resulted in each Bay state being assigned a "load allocation" amount for nitrogen, phosphorus, and sediment by the CBP. For example, using the load allocations, Virginia is to limit the amount of nitrogen entering its rivers and streams to 51.4 million pounds per year by 2010 and to limit phosphorus to six million pounds per year. The load allocation goals replaced the 40 percent nutrient reduction goal developed under the 1987 Bay Agreement.

Components of a Nutrient Management Plan

The components of a nutrient management plan are prescribed in the VPG Permits for confined animal and poultry feeding operations as well as in DCR's Nutrient Management Training and Certification regulations. Plans written for confined animal and poultry feeding operations must contain:

- a site map,
- a site evaluation and assessment of soil types and potential productivities,
- a nutrient management sampling including soil and waste monitoring,
- storage and land area requirements,
- a calculation of waste application rates, and
- a waste application schedule.

NMPs written for confined animal feeding operations must also include a plan for waste utilization in the event the operation is discontinued.

DCR's Training and Certification regulations ensure that essential information is included in the NMPs. These regulations are particularly relevant when plans are developed voluntarily, because plan writers are not required to adhere to the VPG Permit requirements unless they are writing plans for permitted facilities. The regulations require that plans written by DCR-certified nutrient management specialists must include specific information which, in some cases, is more detailed

than the information required by the VPG Permit regulations. The regulations state that NMPs must consist at a minimum of an identification section, a map section, a field summary nutrient balance section, and a narrative section (Exhibit 1).

Neither the *Code of Virginia* nor the regulations require NMPs to be written by State-certified specialists. State requirements prescribe only the information that must be included in a NMP depending on the purpose or program for which the plan is being written.

Exhibit 1	
Major Components of Nutrient Management Plans	
<u>Plan Component</u>	<u>Description</u>
Plan Identification Section	<ul style="list-style-type: none"> Contains general information such as the farmer's name and address, nutrient management planner's name and certification number, and county and watershed code for the farm. Information about the acreage of each crop and the various livestock produced on the farm are also included.
Map or Aerial Photograph Section	<ul style="list-style-type: none"> Depicts farm location, field boundaries, and field numbers. Also shows features such as the manure storage systems, poultry litter storage facilities, mortality composting areas, and animal housing units.
Field Summary Nutrient Balance Section	<ul style="list-style-type: none"> Contains information on crop rotations per field, expected crop yields, soil productivity groups, nutrient crop needs based upon soil tests, and the amount of manure, biosolids, and commercial fertilizer that will be applied to the crop fields.
Narrative Section	<ul style="list-style-type: none"> Provides a description of the type of farm operation (for example, hog, poultry, dairy), the amount of manure produced, and how it will be managed. Also provides a description of cropping practices, and any additional information that is specific to the management of the farm operation, such as the management of environmentally sensitive areas, equipment calibration, and soil nitrate testing results.
<p>Source: <i>Virginia Administrative Code</i> at 4 VAC 5-15-140 and the Department of Conservation and Recreation's <i>Nutrient Management Handbook</i>.</p>	

NUTRIENT MANAGEMENT PLANNING IN VIRGINIA IS REGULATED BY TWO STATE AGENCIES

Virginia's nutrient management program is organized within DCR's soil and water conservation division. The program has 22 positions distributed among the central office and eight regional offices and is led by a program manager. Staff in the central office administer the overall program, including the training and certification activities and the functions regarding approval of NMPs for confined animal and poultry feeding operations. Nutrient management specialists in the field provide one-on-one assistance to individuals and work with farm operators to develop and implement NMPs.

Additionally, the Department of Environmental Quality is responsible for inspecting the farming operations which have been required to obtain Virginia Pollution Abatement General or Individual Permits. The *Code of Virginia* requires that DEQ annually inspect the State's confined animal and poultry operations. State law also requires that the inspections of these facilities be conducted by DEQ staff that are certified by DCR as nutrient management planners. DEQ has allocated 15 positions throughout its seven regional offices to perform this task.

Organizational Structure and Staffing of DCR's Nutrient Management Program

Virginia's nutrient management program is organized within DCR's division of soil and water conservation. Currently, DCR has 20 full-time positions throughout the State dedicated to nutrient management planning and two part-time positions. Four of the 20 full-time positions and one of the part-time positions including the nutrient management program manager and nutrient management training and certification coordinator, are located in DCR's central office in Richmond. The program manager position reports directly to the assistant director for nonpoint source pollution programs of the soil and water conservation division. The remaining central office positions include: the poultry nutrient management coordinator, the Virginia Pollution Abatement nutrient management coordinator (currently vacant), and the urban nutrient management specialist (part-time). These positions report directly to the NMP program manager.

DCR employees are responsible for nutrient management plan approval for producers required to have a DEQ-issued Virginia Pollution Abatement General Permit for confined animal operations. Nutrient management field staff help train water quality specialists employed by Virginia's Soil and Water Conservation Districts. Nutrient management specialists also provide plan writing assistance and support to approximately 20 counties that have local zoning ordinances requiring nutrient management plans for confined animal and poultry feeding operations.

In addition to the five central positions, another 17 positions are spread among DCR's eight regional offices. Each regional office has responsibility for one or more of Virginia's twelve watersheds. (DCR identifies 12 watersheds while DEQ

identifies only nine.) Five positions are located in the Staunton office (Shenandoah watershed), while three positions are located in Suffolk (Albemarle, Chowan, and coastal watersheds). Two nutrient management positions are located in each the Tappahannock (York and Rappahannock rivers), Warrenton (Potomac River), and Richmond (James River) offices. DCR's regional offices in Abingdon (Upper Tennessee and Big Sandy), Dublin (New River), and Clarksville (Roanoke) each have one position. (Three of the nutrient management specialist positions are currently vacant in Tappahannock, Staunton, and Clarksville.) Positions in the regional offices report directly to the regional office manager and not the nutrient management program manager in Richmond.

The poultry nutrient management coordinator and the Virginia Pollution Abatement nutrient management coordinator are responsible for reviewing nutrient management plans submitted for approval as part of the State's Poultry Waste Management Act and the Virginia Pollution Abatement General Permit for confined animal feeding operations, respectively. DCR also has a part-time urban nutrient management specialist who is responsible for working with lawn care companies to reduce the over-application of fertilizers. In addition, a regional specialist spends at least part of his time working with golf courses in Virginia to accomplish the same goal. Nutrient management specialists in the field implement Virginia's nutrient management program "on the ground" by providing landowners and operators with technical assistance, reviewing nutrient management plans prepared for the voluntary or regulatory programs, and leading educational programs for targeted groups on the need to reduce nutrients from entering State waters.

DEQ Is Responsible for Enforcing the Nutrient Management Components of Regulated Feeding Operations

The Department of Environmental Quality is responsible for annually inspecting the confined animal and poultry feeding operations that have received Virginia Pollution Abatement General Permits. As part of these inspections, DEQ staff verify that the farming operation has followed the nutrient management recommendations contained in the plan. The NMP components of the plan are enforceable through the permit.

DEQ has 14 full-time positions dedicated to inspecting these permitted facilities. Eight of these positions are organized within the department's Valley regional office. The Piedmont regional office has two positions, while there is one position for the CAFO program in the South Central, Tidewater, and West Central regional offices. Currently, there are no positions in the Northern Virginia or Southwest regional offices dedicated to the CAFO program. Instead, these regions rely on other staff who are also DCR-certified nutrient management specialists to conduct inspections of permitted facilities in those areas. Three of these positions are currently vacant.

Additionally, DEQ has allocated a position within its central office to coordinate the efforts of regional staff and to ensure consistency across the State. This

position was filled in late July after having been vacant for approximately five months.

Virginia Administers Funding Programs to Encourage NMP Use

Virginia provides financial incentives to encourage the use of NMPs. The Agricultural Best Management Practices Cost-share Program (Cost-share Program) reimburses farm managers for funds expended to implement certain best management practices (BMPs), including the development and writing of nutrient management plans. The Cost-share Program is administered by DCR through the 47 local Soil and Water Conservation Districts (SWCDs). The State will pay up to 75 percent of the cost of each BMP, a flat amount based on acreage, or a combination of the two, not to exceed \$50,000 per operator. State funding for this program is prioritized by watershed based on the greatest potential effect. Because some BMPs offer greater potential nutrient or sediment reductions than others, funding is also prioritized by the type of BMP. According to DCR, between FY 2000 and FY 2004, NMPs covering almost 32,000 acres were written using the Cost-share Program. DCR's share of these expenditures totaled more than \$85,000.

There is no dedicated source of State funding for the Cost-share Program, and it has been dependent on other funding mechanisms such as support from the Virginia Water Quality Improvement Fund (WQIF) or direct appropriations in the past. DCR is the lead agency for disbursing grant funds from the WQIF for projects related to nonpoint source pollution, including nutrient management functions, to local governments, SWCDs, institutions of higher education, and individuals who propose specific initiatives. The 2004 General Assembly provided at least \$5 million to the WQIF for agricultural best management practices, including nutrient management plans, in both FY 2005 and FY 2006. Projects that had been initiated previously continued to receive some funding from the pool of previously obligated funds, but no new projects were funded.

Farm operators can also receive tax credits for adopting certain agricultural best management practices. The program allows a tax credit against the State's individual income tax of up to 25 percent of the first \$70,000 expended to adopt an agricultural best management practice. According to records at the Department of Taxation, almost 600 tax returns were filed in tax year 2001 and another 760 returns were filed in 2002 claiming the credit. These figures include all best management practices adopted during that time, not just those returns filed for purchasing nutrient management plans.

The State also offers another tax credit program for the purchase of "advanced technology pesticide and fertilizer application equipment." To be eligible to claim this tax credit against an individual income tax, an operator must already have in place a SWCD-approved nutrient management plan. Although this tax credit does not provide funding assistance for the development of a NMP, it does encourage its implementation in order to reduce other farm-related costs. The program also provides incentives for replacing older applicators with more technologically advanced spreading equipment that can better address lower spread-

ing rates. Almost 140 claims were filed for this credit in tax year 2001, and almost 90 were filed in tax year 2002.

Involvement of Other Organizations in Nutrient Management Planning

The *Code of Virginia* does not specifically direct State agencies to develop and implement NMPs; however, some agencies that are involved in agricultural activities use NMPs to manage the storage and field application of commercial fertilizers and animal manures at their farm facilities. State agencies and institutions surveyed by JLARC staff are responsible for managing approximately 650,000 acres of agricultural and non-agricultural land, with roughly 24,000 acres of State-owned agricultural land managed under a NMP. (DCR staff indicated that not all of these NMPs may be current, however.) The Department of Corrections, for example, uses NMPs to manage over 12,000 acres of their agribusiness operation at 28 correctional facilities.

Moreover, Virginia Tech has developed NMPs to manage more than 70 percent of its agricultural land, including a 3,200-acre farm. Other agencies such as the Virginia Department of Transportation (VDOT) apply fertilizers to the State land that they maintain. VDOT has expressed interest in maintaining its acreage through site-specific NMPs and having the department's program managers for roadside activities become DCR-certified nutrient planners.

As mentioned previously, the SWCD staff perform functions related to nutrient management in conjunction with DCR and on their own. SWCD staff assist in identifying potential cost-share recipients, provide educational material to landowners and land operators, and provide individual assistance with the design and installation of farm conservation practices. Some funding of the SWCDs is provided by DCR and the localities in which they operate.

Other organizations also provide educational services to farmers and operators in Virginia. For example, the State operates the Virginia Cooperative Extension (VCE) at Virginia Tech and Virginia State University. One focus of the VCE is to provide assistance with agricultural and natural resource issues in order to balance the needs of farmers and landowners with the need to protect the State's environmental resources. There are 107 local extension offices in Virginia. Virginia Tech also provides a substantial amount of research on agriculture and natural resources through its College of Agriculture and Life Sciences.

JLARC REVIEW

This JLARC review of nutrient management planning in Virginia provides an assessment of the implementation, compliance with, and enforcement of those plans, the adequacy of litter transfer reporting requirements, the use of NMPs by State agencies, and the extent of nutrient management planning in urban and rural settings. The study does not address any issues that relate specifically to the land application of sewage sludge, due to the scope of work required to complete the topics that are addressed. The 2003 General Assembly enacted a law requiring the

Board of Health to initiate regulatory action to require site specific nutrient management plans developed by DCR-certified planners for all sites where sewage sludge is applied to the land. At this time, the Board has not yet published a notice of intent to start the regulatory process needed to make that change.

A number of research activities were undertaken in order to address the items identified in HJR 72. These activities included structured interviews, surveys, document reviews, and data analysis.

Structured Interviews

Numerous structured interviews were conducted during the course of this review. JLARC staff interviewed staff with the Department of Conservation and Recreation, the Department of Environmental Quality, representatives of farming organizations, an environmental group, and others. Interviews with DCR staff included the agency director, chief deputy director, nutrient management program manager, and the two nutrient management specialists responsible for reviewing and approving nutrient management plans submitted by animal and poultry facilities subject to the State's permitting requirements. JLARC staff also interviewed DEQ personnel, including: the director of water permit programs, the confined animal feeding program (CAFO) coordinator, and staff in five of the department's seven regions. In addition, JLARC staff also interviewed: (1) representatives of the Virginia Farm Bureau, the Virginia Poultry Federation, the Virginia State Dairymen's Association, and the Chesapeake Bay Foundation; (2) staff of the National Resource Conservation Service; (3) staff of other State agencies, including the departments of Transportation, Corrections, Agriculture and Consumer Services, and General Services; and (4) researchers at Virginia Tech, the Chesapeake Bay Program, and the University of Maryland. JLARC staff also spoke with nutrient management program staff in Maryland and Delaware, including the program administrator in Maryland.

Surveys

Several mail surveys and one web-based survey were conducted by JLARC staff in concert with this review. For example, JLARC staff surveyed approximately 1,650 Virginia farmers regarding the management of nutrients on their farms. This survey effort had two parts. First, JLARC staff mailed a survey to 650 (63 percent) of the 1,032 farmers that were identified as having a current NMP for operating a confined animal or poultry feeding operation. Farmers receiving a survey through this part of the survey effort included 52 percent of the poultry facilities (a randomly drawn sample) and all beef, dairy, and swine operators in the Commonwealth that are regulated as CAFOs. Second, JLARC staff also worked in conjunction with the U.S. Department of Agriculture's Virginia Agricultural Statistics Service (VASS) to mail surveys to another 1,000 farmers in the State. Response rates were 47 percent and 31 percent, respectively, for the two parts of the survey effort.

In addition to Virginia farmers, 244 of the State's 285 certified nutrient management planners were surveyed concerning nutrient management plan devel-

opment, implementation, and other program elements. Forty-one planners were excluded from this survey because they were believed to no longer actively write NMPs. Fourteen of those excluded were DEQ staff, who do not write plans. This survey was also administered in two parts. First, all 14 of DCR's nutrient management staff organized within the department's seven regions received surveys, with 13 submitting responses. Second, 230 other certified nutrient management planners not employed by DCR were also surveyed, with 70 responding. A web-based survey was conducted of 47 State agencies and institutions regarding their use and implementation of NMPs on State lands, and 39 responded.

Document Review and Data Analysis

In addition to interviews and surveys, JLARC staff reviewed various documents and data from both DCR and DEQ as part of this study. The following information was included as part of this review.

DEQ Inspection Reports from Confined Animal and Poultry Feeding Operations. The *Code of Virginia* requires that DEQ annually inspect all permitted confined animal and poultry feeding operations. As such, JLARC staff reviewed DEQ inspection files for 200 permitted facilities in five of the department's seven regions. The facilities in these regions accounted for more than 90 percent of all permitted facilities in the State. The 200 facilities were randomly selected from the five regions and included five of the seven beef operations, half of the dairy and swine operations, and fifteen percent Virginia's poultry operations. JLARC staff also reviewed the files of 27 additional facilities that were identified using DCR information as having expired nutrient management plans. As part of this file review, JLARC staff also accompanied DEQ staff on six inspections of permitted farming operations.

Review of Nutrient Management Plans. JLARC staff collected and reviewed nutrient management plans developed as part of mandatory and voluntary programs in Virginia. JLARC staff examined 50 randomly chosen nutrient management plans that had been reviewed and approved by DCR staff since 2001 as part of the CAFO permitting process. DCR maintains copies of all plans approved for permitting purposes at its central office in Richmond. The elements contained in these plans were reviewed for consistency with DCR's Training and Certification regulations. Additionally, JLARC staff reviewed 25 NMPs that had been developed for farms that are not regulated as a CAFO. These NMPs could be developed to meet requirements for State Cost-share or tax credit programs, or in situations where farmers simply request a plan so that they can more efficiently use nutrients in their farming operations.

Review of Tributary Strategy Documents and Other Information Developed to Address Virginia's Commitment to the Goals of the Chesapeake Bay Agreement. JLARC staff reviewed the State's five most recent tributary strategy documents, as well as past strategy documents. Data from DCR on the quantity of acreage covered by nutrient management plans that is credited to Virginia now, other DCR data on the amount of acreage covered by plans written or revised during

the last three years, and data on the quantity of acreage projected for 2010 under the State provisional tributary strategy, were compared. The updated strategies were also compared against the State's tributary strategies as first presented in the mid-1990s.

REPORT ORGANIZATION

This report assesses nutrient management planning in Virginia by examining participation, compliance, and enforcement of the program's key components. The document is divided into five chapters. This chapter provides an overview of the study mandate, Virginia's nutrient management planning program, and the JLARC review. Chapter II addresses the use of plans on agricultural lands. Chapter III assesses the State's activities with regard to poultry waste transfer and alternative uses. Chapter IV examines the extent to which nutrient management plans or criteria are developed and used in non-agricultural settings and by State agencies and institutions. The fifth and final chapter discusses several potential changes to nutrient management planning that are already underway, or that could be considered, to improve the plans or the process and increase the protection of water quality.

II. Nutrient Management Plans for Agricultural Land

HJR 72 requires that this review examine the effectiveness of the implementation and enforcement of NMPs in Virginia. As indicated in Chapter I, NMPs are regarded as effective tools for improving the efficient use of crop nutrients while also minimizing adverse effects of those nutrients on water quality. However, to be effective, the plans that are written must be of good quality, and they cannot sit on a shelf unused. Individuals receiving NMPs must either view them as realistic and choose to implement them without substantial prodding, or the provisions of the plans must be enforced.

Accordingly, this report examines the quality of the NMPs written in Virginia, the extent of implementation, and State enforcement efforts. The focus of this chapter is upon agriculture, which accounts for a high proportion of nonpoint source nutrients, as well as most acreage covered by NMPs. Of the agriculture acreage that is currently covered by NMPs, about 30 percent is covered by NMPs that are required by law and are within the purview of State inspection and enforcement activity by DEQ. About 70 percent of the agriculture acreage that is covered by NMPs have been developed and adopted for other reasons and are not inspected or enforced. These plans are referenced in this chapter and in the remainder of the report as “voluntary plans.”

The review found that the NMP program in Virginia has some strengths and weaknesses. The quality of the nutrient management plans that are written for farms is generally good (although there is some concern that permissible deviations from NMP nutrient application recommendations may unduly limit the benefits of some NMPs). However, the performance of farmers in implementing their required NMPs appears to be somewhat mixed; and, partly by intent, partly due to the difficulty of the task, and partly due to resource impediments, the State’s inspection and enforcement activity for required NMPs appears to be weak. The degree of rigor that is appropriate for the State’s inspection and enforcement program for NMPs is a policy choice; however, the State may wish to consider whether more vigorous action should be taken in the future in instances where there are serious or repeated violations of NMP conditions.

For NMPs that have been accepted by farmers on a voluntary basis, the extent to which the conditions set forth in these plans are being implemented over time is somewhat unclear. However, available evidence suggests that, as is the case for required plans, full implementation of these NMPs is not being realized, but yet it has been assumed in State tributary strategy documents.

Overall, the approach that is taken in Virginia to promoting the implementation of NMPs relies heavily on the good will and record-keeping of farmers. This approach is achieving a level of implementation of NMPs that appears to be beneficial. However, the approach is not producing a level of NMP implementation and

compliance that will be sufficient to achieve the State's commitments to water quality goals in the long term.

QUALITY OF NUTRIENT MANAGEMENT PLANS WRITTEN IN VIRGINIA IS GENERALLY GOOD

Four aspects of nutrient management plan quality were considered as part of the review: (1) the adequacy of the State's legal requirements addressing nutrient management plan content to provide the information needed in good nutrient management plans, (2) whether or not the plans as written provide all of the information that is required by State regulations, (3) whether the plans are written to be effective for the length of time that is recommended by DCR, and (4) whether the guidance that farmers are receiving about nutrient applications under the plans are likely to be compatible with the efficiencies that are believed to be attainable by the use of NMPs.

The review found that the quality of nutrient management plans written for farms is generally good. The plans that are written are typically complete and consistent with requirements established in the *Code of Virginia* and regulations. The foundation for nutrient recommendations in NMPs is an agronomic land use evaluation system that was developed at Virginia Tech. One area of concern, however, is that some adjustments to NMP recommendations that are permitted under State regulatory language may go too far in allowing for deviations from the recommended limits, such as in exceptions for some fields. This is a concern because the benefits of NMPs are often obtained by relatively modest reductions in the amount of nutrients that are applied to crops. To the extent that recommended limits are substantially relaxed, the nutrient reductions that might have been expected will not be obtained.

State Regulations Specify Most, But Not All, of the Elements That Would Be Useful in NMPs

NMP content is guided by State law and regulations administered by DCR and DEQ. State law codified in 1994 requires that in order to operate a confined animal feeding operation in Virginia, a Virginia Pollution Abatement General Permit (VPG Permit) must be obtained. Prior to being issued a VPG Permit, the facility operator must submit to DCR for approval a nutrient management plan outlining how the facility will address the efficient use of nutrients. The *Code of Virginia* identifies several types of information that must appear in any nutrient management plan submitted as part of this process. Specifically, section 62.1-44.17:1(E)(2) of the *Code of Virginia* states that plans submitted for these purposes must contain, at a minimum:

- (i) a site map indicating the location of the waste storage facilities and the field where waste will be applied;
- (ii) a site evaluation and assessment of soil types and potential productivities;

- (iii) nutrient management sampling including soil and waste monitoring;
- (iv) storage and land area requirements;
- (v) a calculation of waste application rates;
- (vi) a waste application schedule; and
- (vii) a plan for waste utilization in the event the operation is discontinued.

The Poultry Waste Management Act was codified five years later. As part of the Act, a DCR-approved nutrient management plan must be submitted in order to obtain a VPG Permit for operating a confined poultry feeding operation. The information required in a NMP to obtain an operating permit for a confined poultry feeding operation is the same as that required in a NMP for a confined animal feeding operation. However, language was eliminated that required a plan for waste utilization in the event that an operation is discontinued.

Also in 1994, the General Assembly directed DCR to provide a standard set of criteria to be used in the development of nutrient management plans for both agricultural and non-agricultural purposes. In 1996, DCR published the department's Training and Certification regulations in the *Virginia Register* addressing the requirements of section 10.1-104.2 of the *Code of Virginia*. The regulations establish the criteria that must be met in order for someone to be certified by the State as a nutrient management planner. In addition, the regulations specifically identify the content that must be included in all nutrient management plans submitted to DCR by certified nutrient management planners. NMP content is governed by section 4 VAC 5-15-140 of these regulations, and was briefly discussed in Chapter I. Broadly, these components are comprised of a plan identification section, maps or aerial photographs of the facility, a summary of the NMP recommendations, and a narrative section that describes special conditions based on the specifics of the farming operation.

The training and certification regulations appear to incorporate most of the seven elements required by law to be in every nutrient management plan written for a CAFO operating permit. However, where the statute requires "a site map indicating the location of the waste storage facilities and the fields where waste will be applied," the Training and Certification regulations only require that each plan contain a map identifying:

- the farm location and boundaries;
- individual field boundaries; and
- field numbers and acres.

In addition, neither statute nor the regulations require that the environmentally sensitive sites and buffer areas located on acreage managed under a plan be identified on a map. Some of this information is already available to planners through soil surveys. However, additional information may assist plan writers in developing more accurate nutrient management plans.

Recommendation (1). The Department of Conservation and Recreation should include in its Training and Certification regulations a requirement that all nutrient management plans contain a map indicating the location of waste storage facilities and the fields where the waste will be applied on the operation for which the plan is written as is required for confined animal and poultry feeding operations by §62.1-44.17:1(E)(2) and §62.1-44.17:1.1 of the *Code of Virginia*.

Recommendation (2). The Department of Conservation and Recreation should amend its Training and Certification regulations to require that nutrient management plans contain a legible and clearly marked map identifying all environmentally sensitive sites and buffer areas on the fields for which the plan is written.

NMPs Written in Virginia Appear to Contain Required Information

As discussed in the previous section, plans submitted for DCR-approval in order to obtain a VPG Permit must contain the information required by the *Code of Virginia* and the Training and Certification regulations. Plans developed by certified nutrient management planners for voluntary purposes, such as Virginia's Agricultural Best Management Practices Cost-share and tax credit programs, are required to provide the information indicated in the Training and Certification Regulations. JLARC staff reviewed the content of 50 NMPs written by certified specialists for permitted facilities that had been reviewed and approved by DCR between May 2001 and August 2004. JLARC staff also reviewed 25 plans that were identified for facilities that did not need to be permitted.

This review indicated that the percentage of missing items from the plans was low (Table 6). Of the 1,300 items reviewed in required NMPs, only 41 items were missing, or 3.2 percent. Only 13 of 225 items reviewed in voluntary NMPs, or 5.8 percent, were missing. Five of the 50 required NMPs reviewed by JLARC staff were missing maps identifying the field numbers and acreage. Three NMPs were missing soil analysis test summaries and three were missing field productivity reports. Other missing items included manure production calculations and storage capacity.

Plans Do Not Appear to Be Written for Longer than Recommended

The training and certification regulations require that plans be updated at least once every five years. However, the regulations also recommend that only plans written for hay or pasture rotations be written for a period longer than three years. The nutrient management program manager stated that plans should generally be written for no more than three years, as a way to capture the frequent changes inherent in farming operations. To reflect that concern, the Training and Certification regulations compel farm operators to have a new soil analysis completed for every field at least once every three years. Waste analyses are also to be completed annually for liquid manure and every three years for dry or semi-solid

	Required		Voluntary	
	Number of Missing Items	Percent of NMPs Reviewed	Number of Missing Items	Percent of NMPs Reviewed
Plan Identification:				
Date of plan expiration	1	2	--	--
Manure allocated vs. produced	1	2	--	--
Litter produced, used, sold	2	4	--	--
Maps:				
Farm location and boundaries	2	4	1	4
Individual field boundaries	2	4	1	4
Field numbers and acreage	5	10	1	4
Balance Sheet:				
FSA tract & field numbers	1	2	--	--
Field acreage	2	4	--	--
Expected crops/crop rotation	1	2	--	--
Crop nutrient needs	1	2	--	--
Residual nitrogen credits per acre (legume and organic)	4	8	--	--
Manure application rates	1	2	--	--
Timing of application	1	2	--	--
Manure analysis	2	4	--	--
Expected days for incorporation	1	2	--	--
Spreading schedule	1	2	--	--
Manure used as crop nutrients	1	2	--	--
Commercial fertilizer rates (timing of application)	1	2	--	--
Additional Information:				
Manure produced	1	4	1	4
Manure storage capacity	3	6	3	12
Manure sold	1	2	1	4
Soil analysis test summary/soil tests	3	6	2	8
Field productivity report and yield ranges	3	6	1	4
Identification & management of environmentally sensitive sites	--	--	2	8
Note: Nutrient management plans from 18 confined animal feeding operations and 32 confined poultry feeding operations were reviewed.				
Source: JLARC file review of 50 NMPs written for confined animal and poultry feeding operations and 25 voluntary NMPs written by DCR staff.				

manures. This helps to ensure that plans reflect the actual farm activities and changes that have likely occurred during that time. JLARC staff analysis of the 50 NMPs that were written for permitted facilities found that none of the 32 poultry facilities or 18 animal operations that were reviewed had a plan length greater than what is recommended by DCR's regulations.

One Area of Uncertainty Is How Final Application Rates Recommended Under the Plans Compare to Presumed Nutrient Management Efficiencies

Over the years, the Chesapeake Bay Program (CBP) has developed and adjusted efficiency factors to represent the effectiveness of nutrient management for use in its predictions of Bay water quality. CBP assesses the effects of certain best management activities and their assigned efficiency assumptions on the Bay's water quality conditions through simulation runs of its Chesapeake Bay Watershed Model (CBWM). Nutrient management planning is one of the practices included in the CBWM.

Currently, the CBP estimates that farms not using NMPs receive applications that are as much as twice the amount crops can use, with an approximate average of 1.55 times the amount crops can use. CBP estimates that farms using appropriate NMPs are likely to apply an average of about 1.35 times the amount that crops can use. (In general, most states program their nitrogen NMP recommendations somewhat above actual crop needs, since crops like corn are rather inefficient at nitrogen utilization). Thus, a group of farmers who would apply nutrients at levels 1.55 times what crops can use absent a nutrient management plan, but who would apply nutrients at only 1.35 times what crops can use under the guidance of a nutrient management plan, are able to produce the typical efficiency that is estimated by the Chesapeake Bay Program.

How the typical situation in Virginia compares to this assumption is unclear. DCR collects data on the number of NMPs that are written, but does not have data on how recommended amounts of nutrients from the NMPs compare to the rates used by farmers prior to receiving the NMPs. In addition, Virginia's NMPs are based on application guidelines that are designed to allow for some level of application beyond crop needs. While this is consistent with Bay Program assumptions and is reasonable, there are allowable adjustments and deviations from the recommendations that make it difficult to say with confidence that the application rates of farmers with NMPs will be reduced to the levels contemplated by the Bay Program.

NutMan Assists Certified Planners with Plan Writing. In order to write a NMP, planners generally visit a farm, meet with the operator, and use the operator's records and future crop and livestock plans to develop the NMP. To assist certified nutrient management planners in developing NMPs and to ensure a certain degree of uniformity in the plans, DCR and Virginia Tech created the "NutMan" computer application, which helps plan writers develop NMPs. As described by Virginia Tech, NutMan:

automates virtually all of the calculations involved in balancing nutrient production, needs, and use, and it produces several reports for use in farm management, record-keeping, and compliance with nutrient-related regulations.

The NutMan program has been available since 1998. DCR provides a copy to all persons who become certified nutrient management specialists in Virginia and attend a training session on the computer program. In order to complete a nutrient management plan using NutMan, plan writers must provide several pieces of farm information, including, but not limited to: soil and manure analyses, prior crop yields if available, intended crop rotation, and the type and number of confined animals, if any.

Deviations from Basic NMP Assumptions Could Compromise the Achievement of Nutrient Reductions. While the NutMan package is helping to provide more consistency across written plans, plan writers are still provided the opportunity to make adjustments to the figures calculated by the NutMan software. For example, planners can increase the yield potential of fields beyond what the software calculates if written records exist of higher yields. According to DCR staff, there is no internal mechanism within the program to ensure that amounts entered into NutMan are not outside the accepted range for each item. As a result, the potential exists for the program to recommend an over-application of nutrients based on inaccurately entered or intentionally manipulated values. The extent to which DCR's review of plans identifies and overrides such entries is unclear.

In addition to adjustments allowed in NutMan, DCR's nutrient management program manager told JLARC staff that the recommendations from VALUES have been designed with consideration given to farm economics, and hence, some protections are built in for the farmer. For example, DCR staff asked that instead of a specific recommendation for the pounds of nitrogen that could be used on corn crops, NMPs would be written by planners with an allowance of up to 20 pounds for corn above whatever the basic recommendation would be by soil type. Although this range affords planners some flexibility in their recommendations, it may also reduce the potential water quality benefits that would be gained from applying the minimum amount necessary for crop needs. DCR staff acknowledged that if farmers always apply the highest recommended amount in the range, this would obviously be worse for the environment.

Additionally, during the development of the training and certification regulations, DCR heard from farmers that while the yields assumed for individual fields in nutrient management planning are generally accurate for most fields, there were some fields which were more productive than would be predicted using Virginia Tech's VALUES system. To accommodate these concerns, the training and certification regulations permit operators to deviate from NMP recommendations in up to 20 percent of their fields based solely on the "farmer's past experience with crop yields" as long as the adjustment be "reasonable." When asked about this, the program manager agreed that conceivably, a farmer could apply significantly more than the recommended rate on one-fifth of their fields without that being considered a prob-

lem under the regulations. Moreover, there would be no way to verify whether any adjustment that had been made was reasonable or not.

When making adjustments to more than 20 percent of the fields in an operation, the training and certification regulations allow farmers to substitute actual yield records from the most recent five years for the average yields that have been calculated for use in NMPs. DCR regulations require that if yield records are used, the calculation can be “an average of the 3 highest yielding years taken from the last 5 years the particular crop was grown in the specific field.” NutMan was originally designed to automatically flag field application records where the crop yields have been manually modified and also produce a note in the field summary page of the printed NMP. In discussions with DCR staff and in reviewing nutrient management plans, it does not appear that this function is still operational, however. This would appear to be a useful tool for the plan reviewers to have.

The importance of the issue of higher application levels that may result from such adjustments and deviations is heightened by two concerns that are discussed later in this chapter: (1) farmers who do not think that their NMP is realistic usually think that it under-prescribes the amount of nutrients that are required, and (2) the State’s enforcement program does not lend itself to observing actual field applications of nutrients, and does not appear to be very strict with regard to the number of animals on farms relative to the NMPs or to nutrient over-applications.

Recommendation (3). The Department of Conservation and Recreation, in conjunction with the Department of Environmental Quality, should analyze a sample of NMPs, to examine the extent to which the terms of existing NMPs may call for or allow over-applications of nutrients that could be harmful to water quality. The analysis could be used to determine whether there is a need for greater stringency with regard to allowing adjustments to basic NMP recommendations.

Recommendation (4). The Department of Conservation and Recreation should reinstitute the component within NutMan that will automatically flag instances in which crop yield values have been manually adjusted upward.

Recommendation (5). The Department of Conservation and Recreation should reconsider the language in the training and certification regulations that permits farm operators to make upward adjustments to expected crop yields, and hence increase nutrient application rates, on up to 20 percent of a farm’s fields based solely on previous experience. If the department wishes to continue providing farm operators this opportunity, it should consider limiting undocumented upward adjustments to field productivity in a more restrictive manner, such as limiting changes to a percentage of acreage or requiring that the plan identify the areas and describe the agricultural activities intended to take place there. Moreover, the department may want to consider requiring farmers to keep field productivity records.

FARMER PERFORMANCE IN IMPLEMENTING AND COMPLYING WITH REQUIRED NUTRIENT MANAGEMENT PLANS APPEARS TO BE MIXED

In order for the State's nutrient management planning program to effectively reduce agricultural pollution, NMPs must be properly implemented and consistently utilized over time. Farmer implementation and compliance is likely to result in one of two ways. First, if farmers perceive that their NMPs are realistic for their farms and beneficial for their farm operations, then as long as they understand the requirements of their plan, they are likely to implement them based on their own self-interest. Second, even if not perceiving their plans as positively beneficial for their farm, farmers may implement the plans in deference to the requirements of State law.

To assess implementation and compliance with NMPs, JLARC staff developed survey questions asking farmers and certified nutrient management planners about these issues. In addition, JLARC staff reviewed DEQ inspection files for evidence regarding the extent of farmer compliance and non-compliance with plans.

The results from this review indicate that the picture in Virginia with regard to the implementation of required NMPs is somewhat mixed. On the positive side, survey data indicate that a majority of farmers think that their NMPs are realistic most or all of the time. In addition, the data also suggest that farmers mostly or always implement their required NMPs.

However, there are farmers who think that their NMPs are not realistic, most typically because they do not think that their plan allows for enough nutrients to be applied. Also, about 40 percent of farmers with required NMPs report that they do not always follow their plans, and a majority of certified nutrient management planners believe that farm operators do not always implement their plans. DEQ inspectors, with fairly limited inspection techniques, find that about 30 percent of inspected facilities have at least one deficiency requiring corrective action.

About 60 Percent of Farmer Survey Respondents Consider Their NMPs to Be Realistic All or Most of the Time, But About 40 Percent Do Not

In general, it seems reasonable to assume that NMPs that are regarded by farmers as realistic relative to their farm operations and their economic self-interests are more likely to receive willing implementation than NMPs that are considered unrealistic. DCR's *Nutrient Management Handbook*, for example, states that "a well written plan which addresses the specific needs of an operation with a practical and realistic approach is also more likely to be successfully implemented." Considering this, a survey of farmers for this study asked about the extent to which they think their NMPs are realistic.

Respondents to the survey provided a mixed response to this question (Table 7). On the one hand, about two-thirds of respondents indicated that their NMP is realistic most or all of the time. However, less than 20 percent of the re-

How Realistic Is the Plan?	Respondents With Operations Under Confined Animal Control Law		All Respondents With NMPs	
	Number	Percent	Number	Percent
Always	54	19.2	67	18.9
Most of the Time	119	42.3	162	45.6
Sometimes	86	30.6	103	29.0
Rarely or Never	22	7.8	23	6.5
Total	281	100.0	355	100.0

Source: JLARC staff survey of regulated confined animal and poultry feeding operations and JLARC staff and USDA Virginia Agricultural Statistical Service survey of farmers in Virginia, summer 2004.

spondents indicated that their plan was realistic all of the time, even among respondents who are required to implement their NMPs. Moreover, more than one-third of respondents indicated that their NMP is realistic only some of the time, rarely, or never.

Farm operators who indicated that their plan was sometimes, rarely, or never realistic were asked on the JLARC survey to describe why (Table 8). Respondents could choose more than one factor. Among the respondents with operations under the confined animal control law who felt that their plan was only sometimes or never realistic, 72 percent believed that the NMP recommended amounts of animal manure or litter that they could apply on their fields were too small. Another 62 percent of these respondents indicated that their plans do not adequately consider farm economic concerns, and more than one-third indicated that the plans have unrealistic assumptions about the management of excess manure.

The results suggest that a majority of farmers with NMPs may be willing to implement their plans all or most of the time simply on the basis that they view their plans as providing a realistic assessment of nutrient needs of their fields, and therefore it is in their self-interest to do so. However, the results also indicate that a substantial minority of respondents (40 percent) think that their NMPs are only sometimes or rarely realistic. Implementation and compliance with NMPs in this case is likely only achievable if these farmers wish to, or are compelled to, defer to NMP fertilizer recommendations due to legal requirements that they do so.

Therefore, JLARC staff also asked farmers about the extent to which they implement their plans, and compared those responses to farmer replies about the extent to which their NMP is realistic. Certified nutrient management specialists were also asked about the extent to which they think that the NMPs they write are actually implemented.

<u>Explanation for Why the Plan Is Not Always Realistic</u>	<u>Percentage of Respondents</u>
The plan's recommended amounts of nutrients/litter/manure are too small	72 %
The plan does not adequately consider farm economic concerns	62
The plan has unrealistic assumptions about management of excess manure or transport of excess litter from my facility	36
The plan provides impractical or inappropriate recommendations on the timing of fertilizer applications	28
The NMP recommendations are too complex and confusing	24

Source: JLARC staff survey of regulated confined animal and poultry feeding operations. The percentages are based on the total number of valid responses (106). Respondents could choose more than one response, so the total percentage can be greater than 100 percent.

Survey Results Suggest that Required Plans Are Implemented Most But Not All of the Time

JLARC staff surveyed a sample of regulated farmers across the State, and certified nutrient management planners, to help assess the level of farmer implementation of required NMPs. Among the 288 farmer respondents to the question, 60 percent reported that they implement their plans all of the time, while another 38 percent indicated that they implemented their plans most of the time. The survey of certified nutrient management specialists provided a more pessimistic assessment. For example, whereas 60 percent of farmer respondents with required NMPs responded that they “always” implement their plans, only eight to 14 percent of active nutrient management planners believe that farmers always implement their plan (Table 9). The majority of certified nutrient management specialists do believe that farmers implement their NMPs “most” of the time.

The survey responses by farmers also suggest that farmers who believe their plans are always realistic are more likely to implement them (Table 10). For example, of the 53 respondents who believed that their plans are always realistic, 94 percent also report that they always implement their plans. Furthermore, of those respondents who believe their plan is realistic most of the time, 57 percent always implement their plans and 43 percent implement their plans most of the time. Interestingly, whether due to deference to the requirements of the law, or overly optimistic self-reporting of compliance, among the relatively small group of respondents who felt that their plans were rarely or never realistic, half reported that they nonetheless always implement their plans.

<u>Farmer / Specialist Response</u>	<u>Percentage of Farmers</u>	<u>Percentage of Non-DCR Specialists</u>	<u>Percentage of DCR Specialists</u>
<u>Always</u> implement plan	60	14	8
Implement plan <u>most</u> of the time	38	57	85
Implement plan <u>some</u> of the time	2	29	8
<u>Never</u> implement plan	0	0	0
Total Respondents	288	21	13

Source: JLARC staff survey of regulated confined animal and poultry feeding operations and survey of nutrient management specialists.

<u>How Realistic Is the Plan?</u>	<u>Number of Respondents Whose Plans Are Realistic . . .</u>	Farmers' Implementation of NMPs (Percentage of Respondents)		
		<u>Always</u>	<u>Most of the Time</u>	<u>Some of the Time</u>
Always	53	94	6	0
Most of the Time	117	57	43	0
Sometimes	84	40	56	4
Rarely or Never	22	50	36	14

Notes: The implementation rates are based on the number of respondents who believe their plan is always realistic, is realistic most of the time, is sometimes realistic, or is rarely realistic. For example, 53 respondents believe their plan is always realistic, and 94 percent of these farmers indicated that they always implement their plans.

Source: JLARC staff survey of confined animal and poultry feeding operations who are required to have a NMP.

Overall, the survey results paint a mixed picture, suggesting that NMPs are implemented much but not all of the time. These findings indicate the need to consider the next topic in this chapter, an assessment of the State's process for enforcing NMP requirements, and consideration of what the results from the enforcement process suggest about NMP compliance.

INSPECTIONS OF PERMITTED FACILITIES AND NUTRIENT MANAGEMENT PLAN ENFORCEMENT EFFORTS HAVE BEEN WEAK

Partly by intent, partly due to the difficulty of the task, and partly due to resource impediments, the State's inspection and enforcement processes for required NMPs have been weak. State inspections and enforcement efforts have placed a premium upon having amicable relationships with the regulated farmers. This priority is evidenced in the inspection and enforcement approach that is taken, including announced rather than unannounced inspections, and a presumption that non-compliant farmers need to be educated rather than penalized to help bring them into compliance. In addition, allowable penalties for non-compliance are limited. For example, for confined animal and poultry feeding operations, civil penalties are limited to \$2,500 for operators violating the permit conditions, including violations of NMP requirements. (Changes to the federal National Pollution Discharge Elimination System program will permit states, including Virginia, to fine violators up to \$25,000 for permit violations beginning in 2006.)

To some extent, weak inspection and enforcement activity is also due to the inherent difficulty of the task. It is difficult for DEQ staff to really monitor what is happening on farms at the time of nutrient applications. Enforcement activity therefore hinges substantially on the checking of farmer records.

There are opportunities for DEQ staff to allocate their priorities and resources more on a seasonal basis in order to be present more often at times when nutrients are applied. DEQ inspection and enforcement activities in several regions have been hampered, however, by an apparent lack of resources. This review found that four of the five DEQ inspection offices did not meet statutory requirements to perform annual inspections of confined animal and poultry feeding operations.

The degree of rigor that is appropriate for the State's inspection and enforcement program for NMPs is a policy choice. However, the State may wish to consider whether DEQ staff should be authorized to proceed more vigorously in instances where there are serious or repeated violations of NMP conditions.

DEQ Inspections Are Scheduled in Advance, and Rely Heavily on Farmer Records

Section 62.1-44.15 (5a) of the *Code of Virginia* requires DEQ to perform annual compliance inspections of permitted animal feeding operations. The statute further requires that DEQ staff performing the annual inspections must be certified under DCR's training and certification program. Part of the DEQ inspection process includes an evaluation of the extent to which the operation is complying with the NMP recommendations.

Inspections Are Scheduled in Advance, and Involve Records Review and Some Visual Inspection. According to DEQ staff, the annual inspection process involves scheduling an inspection, reviewing the operation's file prior to conducting the inspection, reviewing the farmer's records while on-site, and observing

fields for runoff. DEQ staff explain that inspectors schedule their visits to farms prior to the inspections to ensure that the farmers and the farm records will be present. However, this provides non-compliant farmers with an opportunity to try to disguise areas of non-compliance.

DEQ inspectors verify that farm operators have a current NMP and have attended the approved training course. Section 62.1-44.17:1(E)(10) directs CAFO operators to complete DCR's training program within one year after they register for the permit and at least once every three years thereafter. The regulations for poultry operations require that each poultry grower attend the training program once, within one year of registering for the VPG Permit.

DEQ inspectors assess the compliance of permitted operations by reviewing farm records and conducting a visual inspection of the facilities. The record-keeping review is a paper-driven process that focuses on soil and waste monitoring, land application information, and litter transfer records. Several DEQ inspectors stated to JLARC staff that the record-keeping review is the most important aspect of the inspection.

According to a DEQ guidance memo, the visual inspection is intended to focus on proper storage of waste, disposal of mortalities, and land application of waste. DEQ inspectors look at poultry waste storage facilities to assess whether poultry litter is properly covered to prevent runoff and avoid contact with rainwater. They also examine the stored waste to estimate the quantity in storage at the time of the inspection. This information is needed to calculate whether farmers are applying and transporting the proper amounts of waste. DEQ staff also inspect liquid storage systems for leaks and to assess whether there is adequate freeboard (farmers are required to maintain 12 inches of freeboard plus the runoff from a 25-year, 24-hour storm event from the top of the lagoon to the waste to prevent overflows).

DEQ inspectors also perform a visual inspection of fields (if applicable) where manure or litter is applied. DEQ staff generally select two fields to inspect prior to arriving at the farm. This part of the inspection provides DEQ staff with an opportunity to identify crops being grown and to look for potential runoff.

DEQ inspections of permitted facilities can be described as informal and cooperative. In most cases, the review of farm records and conversations about farm management take place in informal settings. For example, it is common for DEQ inspectors to review farm records on the hood of a car or truck. The conversations that JLARC staff observed between farmers and inspectors were friendly and cooperative, with DEQ staff politely requesting information from the farmers.

Inspection Checklists Contain NMP Elements That Are Required in the Code of Virginia and Regulations. In order to promote consistency and thoroughness in the inspections conducted across the State, DEQ developed a Confined Animal Feeding Operation Inspection Checklist, originally designed to mirror the permit requirements. The checklist was modified by DEQ in 2002 to accommodate inspections of poultry facilities. The inspection checklist includes a section that assesses the farmers' compliance with their approved nutrient management plans by

documenting animal numbers, spreader calibration dates, and amounts and timing of waste applications.

Although a general checklist was designed for use across the State, several regional offices have modified the checklists to better fit their situations. For example, the Valley regional office recently revised its checklist to include questions about the total amounts of litter that are in storage, land applied or transferred. This additional information helps DEQ inspectors in the Valley identify where all the poultry litter is at the time of the inspection. Despite slight regional differences, the inspection reports seem to be consistent across the State. Furthermore, the inspection checklists appear to contain the elements required by the law and regulations.

Visual Inspections of Fertilizer Applications and Farm Fields Are Not as Timely and Useful as They Could Be. For the most part, field inspections are not done during or immediately after field applications have been made. Consequently, inspection reports almost always lack first-hand observations regarding the nutrient application activity of farmers. All of the application sites (fields) that DEQ inspected during JLARC's site visits had crops that were already growing or full-grown. For this reason, DEQ staff were not able to confirm which application methods or amounts were used. DEQ staff told JLARC staff that they were looking for evidence of runoff when they inspected the fields.

Discussions with DEQ staff indicate that this occurs for a couple of reasons. First, rather than managing its staff in a way that would maximize its inspection presence at times of field applications, DEQ seeks to distribute the workload of full-time inspectors throughout the year. Second, DEQ staff believe that their presence at the time of field applications would be more disruptive of farm operations, and would be unfavorably received by farmers. DEQ staff indicate that if farmers are applying nutrients at the time of an inspection, they are not free to produce records or answer many questions. Also, it was stated that farmers might use the proper application rates and timing simply due to the fact that they are being observed.

However, DEQ inspectors could focus on visual inspection work and taking soil samples when visiting farms at times of nutrient application, and come back at later times for reviewing records, an inspection activity that does require more time and more access to the farmer. The argument that the visits themselves might induce compliance simply due to the observation process is weak, given that obtaining compliance is a key part of the objective. Inspectors could also assess other indications of compliance by randomly collecting soil and manure for analysis for comparison with analyses contained in NMPs.

Four Regions Did Not Meet the Statutory Requirement for Annual Inspections

JLARC staff's file review of annual DEQ inspections revealed that four out of five regions visited by JLARC during this review were not able to meet their annual inspection requirement for some period of time. For example, in the Northern Virginia region, one third of the facilities that JLARC staff reviewed did not have

any inspection reports. In fact, Northern Virginia did not conduct CAFO inspections in 2001, 2002, or 2003, unless there was a known problem with an operation. According to DEQ staff in that region, they were understaffed during those years due to high turnover. In order to meet the inspection requirement, they have currently tasked two VPA permit writers who are certified nutrient management planners with conducting inspections on a part-time basis. According to DEQ staff, this region recently filled a vacant permit position, which could alleviate some of their staffing concerns. They believe that they will be able to meet this requirement in the future.

A similar problem occurred in Tidewater, where DEQ regional staff completed only a few annual inspections between July 2001 and April 2003 because of staffing issues, according to the regional office's water compliance manager. In July 2001, the DEQ inspector in this region left to go to another DEQ regional office. Tidewater's regional office was not able to fill the vacant inspector position until May 2003. During the time that the position was vacant, two staff from the Virginia Beach office completed some of the annual inspections on a part-time basis.

The Piedmont regional office also missed some annual inspections. According to DEQ staff in that region, a poultry inspector position was vacant during FY 2004. Information provided by the region indicates that only 59 percent of their VPA-permitted facilities were inspected during that fiscal year. Among those not inspected, a few farms were either closed or were scheduled for future inspections. One of the two inspector positions is still vacant in that region.

DEQ staff at the Valley Regional Office also indicated that they missed some inspections during fiscal year 2004 due to staffing issues. According to the DEQ regional manager in the Valley, they were not able to complete 20 percent of their poultry inspections during fiscal year 2004 due to the loss of four inspectors between April 2003 and April 2004.

In addition to staffing issues, outbreaks of avian flu also affected inspections in the State. In all DEQ regions, inspections of poultry facilities were suspended between March 11, 2002 and September 11, 2002. DEQ staff in the Valley, Tidewater, Piedmont, and Northern Virginia regional offices also suspended inspections from September 8, 2003 to March 11, 2004. During FY 2004, the Tidewater regional office missed about 20 percent of their inspections due to avian flu. The majority of the inspections delayed by the avian flu outbreak in this region have since been completed.

Recommendation (6). The Department of Environmental Quality should ensure that each region meets the *Code of Virginia's* annual inspection requirement.

Despite Limitations in the Rigor of Its Inspections, DEQ Finds About One-Third of Facilities Have At Least One Deficiency Needing Correction

To help assess the level of compliance of Virginia's farmers with the recommendations of their required nutrient management plans, and DEQ's actions in cases where non-compliance is found, JLARC staff reviewed DEQ inspection reports to identify the types and frequencies of deficiencies recorded by DEQ staff. JLARC staff reviewed inspection files for 227 randomly selected operations in five of DEQ's seven regions. The analysis revealed that about 32 percent of the files had at least one deficiency requiring corrective action in the most recent inspection. This demonstrated some improvement from the previous inspection cycle, when 48 percent of the files had at least one deficiency noted. Specific findings from this part of the review are summarized in Table 11.

As indicated in the table, some violations represented out-of-date waste or soil analyses. According to the regulations, confined animal and poultry feeding operations are required to monitor soils and wastes at specified frequencies. Missing current waste analyses were cited in eight percent of the files reviewed, making it the most cited violation. Missing current soil samples were cited in six percent of the files. According to DCR's *Nutrient Management Handbook*, soil tests and manure analysis results are important aspects of maintaining good field records. In addition, this information is crucial for writing effective nutrient management plans. Furthermore, soil test results can reveal soils that are high in phosphorus, which could indicate a possible over-application of nutrients.

In almost five percent of the cases, farmers over-applied nutrients to some portion of their fields. This suggests that applications were occurring at rates other than those prescribed by the NMP for crop needs. DEQ inspectors explained, however, that applying more than the prescribed nutrient rates during one inspection cycle does not necessarily mean that an over-application of nutrients has occurred. For example, NMPs prescribe specific application rates for each crop, but if cropping rotations are changed, more nutrients may be applied and the rates could still be within recommended agronomic ranges identified for that crop.

Furthermore, the NMP is written for a three-year period, so using nutrients in excess of the prescribed rate during the first year of the plan may not translate to an over-application over the life of the nutrient management plan. If an over-application occurs during the first year of their plan, operators must contact their plan writer to account for the nutrient usage in the second and third years of the plan. If farmers continue to apply at a rate above what was prescribed in their NMPs, however, an over-application of nutrients will occur. The application rates prescribed by a NMP are based on crop needs and productivity as identified by agronomic recommendations or farmer records. If crops receive nutrients above the recommended rates for a given year, the crop may not be able to use all of the nutrients, increasing the potential for runoff and leaching.

Based on JLARC's assessment, approximately four percent of the facilities reviewed had incomplete field records. Examples of information retained in field

Table 11				
Deficiencies Needing Corrective Action				
Deficiencies Needing Corrective Action	Number From Current Inspection	Percentage of Total Files	Number from Previous Inspection	Percentage of Total Files
No Current Waste Analysis	17	8.1%	23	11.0%
No Current Soil Analysis	13	6.2	31	14.8
Over-application of Nutrients	10	4.8	12	5.7
Field Records Not Maintained	9	4.3	25	12.0
No Current Litter Analysis	8	3.8	12	5.7
Did Not Comply with Recommended Spreading Schedule (in balance sheets or Special Conditions)	7	3.3	8	3.8
Expired NMP	6	2.9	2	1.0
Spreader Not Calibrated	6	2.9	26	12.4
Incomplete Litter Transfer Records	6	2.9	13	6.2
Berm Needs Maintenance (i.e., Trees growing, animal burrows, grass needs to be cut)	5	2.4	7	3.3
Uncovered or Improperly Stored Litter	5	2.4	3	1.4
Custom Applicator Agreement Not Signed or Not in Records	5	2.4	6	2.9
Producer Did Not Attend DCR Training	2	1.0	5	2.4
Inadequate Freeboard or Missing Freeboard Marker	2	1.0	5	2.4
Change in Cropping Rotation	2	1.0	3	1.4
Applied Waste to Fields Not Under NMP	2	1.0	13	6.2
Leaks from Lagoon or Tears in Lagoon Lining	1	0.5	4	1.9
Encroached Buffer When Spreading Waste	0	0.0	3	1.4
Overflow from Lagoon	0	0.0	2	1.0
Other	8	3.8	7	3.3
Total Items Requiring Corrective Action Identified in 209 Files	114		210	
Notes: The current inspection refers to the most recent inspection report on file for each operation. It would not be accurate to say that 114 out of 209 files reviewed had items requiring corrective action. Each file could have more than one deficiency noted, or none at all.				
Source: JLARC staff review of a sample of DEQ inspection reports.				

records include soil tests, manure analysis results, spreading calibration settings, fertilizer application rates, and final crop yields. This information is critical for DEQ inspectors to determine how carefully farmers are following their NMP application rates and timing recommendations. DCR's *Nutrient Management Handbook* states that, "without good field records, it is impossible to know what has been done, and if any progress or improvements are being made." Similarly, a Pennsylvania report assessing the effectiveness of their state's nutrient management program concluded that, "while record-keeping violations may seem trivial, the lack of complete records completely undermines the goals of the [Pennsylvania] Nutrient Management Program."

In three percent of the records in which the calibration of waste spreader equipment was applicable (for example, waste transfer plans do not require documentation of calibration), the calibration was not done or was not documented properly. According to DCR's *Nutrient Management Handbook*, "equipment calibration represents another area which is critical to plan implementation." Without proper calibration, the result may be over or under-application of plant nutrients, which will do little to increase the efficient use of nutrients. Nonetheless, DEQ staff stated that spreader calibration is not an exact science. Due the nature of the equipment and the animal waste, precise calibrations are difficult to accomplish.

JLARC's assessment of DEQ inspection reports reveals that although the inspection process is somewhat limited in its rigor, it is useful in identifying some deficiencies that need correction. For example, about one-third of the operations had identified deficiencies. For the items that the inspection does cover, inspection results also indicate that many of Virginia's regulated farmers are complying with elements in their NMPs some or most of the time, which is generally consistent with study survey results. Although some of the violations that the DEQ inspection process is capable of detecting may not represent an imminent threat to water quality, the items reviewed and the corrections cited are generally necessary to promote well-informed and appropriate nutrient management activity, and oversight.

DEQ Has Taken an Educational Approach to Enforcement, With Few Formal Enforcement Actions

In most cases, DEQ has used an informal, educational approach to the enforcement of confined animal facility permits. DEQ staff have described their approach to enforcing the requirements upon permitted facilities as "compliance assistance." Compliance assistance refers to DEQ's preference to educate farmers about the importance of complying with their NMPs as opposed to levying civil penalties against them for noncompliance. The Virginia Poultry Federation remarked in May of 2003:

The VDEQ has a year of poultry farm inspections under its belt. VDEQ has seemed to view the initial inspections as an educational process, pointing out and politely asking growers to correct minor compliance problems. . . VDEQ says that in round two of inspections, they will continue to take an educational approach and not

take enforcement actions against any growers that make a good faith effort to comply.

After facilities first come under permits, as has been the case under the Poultry Waste Management Act, compliance assistance can be appropriate. As indicated in the preceding section of this chapter, there is some evidence that compliance assistance may have been beneficial recently, as the percentage of inspected farms with deficiencies dropped from 48 percent in one year to 30 percent in the next. However, in the long term, DEQ may need to turn to more formal enforcement actions, particularly in instances of serious and/or repeated violations.

DEQ's Enforcement Process. In cases for which a violation of the facility permit or facility NMP is identified, DEQ assesses the potential impact of the violation on water quality to determine the appropriate enforcement method. DEQ staff may use either informal or formal procedures to resolve the deficiencies.

In most cases, inspectors will use informal procedures. For example, if the inspectors determine that the violations pose no threat to the environment they will use informal procedures to resolve them. Informal procedures generally include identifying the violation in the inspection report, indicating the required corrective action, and in some cases setting specific deadlines. The deadlines for corrective actions vary based on the severity of the violations and the actions needed to remedy them. For example, DEQ staff in the South Central region told JLARC staff that litter left uncovered for more than 14 days requires immediate correction. However, a facility with inadequate freeboard in its lagoon is a more complicated issue to resolve, so an immediate fix may be unrealistic.

If the inspectors determine that the violations represent a potential threat to the environment, they will issue warning letters to the producers requesting that they address the deficiencies by specific dates. Furthermore, if DEQ inspectors determine that the violations pose an imminent threat to the environment, or if the farmers did not respond to their warning letters, they will issue notices of violations requesting that the farmers enter into formal negotiations with DEQ to resolve the deficiencies as expeditiously as possible. After concluding the negotiations, DEQ staff issue letters of agreement to the farmers stating the corrective action that both parties agreed to in order to address the deficiencies.

Once the permitted operations correct their deficiencies, they must submit written confirmation to DEQ indicating that they addressed the agency's concerns. DEQ inspectors follow-up with the farmers to verify that the violations were properly corrected. If the permitted farmers are negligent in addressing their violations, or if the violations are very severe, DEQ will take formal enforcement action by issuing consent orders directing the farmers to comply with the requirements of the program. If farmers do not comply with the requirements of their permits, DEQ staff can enforce the program by issuing civil penalties up to \$2,500. Specific penalties differ based on the severity of the violations. Changes to the State's Virginia Pollution Discharge Elimination System (VPDES) permitting program that will become effective January 1, 2006, will allow DEQ to fine certain large confined animal and

poultry feeding operations up to \$25,000 per violation of the permit, including violations regarding the NMP.

JLARC staff identified a number of informal enforcement actions in the DEQ inspection reports. For example, in the inspection reports that JLARC staff reviewed, 17 facilities were issued warning letters. Five additional facilities were issued notices of violation. One of these five facilities was issued a consent order and a civil penalty for exceeding the specified application rate in the NMP and not maintaining adequate freeboard.

Only one of the warning letters or enforcement actions identified in the file review was issued against a poultry operation. According to DEQ staff, more of the warnings and penalties are issued against CAFOs because the water quality threat associated with storing and handling liquid manure is usually more imminent. Furthermore, the permit requirements for poultry operations are still relatively new. For example, DEQ is now in its third year of poultry inspections.

DEQ staff also told JLARC staff that the majority of violations that result in enforcement action stem from noncompliance with reporting requirements rather than physical violations of the permit or NMP requirements. Of the Notices of Violation and consent orders identified in JLARC staff's review, three were related to reporting requirements and two were related to over-application and freeboard issues. Among the warning letters that JLARC staff identified, about half of the violations were associated with reporting requirements, including waste and groundwater monitoring, submitting land application reports, applying for permits, and attending DCR training, while the other half involved physical violations of the permit or NMP requirements, including freeboard violations, over-application of nutrients, or encroaching on buffers.

JLARC Staff Identified Some Cases In Which Greater Enforcement May Be Warranted. Although experience and judgment are needed to enforce the State's nutrient management program, there may be some instances in which DEQ should take greater enforcement action. For example, the act of spreading nutrients outside of the spreading schedule is a fairly blatant disregard of the NMP. Based on an assessment of items requiring corrective action from the current DEQ inspection reports (Table 11), 3.3 percent (seven) of the total files reviewed indicated that farmers had applied outside of the recommended spreading schedule indicated in either the balance sheets or special conditions of the NMPs, yet none of these seven violations resulted in enforcement action.

In addition, if the permits are to be meaningful, then DEQ inspectors need to take special note when the number of animal units at the facility are substantially greater than what is provided for in the NMP, and enforcement action should be considered. A higher number of animals than is accounted for in the NMP is very likely to result in higher manure production than is addressed by the NMP. In recognition of this concern, the special conditions section of the NMPs states that the "nutrient management plan is void if livestock numbers (dairy, swine, poultry, etc.) are above the level specified in the nutrient management plan."

However, during the review, JLARC staff identified seven inspection reports in which DEQ staff indicated that the numbers of animals in confinement at the time of the inspections did not exceed the NMP animal units when, in fact, they did by as much as 28 percent. In another inspection report reviewed by JLARC staff, a DEQ inspector noted an overage in animal number, but did not identify it as a violation requiring corrective action. In this example, there were more than twice as many livestock at the facility during the inspection than were identified in the NMP (11,000 turkeys was the number in the NMP, but 24,000 turkeys were at the facility at the time of the inspection). The inspection report did not address the issue that the facility had more than twice as many birds as permitted by the NMP.

DEQ needs to develop some guidelines for its inspectors that address the actions that should be taken when permit holders are over the animal unit numbers in their NMP. These guidelines should take into account the percentage by which permit holders may exceed the number established in the NMP and the land available for nutrient applications. DEQ staff in several regions indicated an overage in the number of animals listed in the NMP of ten percent or less generally does not warrant corrective or enforcement action, although DEQ has not established a formal policy for addressing this NMP violation. DEQ staff indicated to JLARC staff that in many cases operations can increase their animal units by less than ten percent without significantly affecting the amount of manure produced and managed by the NMP.

In addition to animal units being exceeded, there may be some instances in which an over-application of nutrients could warrant greater enforcement action. The central benefit of having NMPs on the farms is to ensure that nutrient applications are not overly excessive, so substantial nutrient over-applications undermine the value of the NMPs. As discussed earlier, the application rates provided by NMPs are based on an approach that already includes an amount of nutrients above what crops actually need. The following two case studies illustrate substantial over-application deficiencies in which no enforcement action was taken by DEQ staff:

In one file identified during JLARC staff's review, the farmer had over-applied nutrients to the same 12-acre field in consecutive years. It was noted in the inspection report that an over-application of 46 pounds of nitrogen per acre was made in 2003, and an over-application of 47 pounds of nitrogen per acre had been made in 2002 to the same field. Although the farmer was directed to contact the nutrient management planner to adjust the rates and timing in the NMP, no enforcement action was taken.

According to DCR staff, a nitrogen over-application of this magnitude should cause concern. DCR staff indicated that little could be done in this case to remedy the environmental impact of this violation. For example, adjusting the rates in the NMP for the following year could negatively affect crop yields without improving the environmental impact because the nitrogen would have already been lost. As opposed to nitrogen, which easily contaminates water through run-off and leaching, phosphorus stays in the soil from

year to year, so adjusting the NMP application rates in cases of over-applications of phosphorus makes sense. DCR staff suggested that an over-application of this magnitude on one field might represent an isolated event. If this were the case, it would be beneficial to communicate verbally with the farmer to make sure that the farmer understands the NMP and will not repeat the same violation. On the other hand, if an over-application of this magnitude were to occur more than once, or on more than one field, this would be an issue of greater concern that could warrant further enforcement action.

In a second case, the producer applied nitrogen in excess of nearly 200 pounds per acre of nitrogen:

According to DEQ's inspection file, the total nutrients applied to the inspected seven-acre field were exorbitant, greatly exceeding the NMP allowable loading rates. Based on DCR's Standards and Criteria, the soil productivity group and crop type called for 65 to 85 pounds of nitrogen per acre. The producer, however, applied 283.5 pounds of nitrogen per acre to the field. According to the report, this was a serious environmental violation.

An over-application of this magnitude appears to represent complete disregard for the nutrient management plan recommendations. Despite the potential seriousness of this over-application, however, no enforcement action was taken against the facility. According to DEQ staff, this inspection took place in March 2003, while the agency was taking a purely educational approach to enforcement. In fact, according to regional staff, their enforcement procedure was not in place until June of 2003. At the time of the inspection, the operator was instructed to contact the nutrient management planner to adjust the nitrogen rates for the remainder of the plan. During an inspection in 2004, the facility had an expired litter analysis and an expired NMP, but a similar over-application was not noted. Although this over-application might represent an isolated incident that was corrected through DEQ's educational approach, the environmental consequences of such action cannot be corrected.

In addition to specific cases where it appears that DEQ should have taken greater enforcement action, it also appears that even when operators have demonstrated repeated deficiencies, DEQ has taken an educational approach to bring these facilities into compliance. JLARC staff identified 16 facilities that had identical items requiring corrective action in two consecutive inspections. Five of these operations had two identical deficiencies identified in consecutive inspection reports. The breakdown of items requiring corrective action by type appears in Table 12.

Only one of the repeated violations identified resulted in informal enforcement action, although a few of them stand out as potentially serious violations. For example, two operations that had expired soil samples were identified in inspections that were eight or nine months apart. In the most current inspections for each of these facilities, the DEQ inspectors directed the farmers to obtain current soil sam-

Table 12
**Types of Violations that Were Identified
in Consecutive Inspection Reports**

Type of Violation that Occurred in Consecutive Inspections	Number of Facilities with Repeated Violations
Field Records Not Maintained Properly	4
No Current Soil Analysis	4
Lack of Spreader Calibration or Proper Documentation	2
Berm Needs Maintenance	2
No Current Litter Analysis	2
No Current Waste Analysis	2
Over-application of Nutrients	1
Leaks from Lagoon or Other Waste Storage or Application Structures	1
Change in Cropping Rotation	1
Custom Applicator Agreement Not Signed	1
Incomplete Litter Transfer Records	1

Source: JLARC staff review of DEQ inspection reports for permitted facilities.

ples for each field slated to receive a waste application within 90 days or prior to the next manure application. If these two facilities had obtained current soil samples after the first inspection, the samples would have still been valid 12 months later.

Therefore, it appears that the facilities never took the corrective action identified in their inspection reports. In a third instance of missing soil tests, inspection reports for one facility indicated that soil tests on this farm had been expired for over two years. This was the only deficiency identified in two consecutive inspections that resulted in a warning letter.

Over-applying nutrients in consecutive years is another violation that could warrant greater enforcement action. The case study that was previously described illustrates an example of an operation in which nitrogen was over-applied to a field by more than 40 pounds in two consecutive years. As mentioned above, DCR staff indicated that this type of violation should be considered especially serious if it occurs more than once.

In addition to those facilities that had repeated offenses, a number of facilities also had more than one deficiency. For example, in the files that JLARC staff reviewed, 13 percent had at least two items requiring corrective action. In some cases, files had as many as six or seven deficiencies noted as items requiring corrective action. If an operation has had multiple deficiencies this could suggest that the farmer is having difficulty following the NMP, does not understand the requirements of the permit, or does not wish to comply. One facility that had multiple violations cited in the most recent inspection was missing information about the date of the manure application, when or if the manure was plowed into the soil, and the

number of loads and gallons per load that were applied. In addition, the manure analysis was out of date, weeds were too high on the berm of the lagoon, and the custom applicator agreement was not signed for the second year in a row. Despite all these deficiencies, no enforcement action was taken against the farmer.

Recommendation (7). The Department of Environmental Quality should take stronger enforcement action against facilities with serious or repeated violations.

Agency Guidelines for Enforcement Actions Could Lead to More Consistency in the Regions

During this review, JLARC staff found that there was a lack of DEQ enforcement guidelines to achieve consistency among the regions. Individual regional offices have worked to create some inspection / enforcement guidelines for their own use. For example, DEQ's Piedmont regional office attempted to make their approach to enforcement more uniform in 1998. At that time DEQ staff designed a point system to assess the severity of NMP violations. According to DEQ's memo, "the inspection form and assessment criteria have been designed to minimize the degree of subjectivity in the field. A consistent approach for both inspections and enforcement is needed." This point assessment assigned point values to different permit violations depending on their severity and potential impact on water quality. The guidelines also suggested point thresholds for informal and formal enforcement action, including warning letters and notices of violation. Although this point system was never formally adopted into DEQ's enforcement approach, DEQ staff in Piedmont try to follow its guidelines when possible. At this time, none of the other regions reviewed by JLARC are using a formal point system to assign appropriate enforcement actions to various violations.

Also, in 2003, the Valley regional office did create enforcement guidelines in an effort to ensure greater consistency among inspectors in their region. The guidelines they created included a section that outlined a number of common deficiencies, their corrective actions, and expected completion dates.

It should be noted that between February and July of 2004, the central coordinator position for the CAFO permit program was vacant. Furthermore, there was no specific training last year for CAFO inspectors due to limited resources, according to DEQ staff. A central coordinator was recently hired by DEQ, which could lead to greater consistency among the regions in the future. According to the new coordinator, developing consistency among regions is a necessary improvement to the CAFO permit program. Central guidelines on proper corrective actions and enforcement actions for specified deficiencies could alleviate some of the inconsistency across regions.

Recommendation (8). The Department of Environmental Quality should develop guidelines for enforcement activity that promote greater consistency across regions.

FULL IMPLEMENTATION OF VOLUNTARY NUTRIENT MANAGEMENT PLANS CANNOT BE ASSUMED

The previous sections of this chapter discussed the lack of full implementation and limited enforcement of NMP requirements that have been written for State-regulated farming operations, which account for about 30 percent of the acreage under NMPs in Virginia. As discussed in Chapter I, plans that are developed outside of that regulatory structure, referenced in the report as “voluntary” plans, account for approximately 366,000, or slightly more than 70 percent, of the agricultural acres that are managed by a NMP in the Commonwealth. As with required NMPs, it appears that the plans written on a voluntary basis are not being fully implemented and persistently maintained.

The assumption of Virginia’s NMP program, reflected in tributary strategy documents, has been that if farm operators are willing to take the time and pay the cost needed to voluntarily develop a NMP, then it stands to reason that they would also comply with its intent. However, research findings concerning the implementation rates of voluntary NMPs indicate that 80 percent implementation may be the highest rate that can be expected. Moreover, it is difficult to determine actual implementation rates for voluntarily written plans in Virginia, because only limited State oversight of voluntary plan implementation occurs.

Implementation of Voluntary Plans May Peak at 80 Percent

State agency staff and others suggest that if a farm manager is willing to go through the process and cost of having a NMP written, then it is likely that the manager will implement the plan. Despite this, other evidence suggests that implementation of voluntary plans occurs at less than 100 percent. For example, research conducted in Maryland in 1997 found that only 80 percent of planned acreage received applications of nutrients similar to the NMP’s recommendations. A 1995 research project in Wisconsin found that implementation rates for certain best management practices might be as low as ten percent. The Chesapeake Bay Program (CBP) has begun revising how it accounts for actual implementation of best management practices in the Chesapeake Bay Watershed Model (CBWM), including nutrient management plans, because of potential over-reporting. In Virginia, certified nutrient management specialists do not think that the voluntary plans they write are fully implemented all of the time, but a majority think that these plans are implemented most of the time.

Maryland’s Study of Voluntary Implementation. A 1997 review of farmers’ practices on Maryland’s Eastern Shore reported that the application rates of farmers voluntarily using nutrient management plans did not exceed the rates recommended in the plan on 80 percent of the acreage. (In 1997, Maryland’s program was still voluntary.) Farmers responsible for approximately two-thirds of the agricultural acres in the Pocomoke River watershed, were interviewed about their nutrient application practices. While in general, 80 percent of the acreage received nutrients within ten percent of the plans’ recommendations, there was a substantial difference in application rates depending on who wrote the plan. While application

rates of plans did not exceed 10 percent of the recommended amounts on 87 percent of the acreage managed for which a private planner wrote the NMP, that proportion dropped to 51 percent of the acreage for which staff of the Maryland Cooperative Extensions Service wrote plans.

Review of Implementation of BMPs in Wisconsin. Research done in Wisconsin in the mid-1990s reported even lower rates of compliance than what was found in Maryland. The Wisconsin review focused on implementation and compliance rates as part of the use of voluntary best management practices (BMPs), which included the voluntary adoption of nutrient management plans, to control nonpoint source pollution. The report estimated that while 75 percent participation in the NPS program was considered necessary to achieve improved water quality, actual participation was about 10 to 50 percent.

The author found that when measuring actual compliance with the best management practices being offered in the Wisconsin program, participation (as defined by those who said they would do something) was often a substitute for implementation (as defined by actually doing what was agreed to). The report stated that “actual participation is usually evaluated immediately after the sign-up period and, consequently, only measures *intended* participation (emphasis added).” The report’s findings indicated that “not all intended participants actually implemented the BMPs” for which they had signed up. For example, in one particular watershed, only 50 percent of the amount of streambank control efforts that had been agreed to were actually installed.

Recent Chesapeake Bay Program Conclusions. Recently, the CBP is reaching conclusions that are similar to the conclusions reached by the Wisconsin review. That is, a report by the CBP released in April 2004 found that when states report BMP implementation rates for inclusion in the CBWM, the rates are often based on the number of signed agreements, and not the actual implementation. CBP’s report stated,

Because progress [towards the Bay Agreement’s goals] is based on reported implementation, there is a concern about the overly optimistic reporting of implementation. Progress is usually based on plans written or structures designed, not on actual implementation. (*Innovation in Agricultural Conservation for the Chesapeake Bay*, 2004.)

The report goes on to suggest that inaccurate estimates of actual implementation of voluntary plans may lead to unrealistic water quality goals and expectations.

The Chesapeake Bay Program has also indicated that the 100 percent credit given to implementation of voluntarily adopted nutrient management plans as part of the CBWM has been too high. CBP staff interviewed for this review suggested that an implementation rate of 65 percent where there was universal participation in a cost-share program could probably be expected. The chair of CBP’s nutrient subcommittee told JLARC staff that implementation of nutrient management plans developed under voluntary programs is extremely difficult and may peak

at 60 to 80 percent. Voluntary plans are acceptable to farmers as long as the practices being recommended already match the farming practices or interests of the farmer.

In fact, CBP staff said that conservative estimates will be used regarding implementation rates as adjustments are made to the CBWM in the future. As will be discussed in Chapter V, it is not clear, however, that this new and improved accounting practice is taken into account in the numbers that are being used in the State’s tributary strategies.

Nutrient Management Planners in Virginia Do Not Think that Their NMPs Are Always Fully Implemented as Written. Survey data from nutrient management specialists in Virginia does not indicate much difference in the extent to which they think that voluntary plans are implemented compared to plans that have been required by law. As was the case with required plans, these specialists indicate that most farmers with voluntary plans implement these plans most, but not all, of the time (Table 13). Only two of the 38 respondents to the question indicated that voluntary plans are always implemented, including none of the 13 DCR staff. Ten respondents (27 percent) think that voluntary plans they write are followed only some of the time.

Table 13		
Perspective of Certified Planners Concerning the Implementation of NMPs		
Degree to which farmers implement and continue to follow NMPs written for their facilities:	<u>Required Plans</u>	<u>Voluntary Plans</u>
	Percent of Planners Who Answered:	Percent of Planners Who Answered:
Always	12	5
Most of the Time	68	68
Some of the Time	21	27
Never	0	0

Source: JLARC staff analysis of certified planner surveys. Percentages for required plans are based on responses from 34 certified planners (13 responses from DCR staff, and 21 responses from other planners). Percentages for voluntary plans are based on responses from 38 certified planners (13 responses from DCR staff and 25 responses from other planners).

Oversight of Voluntarily Developed Plans Is Very Limited

Neither the *Code of Virginia* nor DCR’s Training and Certification regulations contain monitoring or enforcement requirements for voluntarily developed NMPs. DCR staff said that Virginia’s nutrient management program has historically relied on voluntary compliance, and the State does not want to pressure these operations for fear that farm managers may abandon using their plans altogether.

Some oversight is applied to the limited number of NMPs that are funded as best management practices through the Cost-share program. Practices funded through the Cost-share program are subject to a compliance inspection for the extent of time that the funded practice is operational. A database containing information on the practices receiving cost-share funding is maintained by DCR. From that list, five percent of the BMPs installed in the most recent year are randomly selected for review and five percent of all funded projects that are still viable are also randomly chosen for review. DCR regional conservation district coordinators, along with local SWCD staff, are responsible for ensuring that annual inspections of newly and previously installed BMPs take place.

Nutrient management plans that are included in the inspection samples do not receive a visual inspection, according to DCR staff. Instead, the SWCD staff will call the farm manager to verify that the NMP is being followed. Generally, they will ask whether there is a NMP and whether it has been implemented, along with other general information such as farm location. If a violation is identified, there is a standard enforcement procedure to be followed. The farmer will have the option to refund the cost-share funding to the State or the farmer can take the necessary steps to correct and/or fully implement the BMP. Only 22 nutrient management plans funded through the cost-share program since FY 2000 have been selected for this review, and these operations were reported as being in compliance.

Some informal oversight of voluntary NMPs may also be occurring through other means. Regular interactions between farm managers and local SWCD staff or extension agents provide opportunities for these agents to provide unofficial NMP implementation oversight, JLARC staff were told. In addition, the two DCR staff members responsible for approving the regulated confined animal and poultry feeding operations said that they will occasionally review voluntary plans that are sent to the central office. Staff at the James River Correctional Center told JLARC staff that as a result of DEQ inspectors evaluating other operations being conducted by the prison facility, there is informal oversight of the facility's voluntary NMP. Overall, however, oversight of voluntary NMPs is very limited, and full implementation of these plans cannot be assumed.

III. Virginia's Poultry Waste Transfer and Alternative Uses Program

The Poultry Waste Management Act requires the Department of Environmental Quality to track and account for poultry litter transfers. The mandate for this study, HJR 72, requires that JLARC review “the adequacy of the requirements for the collection, recordation, and compilation of data” regarding the animal wastes that are to be tracked under this Act. The appropriate transfer and disposal of poultry litter is an important concern for the Commonwealth due to the potential that this waste has to degrade water quality if improperly managed. Because chickens and turkeys are unable to digest some forms of phosphorus in feeds, poultry litter contains a higher concentration of this nutrient compared to wastes that are produced by other animals, such as dairy and beef cows.

According to DCR, in 2003 more than 577,000 tons of poultry litter was generated in Virginia. Of that amount, approximately 411,000 tons, or 71 percent, was transferred from the poultry operations on which it was produced to other farms. Although the improper application of litter has the potential to severely impact water quality, farms that receive litter are not required to have a NMP. An analysis by JLARC staff of a subset of transfers indicates that, for the most part, poultry litter is moved between farming operations that are located within the same DEQ region. Because of potential elevated soil phosphorus levels in high poultry production areas and the associated risk for phosphorus loss, the State, through the Poultry Waste Management Act has deemed that it is important to move some of the litter from fields with high phosphorus levels to fields with low soil phosphorus content in the rest of the State.

The Department of Conservation and Recreation and the Virginia Poultry Federation (VPF) jointly funded a very limited pilot litter transport program in FY 2003 and FY 2004. DCR and VPF contributed a combined total of \$50,000 for the purposes of trying to move litter out of counties in the Shenandoah Valley with soils testing high for phosphorus. A review of the poultry litter transfer program indicates that the program has not been as successful as originally hoped. The program originally intended to move 16,000 tons of litter out of high production areas in the State by paying farms \$6 per acre to accept the litter. However, in the program's first year, only about 1,300 tons were transferred under this incentive schedule. DCR increased the payment to \$10 per acre in the second year of the program and increased the number of localities capable of receiving the litter, resulting in commitments to move a total of 8,000 tons. However, it is unclear whether this type of program will continue in the future. The Poultry Waste Management Act does not require continued participation in such activity by the poultry industry or the State.

In addition to the limited scope and uncertain future of the pilot program, another concern is that the Department of Environmental Quality has not been adequately tracking where the poultry litter is being transported, as is required by statute, and end users are not required by law to have NMPs. DEQ has established a procedure and a tracking form which is employed by the department's inspectors

when they perform annual inspections, and an evaluation of a subset of these tracking sheets reveals that litter is typically transferred within the DEQ region in which it is generated. However, while it is collecting the necessary information, the department is not evaluating that information to identify patterns in transfers. Knowing the destination of the State's poultry litter is vital for ensuring that the waste is not being applied to fields that lack the capacity to appropriately use all the nutrients. Farmers responding to a JLARC survey indicated that the recordkeeping requirements for compiling and collecting the necessary information under the General Permits are not particularly burdensome.

In addition to the litter transport program, the Poultry Waste Management Act, as passed in 1999 required processors to identify how they would develop an alternative use cost-share program by January 1, 2000. However, it does not appear that alternative uses were ever fully addressed. Overall, there has been little movement towards developing alternatives for the use of poultry litter. Inclusion of the enzyme phytase in poultry feed, however, has shown promise for reducing poultry litter phosphorus levels by as much as 30 percent.

DEQ IS REQUIRED TO TRACK AND ACCOUNT FOR POULTRY LITTER TRANSFERS

The Department of Environmental Quality administers a regulatory program pursuant to the Poultry Waste Management Act that is responsible for collecting, recording, and compiling data on animal waste disposal and transfer. DEQ tracks this information by requiring poultry farmers to document each transfer of more than ten tons of dry poultry litter.

To determine where the litter is going, JLARC staff analyzed poultry waste transfer sheets from 139 poultry operations in four DEQ regions. In addition, JLARC staff identified trends in the four regions. These trends are important in understanding whether poultry litter is being transferred outside of areas such as the Shenandoah Valley that have been identified as having phosphorus saturated soils and moved to areas where a need exists for the nutrients contained in poultry litter. This analysis showed 71 percent of the more than 59,000 tons of litter is transferred within the region where it was generated. The Valley region was responsible for roughly 48,000 tons of the litter transferred. Over 10,000 tons of litter went to entities, also known as poultry litter brokers, who are defined in the regulations as someone "who possesses more than ten tons of poultry waste in any 365-day period and who transfers some or all of the waste to other persons." Tracking the final destination of poultry litter that has been transferred to a broker can be problematic.

HJR 72 directs JLARC to evaluate the reporting requirements for animal waste disposal and transfer, and specifically the view of farmers and farming organizations. Survey responses from farmers in the Commonwealth indicate that the current reporting process is easy to understand and manageable. However, a quarter of respondents indicated some difficulty in compiling the required information.

DEQ has not developed a state-wide accounting system for poultry transfers. DEQ regional offices collect the poultry transfer sheets at annual inspections, and then send the sheets to the DEQ central office. However, after staff in DEQ's central office receive the sheets, the Department is not performing the required assessment of the amount of litter transferred and the geographic distribution of transferred waste. To fully meet the requirements of the *Code of Virginia*, DEQ must develop a system to more accurately monitor and account for the transfer of poultry litter.

DEQ could better track poultry transfers by conducting a closer review of litter records when its compliance staff conduct annual inspections, and by improving the accounting of litter broker activities. Based on a JLARC review of poultry transfer sheets, these sheets often contain insufficient information such as listing "varied" or "N/A" for the location of the closest waterbody. DEQ should better inspect these sheets and the litter records of poultry operators at the annual inspection to ensure litter is being appropriately transferred, applied, or stored. In addition, poultry brokers, which account for more than 20 percent of poultry transfers in the Valley, are not being monitored by DEQ to ensure they are submitting annual reports.

DEQ Is Responsible for Tracking the Transfer of Poultry Litter

In 1999, the General Assembly amended the *Code of Virginia* in order to regulate poultry production in Virginia. The resulting statutory language, known as the Poultry Waste Management Act, required the State Water Control Board to develop a regulatory program that provides for the "tracking and accounting" of waste produced by confined chickens and turkeys. (The statute does not require the State to monitor the transfer of wastes produced by livestock, such as dairy cows and hogs. Fields that have waste from animal facilities land applied are required to be included in the NMP of the facility where the waste is produced. Furthermore, animal manure is not usually transferred due to high transportation costs.) Permitted poultry facilities are required to provide certain information concerning each transfer of more than ten tons of dry poultry litter within a 365-day period to a single recipient. According to information supplied to JLARC staff by DCR, approximately 411,000 tons of litter is annually transferred off of farms that have an approved NMP. Farming operations are required to identify the amounts that are expected to be transferred off their operations as part of the NMP.

Regulations promulgated by the State Water Control Board in 2000 require poultry growers, recipients of poultry litter, and poultry brokers to follow a set of record-keeping requirements. The regulations were the result of a compromise between poultry growers, the five poultry processors in Virginia, DEQ, and DCR. Exhibit 2 summarizes the poultry litter transfer regulations for poultry growers, recipients of litter, and poultry brokers. DEQ is responsible for annually collecting records from poultry growers who transfer litter and poultry waste brokers. The recipients of poultry litter are not required to submit records to DEQ.

Exhibit 2		
Requirements for Poultry Litter Transfer		
Poultry Grower	Recipient	Poultry Waste Broker
<ul style="list-style-type: none"> • Shall provide the recipient a copy of the most recent nutrient analysis for the poultry waste and a DCR approved fact sheet. • Shall keep a record of the amount of poultry waste received by the person, the date of the transaction, the nutrient content of the waste, the locality in which the recipient intends to utilize the waste, the name of the stream or waterbody known to the recipient that is nearest to the waste utilization site, and the signed waste transfer acknowledgment. • Shall maintain records on site for three years after the transaction and the records shall be made available to DEQ personnel upon request. 	<ul style="list-style-type: none"> • Shall provide the poultry grower his/her name and address and acknowledge in writing receipt of the waste, the nutrient analysis, and the DCR approved fact sheet. 	<ul style="list-style-type: none"> • Shall keep a record of the source of the poultry waste in their possession, the amount of poultry waste received from the source, and the date the poultry waste was acquired. • Shall provide to the recipient of the waste copies of the most recent nutrient analysis for the poultry waste and a DCR approved fact sheet. • Shall keep a record of the amount of poultry waste received by the person, the date of the transaction, the nutrient content of the waste, the locality in which the recipient intends to utilize the waste, the name of the stream or waterbody known to the recipient that is nearest to the waste utilization site, and the signed waste transfer acknowledgment. • Shall submit copies of the records, except the waste transfer acknowledgment, to DEQ annually.
<p>Source: State Water Control Board – Virginia Pollution Abatement General Permit Regulation for Poultry Waste Management, 9 VAC 25-630-50 and 9 VAC 25-630-60.</p>		

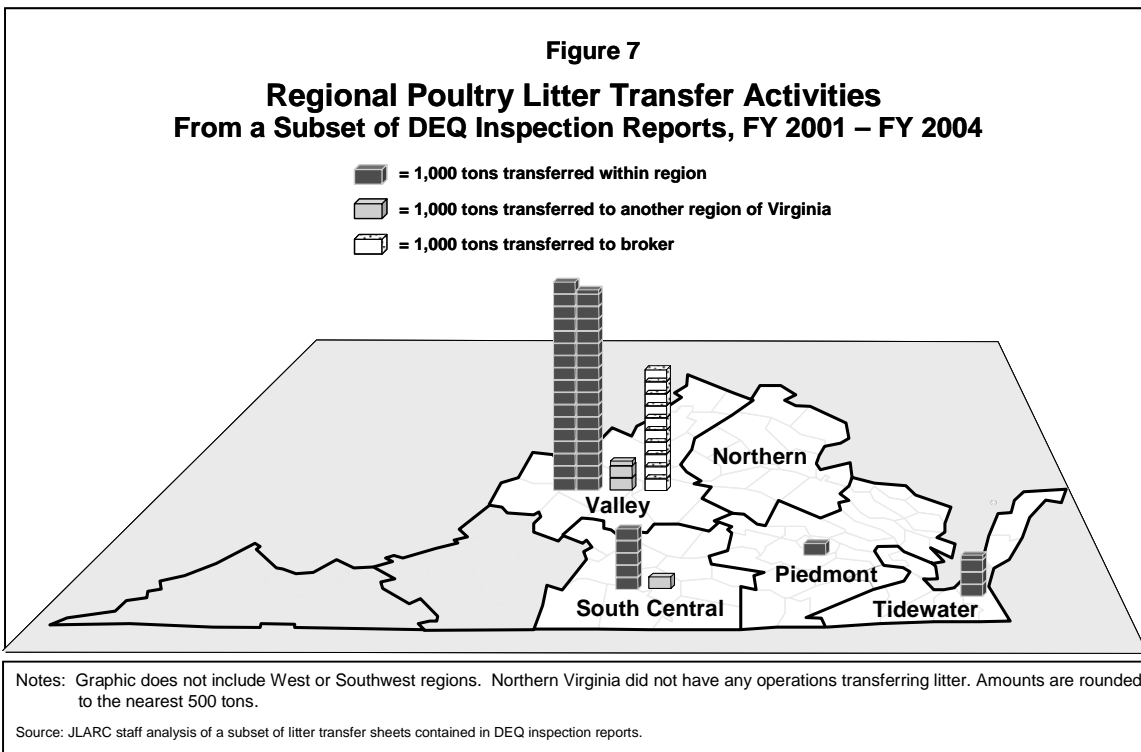
The *Code of Virginia* requires that annual inspections of poultry facilities must be conducted by a DCR-certified nutrient management planner. DEQ staff, who are certified nutrient management planners, conduct the annual inspections that consist predominantly of a visual inspection of facilities and a record-keeping review. DEQ staff use a checklist to review and complete a form consisting of several sections, including poultry waste tracking and accounting (Appendix B). The poultry waste tracking and accounting sheets are collected by the inspector and sent

to the agency's central office in Richmond for monitoring purposes. Poultry litter tracking information from farmers and brokers potentially provides DEQ with the appropriate information to conduct the necessary analysis on poultry waste transfers.

An analysis of poultry litter transfers can be helpful in several ways. First, an effective analysis of poultry litter transfers would provide information on whether litter is being moved outside of high production areas (such as Rockingham and Page Counties) to fields in other counties with soils that can use the nutrients. Second, with a greater understanding of where litter is transported, education and outreach efforts can be geared toward areas receiving or transferring the bulk of poultry litter. In identifying these areas, DEQ and DCR can target outreach efforts or cost-share funding to farmers on the proper application of poultry litter or developing NMPs.

Majority of Poultry Litter Is Transferred Within Regions

As part of the JLARC staff review of 227 DEQ inspection reports that was discussed in Chapter II, 139 poultry waste transfer sheets were reviewed. These poultry operations were located in four DEQ regions: Piedmont, Valley, South Central, and Tidewater. (The ten inspection reports from Northern Virginia that were part of the file review were all from farms that did not transfer litter.) A limited amount of litter transfer data from 2004 was available because some of the farming operations reviewed had not yet received their annual inspection. Figure 7 shows a breakdown since 2001 of the tons of litter transferred from each region and where the litter was transferred.



Since 2001, farming operations in the four regions have transferred 59,204 tons of litter (Appendix C). Seventy-one percent, or more than 42,000 tons, of this litter has been transferred within the same region (at least on the first transfer). An even closer look shows that farms in the Piedmont and Tidewater regions transferred 96 percent of their litter within the region. In contrast, the South Central region transfers 19 percent of its litter outside the region, the highest among all regions. Overall, each region is transferring at least 68 percent of litter within the region.

JLARC staff reviewed 101 poultry farms that are located in DEQ's Valley region and that were responsible for transferring 83 percent of the 59,000 tons. Because of the large number of poultry operations in the Valley, most poultry litter in the State is produced there. Of the almost 49,000 tons of litter transferred between 2001 and 2004, only five percent or approximately 2,500 tons of litter was transferred outside the Valley. Of the transferred sheets reviews, litter transferred outside the Valley was evenly distributed to other regions and out-of-state operations in nearby West Virginia. The percentage of litter transferred outside the Valley has held steady between five and six percent over the last three years.

However, the exact amount of litter transferred outside the Valley could not be determined. Due to the frequency of transferring litter to brokers and incomplete or illegible transfer sheets, JLARC staff were unable to determine the destination for 27 percent of the litter that had been recorded as transferred between FY 2001 and 2004. Of the more than 600 individual Valley poultry litter transfers reviewed, the final destination of one-fifth of the litter transferred in the Valley cannot be accounted for on the transfer sheets. This litter was unaccounted for because the transfer sheet did not indicate the nearest locality and nearest waterbody, but rather noted that the litter went to a "broker." (None of the three other regions reviewed by JLARC staff contained transfer sheets listing "broker" as the destination. The large amount of litter transferred to brokers in the Valley region is especially troubling since DEQ can not ensure that brokers are submitting their annual reports.

DEQ Is Not Adequately Accounting for Litter Transfers

To meet the *Code of Virginia's* requirement for monitoring poultry transfers, DEQ staff are using a poultry waste tracking and accounting sheet. These sheets evolved from a negotiated process between stakeholders in the poultry regulation process and the State. The DEQ water permits director stated that the current transfer sheets provide sufficient information for DEQ to meet its current responsibility to track and account for poultry waste.

However, once the tracking sheets are received, DEQ is not adequately analyzing the poultry waste transfer information. The agency's central office simply maintains the paper copies in files and has not analyzed the information to account for where the litter is being transferred.

DEQ has assigned the responsibilities of tracking and analyzing the poultry litter transfer information to the CAFO program coordinator, a position within DEQ's central office. Ideally, this position would use the information submitted by DEQ regional offices to perform an analysis to identify areas of the State receiving litter and targets resources to farmers who then use poultry litter to ensure that it is managed in an environmentally-friendly manner that protects water quality. However, this position was most recently vacant for five months and was only filled in July; therefore, these activities were not being completed.

The DEQ central office does not have an accounting system in place to ensure brokers are submitting their annual report as is required by law. Under the current system, brokers are identified by the department when their names appear as such on a farmer's litter transfer sheet. Once identified as a broker, these individuals are then required to submit annual reports to DEQ on their activities. However, as will be discussed, not all litter transfer sheets contain the actual names of the brokers. Without identifying these entities, the department is unable to ensure all annual reports are being submitted nor is it able to track where the poultry litter is going.

In addition, DEQ inspectors need to do a better job of reviewing the section of the poultry waste tracking and accounting sheets requiring the listing of the nearest locality and nearest waterbody. Based on the JLARC review of poultry waste transfer sheets, more than five percent of litter transferred was unaccounted for by the regions due to the transfer sheet listing incomplete or illegible information. The DEQ form used to track poultry waste transfers requires that farmers list the date of transfer, tons of litter transferred, litter analysis, locality where waste will be used, and nearest water body to litter application area. Often these sheets are not legible and contain inadequate information. For example, some poultry transfers listed "varied", "feed", and "litter shed" as the nearest locality. In the nearest waterbody section, information was listed as "N/A", "storage shed", or left blank. Because inspections are only conducted annually, instances in which a recipient supplies incomplete information on the transfer sheets may mean that there is no way for DEQ's inspectors to determine where that litter was actually applied.

DEQ's Valley regional office appears to be initiating a process of identifying the total amount of litter on a farm, including that which is stored, produced, applied, and transferred. The Valley's new inspection sheets are part of that process by requiring inspectors to determine the "estimated litter in storage", the total amount of litter applied to the land since the last inspection, and the "total amount of litter transferred since last inspection." Notably, the task of determining the amount of litter produced by a farm is becoming increasingly difficult. New technologies allow poultry operations to delay litter removal from poultry houses for up to five to seven years depending on the specifications of each house. However, inspectors need to be able to sort through the farm's records to determine whether litter is being properly transferred or applied. This addition to DEQ's traditional checklist appears to offer one means of better tracking poultry litter. Other State DEQ regional offices may benefit from implementing a similar system to the Valley's system of accounting for poultry litter.

Also, the Valley region has developed a prototype of an electronic tracking system that will likely become the pilot for a statewide poultry waste transfer tracking system for brokers. A DEQ Valley region staff member stated that the goal of the tracking system is to increase compliance among litter brokers who have not been meeting the requirement to submit an annual report. This is the first year of the program that attempts to better account for the more than 20 percent of the Valley's litter being transferred to brokers. The tracking system requires DEQ inspectors to develop a list of brokers by checking to see if a poultry operation lists "broker" on the poultry waste transfer sheet collected during the annual inspection. If "broker" is listed, the inspector will write down the name of the broker and the tonnage transferred. At the end of the year, the Valley office will contact any broker on the list who has not submitted their annual information. Once this information is collected, it will be sent to the DEQ central office.

Recommendation (9). In accordance with §62.1-44.17:1.1 of the *Code of Virginia*, the Department of Environmental Quality should develop and implement a statewide accounting system for poultry waste that compiles and analyzes the amount of poultry waste transferred in Virginia and the geographic distribution of the transferred waste.

Recommendation (10). The Department of Environmental Quality should monitor the transfer of poultry litter to poultry litter brokers to ensure that they are annually submitting copies of their poultry transfer records required by subsections A and C of section nine of the Virginia Administrative Code 25-630-60.

Majority of Farmers Are Satisfied with Recordkeeping Requirements for Poultry Litter Transfers

As part of the General Permit for poultry operations, operations transferring more than ten tons of poultry waste in any 365-day period to another person must maintain certain records and provide certain materials to the recipient of the waste. The person transferring the waste must provide the recipient with (1) a copy of the most recent nutrient analysis for the poultry waste, and (2) a fact sheet approved by DEQ in consultation with DCR that includes appropriate practices for proper storage and management of the waste. The person transferring the poultry litter must also keep a record for three years of the following information:

- the amount of poultry waste received by the person,
- the date of the transaction,
- the nutrient content of the waste,
- the locality in which the recipient intends to utilize the waste,
- the name of the stream or waterbody known to the recipient that is nearest to the waste utilization site, and

- the signed waste transfer acknowledgement.

The recipient must provide their name and address to the person transferring the litter as well as acknowledge, in writing, receipt of the waste, the nutrient analysis, and the fact sheet.

HJR 72 requires that JLARC evaluate the adequacy of these requirements. In order to address that part of the mandate, JLARC staff's survey of Virginia farmers, asked respondents if they had transferred or received more than 10 tons of poultry litter to a single operation within a 365-day period. Those responding "yes" to this question were asked about the adequacy of the requirements under which they must submit the documented information. As previously mentioned, the current regulations require those transferring poultry litter to keep a record of the amount of poultry waste received by the person, the date of the transaction, the nutrient content of the waste, the nearest locality in which the recipient intends to utilize the waste, the name of the nearest stream or waterbody, and the signed waste transfer acknowledgement. These records are to be maintained on site for three years after the transaction. In the survey, farmers with NMPs and farmers without NMPs were asked their opinions concerning three record-keeping related issues: the clarity of requirements, whether required documents are easy to compile, and to what extent record-keeping requirements are related to water quality protection.

Table 14 illustrates that DEQ has developed a poultry waste tracking process that is clear to understand for the majority of farmers. The majority of farmers view the Poultry Waste Management Act's record-keeping requirements for poultry litter transfers as clear. Out of 263 survey responses, 70 percent (184 respondents) view the record-keeping requirements as clear or very clear. Only 12 percent (31 respondents) considered the requirement confusing or very confusing.

Table 14					
Clarity of Record-keeping Requirements for Poultry Transfers					
<i>If you transferred or received more than ten tons of poultry litter in a single year, did you find the record-keeping requirements to be:</i>					
	<u>Very Clear</u>	<u>Clear</u>	<u>Neither Clear Nor Confusing</u>	<u>Confusing</u>	<u>Very Confusing</u>
Number of Responses	126	58	48	13	18
Percent	48%	22%	18%	5%	7%
Source: JLARC survey of farmers in Virginia. There were 263 responses to this question. Only farmers who transferred or received more than ten tons of poultry litter in a single year were asked this question.					

A smaller majority of farmers regarded the information needed for record-keeping requirements as easy to compile (Table 15). While 56 percent of farmers answered that the records are easy or very easy to compile, nearly a fifth of respondents viewed the requirements as being somewhat burdensome or difficult to compile.

In addition, almost another quarter of respondents felt the requirements were neither easy nor burdensome. These responses do not necessarily indicate that a problem exists with the complexity of compiling records. Each farmer has his own system, which may or may not make it easier to meet these requirements. The poultry tracking information is easier to compile when the correct information is tracked after each transaction. Those farmers waiting until a few days before their annual inspection may find compiling these records to be a more difficult task.

Table 15					
Ability to Compile Required Records					
<i>If you transferred or received more than ten tons of poultry litter in a single year, did you find the record-keeping requirements to be:</i>					
	<u>Very Easy to Compile</u>	<u>Easy to Compile</u>	<u>Neither Easy Nor Difficult to Compile</u>	<u>Difficult to Compile</u>	<u>Very Difficult to Compile</u>
Number of Responses	90	50	56	28	26
Percent	36%	20%	22%	11%	10%
Source: JLARC survey of farmers in Virginia. There were 250 responses to this question. Only farmers who transferred or received more than ten tons of poultry litter in a single year were asked this question.					

Similar to the responses on whether the records are easy to compile, farmer perceptions were mixed on the extent of the relationship between the water quality protection and record-keeping requirements (Table 16). The purpose of this question was to obtain information on whether farmers believe that the requirements are in place to protect water quality. Fifty percent of respondents viewed requirements to be related to water quality protection. The other half of respondents were split between believing the requirements are not related to water quality protection and being unsure of the relationship.

For the most part, farmers find record-keeping requirements easy to understand and the information easy to collect for poultry litter transfers. However, a few adjustments might change the perspectives of more farmers. During the annual inspection, along with checking the poultry waste transfer sheets, DEQ might offer the farmer guidance, if needed, on ways to make it easier to compile the necessary information. Also, farmers should receive information on the reasons for each of the

Table 16					
Relationship Between Farmer Survey Respondent Views on the Record-keeping Requirements and Water Quality Protection					
<i>Record-keeping requirements and water quality protection are:</i>					
	Closely Related	Related	Not Sure	Not Related	Definitely Not Related
Number of Responses	71	44	59	21	38
Percent	31%	19%	25%	9%	16%
<small>Source: JLARC survey of farmers in Virginia. There were 233 responses to this question. Only farmers who transferred or received more than ten tons of poultry litter in a single year were asked this question.</small>					

record-keeping requirements. Farmers might be more willing to comply, if they knew why the information was being collected and the purpose for which the information was used.

Litter Transfer Requirements Could Be Improved

Several problems exist with the State's current poultry litter tracking policy. DEQ staff acknowledged that loopholes exist in the current regulations, but they noted that they may be difficult to eliminate. Some regulated poultry farmers may be avoiding having to abide by the State's nutrient management requirements. For example, two adjacent confined poultry feeding operations could declare themselves to be transfer facilities, meaning they would not apply their poultry litter to their land. Each facility could then transfer its litter to the other facility for land application and would not be required to abide by a nutrient management plan.

DEQ and DCR have seen some instances where a farm's poultry operation and crop activities are treated as separate operations and, hence, litter can be "transferred" to the fields without any nutrient management plan guiding its application. By using this approach, the regulated farmers have essentially become the "purchasers" of the litter from their own birds and are no longer required to manage it in accordance with a NMP. Maryland has tried to address a similar loophole by requiring essentially all commercial farmers to have a NMP as part of its overall NMP program.

Current regulations do not require the poultry farmer transferring the litter to provide to DEQ the name and address of the recipient of the litter. Instead, the regulations only require purchasing farmers to maintain records indicating the nutrient content of the litter and where the litter was applied. The regulations do not require farmers to submit this information to the State. Language in the draft regulations would have required farmers receiving more than ten tons of litter to

supply the litter seller with their name and address and keep that information as part of the seller's records that are inspected by DEQ. That requirement was eliminated from the final regulation for the VPG Permit in October 2000. Requiring a purchasing farmer to submit litter information would provide DEQ with a way of monitoring transfers for signs of abuse.

Furthermore, the regulations currently do not require litter brokers to analyze the nutrient content of the litter prior to reselling it. Brokers may store litter they purchase from several poultry facilities in a central location before selling it. However, combining litter from different facilities changes the nutrient levels. Without a new litter analysis prior to delivery, the person applying the litter has no way to identify the appropriate rate at which the litter should be applied.

Recommendation (11). The Department of Environmental Quality, in consultation with the Department of Conservation and Recreation, should develop a procedure for identifying potential misuse of litter that is transferred and should develop a policy to prevent it. Requiring the name and address of the poultry litter recipient should be considered.

Recommendation (12). The State Water Control Board should amend 9 VAC25-630-60 to include a section stating that if a poultry waste broker stores litter from two or more farming operations together, the broker should provide an updated nutrient analysis reflecting the content of the aggregated litter.

LITTER TRANSPORT COST-SHARE PROGRAM HAS LIMITED BENEFITS

The Poultry Waste Management Act required the five commercial poultry processors in Virginia to develop a plan for participating in the development of a poultry waste transportation program in tandem with the Commonwealth. A very limited pilot cost-share for transporting litter was offered in 2003 and 2004. The State and the Virginia Poultry Federation each contributed \$25,000. The goal of the program is to transport litter from the Shenandoah Valley where the bulk of the State's litter is produced to areas of the State that produce less poultry litter. While participation in the poultry litter transport program increased from the first year to the next, its future remains in jeopardy without continued support from poultry processors.

Two neighboring states, Delaware and Maryland, have created successful litter transport programs that have been able to move litter outside target areas identified as having an excess of poultry litter. In an effort to transport litter outside the Delmarva Peninsula, Delaware offers cost-share rates up to \$18 per ton for transportation costs. Maryland's Manure Transport Program provides higher cost share rates of up to \$20 per ton to lower Eastern Shore farms. As a result, in FY 2004, more than 85 percent of the litter transported was moved outside Maryland's lower Eastern Shore. Poultry litter moved outside the Delmarva Peninsula in Mary-

land and Delaware is most often transported for alternative use projects such as fertilizer for mushroom production in Pennsylvania or the Perdue AgriRecycle pellet-fertilizer plant in Delaware.

Status of Virginia's Litter Transport Program

Section 62.1-44.17:1.1(6) of the *Code of Virginia* required that prior to January 1, 2000, each commercial poultry processor operating in the Commonwealth was to develop a plan explaining how they would achieve certain programmatic objectives, including the development of a poultry waste transportation and alternative use equal matching program. The *Code of Virginia* directs the processors to:

[p]articipate in the development of a poultry waste transportation and alternative use equal matching grant program [with] the Commonwealth [in order] to facilitate the transportation of excess poultry waste in the possession of poultry growers...to persons in other areas who can use such waste as a fertilizer...

(A commercial poultry processor is a business operation that contracts with someone to raise chickens or turkeys.) Cargill Turkey, Tyson Foods, George's, Perdue, and Pilgrim's Pride are the five commercial poultry processors currently operating in Virginia.

Program Development by State and Poultry Processors. DCR and the State's poultry producers entered into a joint agreement to provide a total of \$50,000 in funding for a poultry litter cost-share pilot transport program beginning in March 2003. According to DCR staff, implementation of the program was delayed until this date due to an outbreak of avian flu that occurred in 2002. The program's stated goal was to "move poultry litter outside the State's main poultry producing counties and to develop self-sustaining poultry litter markets in other areas" of Virginia.

The project originally focused on moving litter from 549 permitted confined poultry feeding operations in Rockingham and Page Counties to receiving farms in the counties that had been identified as having soils with low phosphorus content. These included: Albemarle, Amherst, Botetourt, Clarke, Culpeper, Fluvanna, Frederick, Greene, Louisa, Madison, Nelson, Orange, Rappahannock, Rockbridge, and Warren. Confined poultry feeding operators participating in the program were required to analyze the poultry litter to determine its nitrogen and phosphorus content, and to prepare "chain of custody" forms indicating the names of the farmers who purchased and received the litter. The receiving farmers were required to submit cost-share applications to DCR before purchasing the litter, and agree to store and apply the material to their fields in accordance with DCR-approved nutrient management plans. Once the applications were approved, the receiving farmers could apply the litter to their fields and request cost-share reimbursement assistance from DCR.

DCR's program was developed to assist Valley poultry operations with creating self-sustaining markets for their litter outside the Valley. Approximately

730 poultry farms (75 percent) that supply poultry to the five Virginia processors are located in the Shenandoah Valley. These farms produce a large quantity of litter that the farm operator, not the poultry processor, is responsible for transporting. As the amount of poultry litter continues to grow in the Valley, poultry farmers are experiencing difficulty in transferring their litter off the farm. According to farmers in the Valley, those who are able to transport their litter are giving it away or receiving only a small payment to get it off their farm and out of their litter sheds.

Virginia's Pilot Litter Transport Program Moved Slightly More than One-third of What Was Initially Intended. According to DCR documents, the first year of the project was not successful. Only 16 farmers applied for cost-share reimbursements totaling \$5,125 in payments to apply 1,342 tons of litter. This was only about eight percent of the 16,000 tons the program would support, and less than one percent of the estimated 411,000 tons of poultry litter that DCR projected to be transported in 2003.

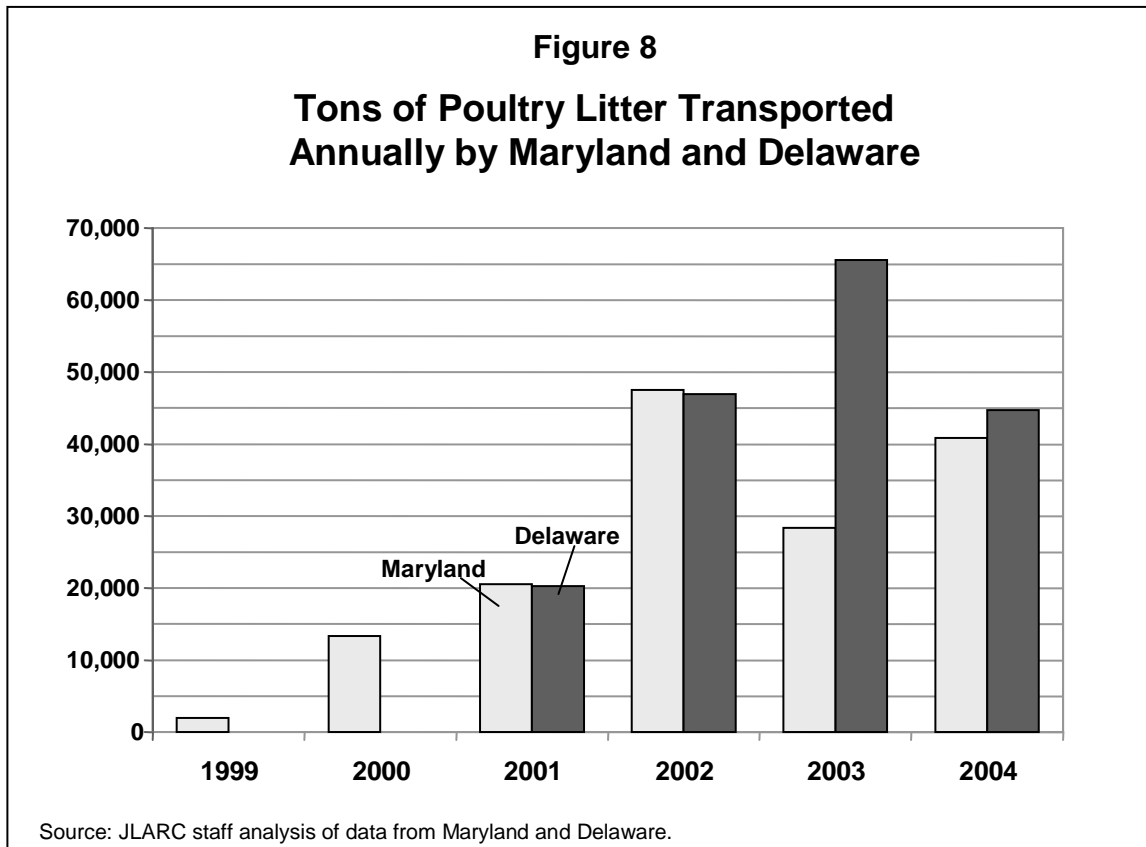
Because there was almost \$45,000 in funds remaining in the poultry litter transport program at the end of December 2003, DCR carried the pilot program over into 2004. Without any additional funding, DCR revised the program and increased to \$10 per acre the cost-share reimbursement assistance to farmers purchasing litter from permitted confined poultry operations in Augusta, Page, Rockingham, and Shenandoah counties. Receiving farmers were still required to have a DCR-approved NMP to participate in the program.

Based on data from this year, farmers have expressed more interest in the program because of the increased cost-share amount. In fact, as of September 2004, 43 applications were approved for 2004 cost-share assistance. The DCR-approved applicants have applied 4,396 tons of litter and received \$15,880 in funds out of the remaining balance. By the end of 2004, DCR expects the original \$50,000 will be exhausted if all of the approved applicants end up applying litter. The results of this pilot indicate that there is some interest among farm operators for a litter transport program if adequate cost-share funding is available.

Reasons Why Program Was Not More Popular. Several potential reasons exist that may explain why the program was not more successful. The primary factor was the level of funding was considered too low to attract adequate interest from the farming community. The reimbursement rate for receiving litter was only \$6 per acre in the first year. When DCR increased the reimbursement rate to \$10 per acre in the second year, use of the program increased. However, because only \$50,000 was available for the whole program, the increased rate reduced the program's goal of moving 16,000 tons of litter to 8,000 tons. In fact, some Virginia farmers received poultry litter from Delaware and Maryland that paid them \$18 and \$20 per ton in cost-share assistance, respectively. Furthermore, the funding levels in the Virginia program were far below levels suggested as necessary in DCR's 1999 report to the Governor and General Assembly on this issue. DCR staff also attributed the low interest in the program to the fact that the farming community was not familiar with the initiative because it was new and that the 2003 growing season was too wet for many farmers to apply fertilizer to their fields.

DEQ staff also indicated that farmers held certain perceptions about the program that made it less likely they would participate. For example, the requirement that operations receiving cost-share funds for accepting litter under the program must develop and implement NMPs may have limited participation in the program. The amount of time needed to get a plan modification approved was also discussed as a potential factor limiting involvement.

The brief history of the DCR cost-share transport program provides limited data to complete a full evaluation of the program's effectiveness. As with most new programs, some adjustments to the initial program were needed to attract more participants. Increasing cost-share assistance to \$10 per acre is an example of an effort to make the program more attractive to prospective participants and more competitive with programs in neighboring states. Similar programs in Maryland and Delaware were not overly successful when started in 1999 and 2001, respectively (Figure 8). Participation increased over time through promotional efforts that encouraged more farmers to participate in transporting their litter. Many Virginia poultry farmers are just learning about the transport program and the various requirements to participate. Therefore, it is difficult to project future participation in Virginia's cost-share transport program based on the numbers from FY 2003 and 2004.



Even without a final review of the effectiveness of the program, DCR staff reported that the agency had an additional \$25,000 available for the pilot transport program that went unmatched. DCR staff indicated that the cost-share transport program will probably not be carried over into 2005 unless the commercial poultry processors are interested in providing additional funds for the program. The Virginia Poultry Federation (VPF) stated that the poultry processors had fulfilled their obligations under §62.1-44.17.1:1 of the *Code of Virginia*. The Poultry Waste Management Act only requires processors to submit a plan to the SWCB prior to January 1, 2000 and then submit changes to that plan once annually. There is no language mandating that a cost-share program be funded in perpetuity. Other states, such as Maryland, have developed voluntary agreements with poultry processors to fund part of their transport program. In Maryland, poultry processors continued to voluntarily match state general funds of approximately \$250,000 a year to fund a transport program.

Maryland and Delaware Litter Transport Programs Have Been More Successful

Maryland and Delaware operate litter transport programs that appear to be more successful than Virginia's program. As Table 17 illustrates, Maryland and Delaware's litter transport programs have resulted in the movement of substantial amounts of poultry litter. Virginia Environmental Quality Incentive Program (EQIP) Poultry Litter Transfer Program, administered by the National Resources Conservation Service (NRCS) is the fourth program listed in Table 17. This program began in 2004, and it is too early to evaluate its success.

In terms of cost-share assistance, Maryland and Delaware decided to provide reimbursement based on the tons of litter transported as opposed to the two other programs that distribute funds on a per acre basis. Officials from Maryland and Delaware stated their cost-share assistance is based on tons since a large

Table 17				
Historical Comparison of Three States' Poultry Litter Transport Programs				
<u>State</u>	<u>Year Program Started</u>	<u>Total Cumulative Amount of Litter Transported to Date</u>	<u>Amount of Cost-share</u>	<u>NMP Requirement</u>
Virginia	FY 2003	5,738	Up to \$10/acre	Yes
Maryland	FY 1999	144,355	Up to \$20/ton	Yes
Delaware	FY 2001	177,486	Up to \$18/ton	Yes
NRCS	FY 2004	N/A	Up to \$10/acre	Yes

Source: Virginia Department of Conservation and Recreation interviews, 2003 Annual Report of the Delaware Nutrient Management Commission, 2004 Progress Report: Implementing Nutrient Management Programs in Maryland, and NRCS interviews.

amount of their litter is transported to alternative use projects that do not apply litter by the acre.

Several reasons may account for the greater success of the Maryland and Delaware programs versus the Virginia effort, in terms of litter transported. First, Maryland and Delaware have more mature programs that began as early as 1999, and over time, have grown as a result of modifications made to enhance their programs. For example, Maryland transported only 1,925 tons in 1999. Subsequent modifications provided greater flexibility to non-poultry producers and adjustments to eligibility standards, so the program transported over 40,000 tons in 2004. During its short lifespan, Virginia has already made modifications, such as increasing cost-share assistance from \$6 to \$10 per acre, to try to attract more participants.

A second reason that may account for some of the differences between the state programs is that a majority of the poultry litter in Maryland and Delaware is being transported for alternative use projects such as fertilizer for mushroom growers. No major alternative uses exist in the Commonwealth, so farmers or brokers must find individuals who want to use poultry litter as fertilizer.

Delaware's Nutrient Management Relocation program was initiated in 2001 and has been successful at relocating litter outside "critical areas" that contain an excess of poultry litter. Critical areas are classified based on the impaired-waters list developed by the state's Department of Natural Resources and Environmental Control (DNREC). Participants receive reimbursement of up to \$18 per ton for costs associated with loading and transport of litter to alternative use projects or to other farms for land application. Delaware's relocation program has transported litter outside critical areas within the State and also to other states, including Maryland, New Jersey, and Virginia.

Since the program's inception in Delaware, more than 177,000 tons of poultry litter has been either applied to land within or outside the Delmarva Peninsula or transported for alternative use projects. The largest amount, 79,269 tons, or 44 percent of the relocated litter, went to mushroom producers in Pennsylvania and the Perdue AgriRecycle pellet-fertilizer plant, which will be discussed in a later section of this report. Another 25 percent of relocated litter is being applied to land outside the Delmarva Peninsula. Through attractive cost-share assistance and an established track record, Delaware's program has been successful in meeting its goal of relocating litter outside the critical areas.

Maryland's Manure Transport Program, initiated as the Poultry Litter Transportation Pilot Project in March 1999, is open to all types of animal operations statewide that are experiencing phosphorous over-enrichment or have excess manure. To be eligible for the cost-share funds, receiving operations must apply the manure in accordance with a NMP prepared by a certified consultant. Although animal manures are included in this program, poultry litter comprises 95 percent of the manure transported.

The original legislation in 1999 established Maryland's transport program as a cost-share between the state and poultry processors. Both the State and poul-

try processors contributed \$750,000 in the first year. Maryland statute requires that “the State and the commercial poultry [processors] shall facilitate the prompt transportation of poultry litter” from areas of the state where phosphorus over-enrichment exists. Funding for the program, as further defined in the statute, is based on the state matching the contributions made by the processors. So far, for all poultry litter transported, the poultry companies have matched up to \$10 per ton in cost-share funds. In FY 2003, more than \$463,000 of financial support was provided to participants with 50 percent coming from the poultry processors and 50 percent in state funds. Poultry processors again contributed in FY 2004 to match a federal grant of \$140,000. According to MDOA staff, all indications from the poultry processors are that they will continue to contribute to the program because they understand the benefits of transporting litter from the farms that raise their poultry.

A 25 percent higher cost-share rate allocated for the lower Maryland Eastern Shore farms has been successful at transporting litter outside the region, out-of-state, and for alternative uses. In FY 2004, Maryland's program transported 31,000 tons of poultry litter; with counties on the lower Eastern Shore accounting for more than 85 percent of this total. The majority of this litter was transported for alternative use projects such as the Perdue-AgriRecycle project located in Delaware and for use as a substrate for mushroom production, composting, and processing fertilizer products.

A MDOA staff member stated that the higher cost-share is crucial in landing alternative use projects. These projects must be able to count on a certain amount of cost-share for their projects to be economically viable for participants. This MDOA official believes Maryland's cost-share has contributed to the program's success at moving litter, especially by opening up markets for alternative uses.

In Virginia, the National Resource Conservation Service (NRCS) has now fully implemented a federal Environmental Quality Incentive Program (EQIP) Poultry Litter Transfer Program. NRCS' pilot is testing this program in Virginia with \$250,000 in federal funding by offering \$10 per acre. Litter recipients must have a nutrient management plan developed using NRCS recommendations. Fields receiving litter must have acceptable phosphorous levels to be eligible. Compared to the DCR program, the NRCS program has a wider geographic range for source counties, including areas outside the Valley.

VIRGINIA'S USE OF ALTERNATIVE METHODS OR TECHNOLOGIES TO DEAL WITH NUTRIENT USAGE IN FARMING OPERATIONS

It appears that several alternative methods or technologies may offer the potential to deal with excess nutrients from animal waste in Virginia. For example, one method that has been used by poultry integrators in Virginia – the use of phytase in poultry feed – has resulted in substantial reductions in the phosphorus content of poultry litter. However, few other methods or technologies to deal with excess poultry litter have been developed successfully in the State. Furthermore, even fewer methods or technologies exist in Virginia to deal with excess waste from confined animal feeding operations.

Alternative Methods or Technologies to Reduce Nutrients in Poultry Litter

The high phosphorus content of poultry litter has made it the focus of increased attention, especially in light of new phosphorus standards. In 1999, the General Assembly enacted the Poultry Waste Management Act, requiring each commercial poultry processor operating in Virginia to file a plan with the State Water Control Board detailing how that processor would:

- conduct research on the reduction of phosphorus in poultry waste, innovative best management practices, water quality issues concerning poultry waste, or alternative uses of poultry waste;
- participate in a matching grant program with an alternative use component; and
- conduct research on the implementation of nutrient reduction strategies in the formulation of feed, including phytase.

The Poultry Waste Management Act also directs DCR to make recommendations about how the Commonwealth should assist poultry growers and processors in pursuing alternative uses for poultry waste.

Research Ways to Reduce Phosphorus. According to DEQ's 2003 *Report on the Effectiveness of the Plans Implemented By Commercial Poultry Processors*, poultry processors have complied with the research components of the Poultry Waste Management Act. The poultry processors, through the Virginia Poultry Federation, have committed \$140,000 since 2000 to fund five years of research by Virginia Tech on nutrient management and water quality issues. They are currently in their fourth year of funding on-going research examining the behavior of phosphorus in Virginia soils. According to the Virginia Poultry Federation, it is not clear at this time if the integrators will continue to fund research projects after the current research project ends.

The Use of Phytase. Several poultry companies have also funded studies on the use of phytase in combination with feed reductions of phosphorus. The introduction of phytase in poultry feed appears to produce significant reductions in the phosphorus concentrations of poultry litter. Phytase is an enzyme that improves the ability of chickens and turkeys to utilize phosphorus in feeds, resulting in a decrease in the phosphorus level in their waste. Findings of the U.S Food and Drug Administration indicate no adverse effects on humans who consume poultry meat from birds fed phytase. Furthermore, DCR analysis of poultry litter after phytase was used found phosphorus reductions as high as 30 percent in some cases. The State has recognized the effectiveness of this enzyme by including a goal of using phytase to reduce phosphorus in poultry litter by 30 percent in the provisional Tributary Strategies for the Shenandoah and Potomac river basins. Similarly, the Chesapeake Bay Program has found that the correct use of phytase could decrease total phosphorus in poultry litter by 20-30 percent.

The State has allocated about \$1 million in matching grants to poultry companies in Virginia to add phytase to their feed programs. DCR documents indicate that six poultry and one swine project were funded during FY 1998 and FY 1999. DCR staff explained that most of this funding provided integrators with one-time assistance in acquiring equipment needed to incorporate phytase into feed, so additional funding after FY 1999 was not required. According to a Virginia Tech researcher, Virginia was the first state to form a partnership with poultry producers to implement the feeding of phytase.

Water quality impacts resulting from consistent and efficient use of phytase could be significant. For example, DCR suggests that phosphorus produced by permitted farms could be reduced by more than 4.5 million pounds annually if the State achieves an across-the-board reduction of 30 percent. As of 2003, all five major poultry integrators in Virginia used phytase to some degree in their feed rations. DCR staff indicated that evaluations of phytase use in Virginia in FY 2004 found reductions between 17 and 21 percent in the amount of phosphorus per ton of litter.

Although the approximate 20 percent reduction in phosphorus in poultry litter represents a significant achievement, greater improvements are necessary to meet a goal of 30 percent reduction across the State. To achieve significant reductions of phosphorus in poultry litter, integrators must reduce the level of phosphorus in feed. The degree to which integrators in Virginia use phytase and reduce phosphorus in feed varies. DCR staff explained that while some integrators are doing an exceptional job of incorporating phytase, achieving reductions of close to 30 percent, others are achieving reductions of only seven percent. Additionally, overall reductions decreased from 20-23 percent in FY 2003 to 17-21 percent in FY 2004.

According to DCR staff, greater reductions may not be achieved without additional pressure on the integrators. In the current system, integrators own the birds, but farmers own the litter. In cases where poultry litter is a commodity, farmers benefit from owning the litter and using it on their farms or selling it for a profit. In areas where farmers are prevented from applying litter to the land because of regulations limiting the amount of nutrients that can be applied, poultry litter loses its value as a commodity. Although integrators could assist producers by consistently incorporating phytase and reducing phosphorus levels in feed, they may not have all seen the necessity to do so. In light of the costs associated with other alternative technologies, the efficient use of phytase in Virginia may offer one of the most feasible means of dealing with excess nutrients. In addition, DCR staff suggested that using phytase often provides integrators with enough cost savings on feed to cover the cost of using phytase. The use of enzymes such as phytase by processors is required in Maryland statute.

Besides Phytase, Relatively Few Methods for Reducing Phosphorus Are Being Used. Since the Poultry Waste Management Act was enacted, it does not appear that significant efforts have been made to develop alternative uses, although one poultry processing company (formerly Rocco, Inc.) did support the development of a pelletizing plant in Shenandoah Valley. Additionally, Perdue is operating a pelletizing plant in Delaware, but the litter used in this plant does not currently originate in Virginia. Aside from Rocco's attempt to build a pelletizing

plant, it appears that the only other alternative use project supported by the integrators was the use of grants to assist three county farm bureaus with the purchase of new spreading equipment. DEQ's assessment of the integrators' compliance with section 62.1-44.17:1.1 of the *Code of Virginia* indicated that the State and integrators need to invest significantly more resources in developing viable alternative use projects.

DCR staff have raised concerns that the State's five integrators have not fully complied with the statutory requirement to participate in the development of an alternative use component of the litter transport cost-share program. Despite this mandate, the current poultry litter cost-share program discussed in the previous section does not have provisions for alternative uses. The original plans submitted to DEQ did not outline concrete plans for the establishment of an equal matching grant program, although integrators indicated that they were working with the Virginia Poultry Federation and DCR to develop this program.

In order to comply with the Poultry Waste Management Act, DCR developed recommendations for several possible alternative uses of poultry litter that may offer opportunities for the State, integrators, and the farming community to utilize excess poultry litter. According to DCR's report, "sole reliance on a poultry manure transport cost-share program is likely more costly to the State and processors than a combination of transport and other alternative uses." One alternative use addressed in the report is composting, a biological process in which microorganisms convert organic materials such as manure, straw, sawdust, wood shavings, and leaves into compost, a soil-like material. Compost can be used as a soil amendment for crops, marginal land reclamation, and landscaping. EPA has also reported that composting transforms nutrients into a more stable form, making them less likely to be transported through runoff and leaching. DCR staff believe that composting, while not a perfect solution to the litter problem, could utilize some excess poultry litter in Virginia.

According to DCR staff, a small number of composting operations already exist in Virginia. JLARC staff's review of DEQ inspection reports of permitted facilities identified at least one farm that uses composting as an alternative use. According to the inspection report, the poultry operation has been composting litter for about two years, and sells the compost for lawn and garden applications.

Pelletization and granulation offer other alternative uses for poultry litter. These processes involve dehydrating poultry litter through a heating process to produce granules or pellets. By reducing the moisture of the litter, the process creates a product that is lighter and more concentrated with nutrients than raw litter. Although this product may be more acceptable to consumers than raw litter, it is still bulkier and more costly to handle than commercial fertilizer.

Alternative Uses Have Had Some Success. In 2001, a pelletization plant began operation in Sussex County, Delaware, one of the country's most concentrated areas of poultry production. This joint venture between Perdue and the state represents one of the first large-scale facilities for manufacturing organic fertilizer products from surplus chicken litter. Delaware granted Perdue AgriRecycle \$3

million in subsidies and construction assistance to build the \$13 million plant. At this plant, raw litter received from Delaware and Maryland is heated and pasteurized to remove excess moisture and destroy bacteria. The dried material is then converted into pellets, which can be shipped to places where soils are nutrient-deficient. After three years of operation, the plant appears to be successful. For example, during the plant's fourth year of operation, managers expect to remove 60,000 tons of litter from the area, to areas as far as Florida.

In addition to the pelletization plant in Delaware, one Virginia-based company experimented unsuccessfully with transforming poultry litter into an organic-based fertilizer while using the energy produced during processing to power the facility. The Harmony-Shenandoah Valley project, which began in April 2000, predicted that it would use at least 24,000 tons of excess litter annually to produce a variety of value-added fertilizers for home and commercial markets. The project was supported by \$500,000 in equity from Rocco (a commercial poultry processor), a \$500,000 matching grant made by DCR from the Water Quality Improvement Fund, and \$1 million in financing from Duke Energy. The plant was abandoned in December 2003 while only 5,376 tons of poultry litter had been used. According to DEQ's report, the project had significant financial difficulty because of limited markets and difficulty competing with the cost of production for chemical fertilizers. The plant was also unable to successfully use the gasification process to generate the energy needed to operate the plant.

Energy generation using poultry litter has been effectively used in Europe. Two processes, gasification and cofiring, have the potential to use significant quantities of poultry litter during energy production. During the gasification process, heat is generated from the contained litter and can be used to produce steam for industrial purposes. Cofiring involves the simultaneous combustion of poultry litter with woodshavings or straw. In addition to producing energy, these processes also generate a residual ash that may have some value as a fertilizer product, especially since it is extremely low in nitrogen and high in phosphorus. Despite substantial costs associated with these technologies, an EPA document claims that cofiring is "proving to be one of the most promising near-term methods of increasing the use of manure in electricity generation." Although some concerns have been raised about possible health and pollution risks associated with these technologies, a review by the Minnesota Pollution Control Agency found that technologies proposed for use to reduce toxic emissions during co-firing are satisfactory.

In 2001, a British firm proposed building a 40 megawatt power plant that would burn poultry litter on Maryland's Eastern Shore. To date, this plant has not been built; however, construction of a similar plant has begun in Minnesota. If these plants become operational, they will be the first major facilities of their kind in the United States. In order for these plants to be successful, however, they will have to develop a market for their electricity. As a renewable resource, the energy generated from poultry litter is still more costly than gas or oil. It has been estimated that electricity generated by gas and oil costs about 4 to 4.5 cents per kilowatt, whereas the electricity generated from poultry litter is expected to cost between 7.5 and 8 cents per kilowatt.

Alternative Technologies to Reduce Nutrients in Waste From Other Animals Besides Poultry

Although the State has focused most of its efforts on developing and implementing means to reduce nutrients in poultry litter and alternative uses of poultry litter, there are also some efforts underway to deal with excess waste from other animals. In addition to those technologies that reduce nutrients in poultry litter or provide alternative uses for it, solid separation offers a potential means of dealing with other types of excess animal manure, and the use of phytase may also help reduce excess nutrients in swine waste.

Solid separation facilities offer the potential to ship animal manure off the farm with the same ease as poultry litter. DEQ staff and researchers at Virginia Tech told JLARC staff that liquid manure is difficult and costly to transport because of its high volume (mostly water). In order to reduce the volume of liquid manure and increase the distance that solids can be hauled, some farm operations are using solid separation to separate the manure's liquid and solid portions. This process creates a solid waste portion that can be used as a soil amendment or to make compost. Researchers at Virginia Tech told JLARC staff that a solid separation facility became operational at the University in July, 2004. In addition, there are several other dairy farms in the State using various methods to separate manure solids and liquids. JLARC's survey of regulated farmers identified at least one facility in Virginia that claims to be implementing this technique.

In addition to solid separation, the use of phytase -- previously mentioned for its use in feed for poultry -- may offer a means of reducing excess nutrients in swine waste as well. More than 30 broiler, turkey, and pig studies conducted at Virginia Tech found that applying phytase to feed can reduce the excretion of phosphorus by 25 to 40 percent in both poultry litter and swine manure, under certain circumstances. In light of these findings, phytase may offer a more cost-efficient alternative to reducing nutrients from animal waste than other technologies.

Recommendation (13). The State may wish to consider regulatory requirements for and/or the use of financial incentives to processors to ensure that phytase is incorporated in all poultry feed used in Virginia.

IV. Use of Nutrient Management Planning Outside of Farmland and on State Lands

The mandate for this review, HJR 72, requires that the study address nutrient management practices and related educational efforts in urban and rural environments. In addition, the mandate requires an examination of the use of NMPs by State agencies on State lands.

Compared to the quantity of nitrogen and phosphorus that is in farm animal waste and farm land fertilizer purchases, the quantity of nitrogen and phosphorus in non-farm fertilizer is relatively small (as indicated in Chapter I, about 2.6 percent of nitrogen and 4.8 percent of phosphorus in 1997). There are opportunities, however, to increase the extent to which applications of fertilizers to non-farm land are made in a manner that is consistent with nutrient management principles. Addressing these opportunities could be part of the State's approach to meeting challenging Chesapeake Bay water quality goals.

Several efforts are currently underway in Virginia to manage nutrients in non-agricultural settings, resulting in approximately four percent of non-farm acreage (hereafter referred to as "urban" land in this chapter) being covered by nutrient management. Specifically, DCR has made efforts to reduce pollution from fertilizer use among lawn care companies, golf courses, and the general public through water quality agreements and educational efforts. In addition, the Virginia Cooperative Extension is educating homeowners in several counties about nutrient management through participatory programs.

In addition to areas of Virginia covered by lawns, parks, and golf courses, the State also maintains agricultural and non-agricultural land. According to data provided to JLARC staff by State agencies and institutions, of the total of approximately 658,000 acres of State-owned land, only a small portion (about 25,000 acres) is agricultural land. Most (94 percent) of that agricultural land is managed under a NMP (even though a NMP is only required at the confined hog feeding operation located at the Southampton Correctional Institution and the dairy facility at Virginia Tech). Also, about half of the reported 633,000 acres that is not agricultural is State park, forest, or marsh land where no nutrients are being applied.

However, it appears that there are opportunities for the increased use of NMPs on Virginia Department of Transportation land, and on up to about 10,000 acres of other State-owned land. The transportation department, responsible for about 300,000 acres of land, reports using nutrient management principles when engaging in land-disturbing activity, but does not fully engage in nutrient management planning. The department has proposed to undertake a NMP project in FY 2005 to guide, train, and educate its personnel in applying appropriate levels of fertilizer. Some State agencies and institutions with relatively small land holdings also appear to be candidates for NMP use. At a time when the State is calling for greater implementation of NMPs to meet Chesapeake Bay and other water quality goals, it

appears that it could set a better example if NMPs were required on all State lands that are agricultural, or upon which fertilizers are actively applied.

VIRGINIA'S CURRENT EFFORTS IN PROMOTING THE USE OF NUTRIENT MANAGEMENT OUTSIDE OF FARMLAND

Nonpoint source pollution from urban and rural environments is widespread and difficult to target. In addition, many citizens know very little about the connection between their individual activities, NPS pollution, and the health of the State's waterways. Current efforts to address nutrient management in non-agricultural settings have resulted in approximately four percent of urban acres in Virginia being covered by a nutrient management plan or agreement.

The State has developed several initiatives to educate citizens and lawn care groups about the importance of nutrient management planning. For example, DCR has established a program to partner with lawn care professionals called the Water Quality Improvement Agreement (WQIA) program. The department also publishes and distributes educational materials for homeowners, lawn care professionals, and golf course managers. In addition, the State is developing a media campaign to target urban and suburban homeowners in northern Virginia with water quality messages. Finally, the Virginia Cooperative Extension administers a program in several counties that partners Master Gardner Program volunteers with homeowners as a way to address nutrient applications.

Four Percent of Urban Acres in Virginia Are Covered by Nutrient Management

According to DCR, there are five million lawns in the Chesapeake Bay watershed covering six states and the District of Columbia. Each lawn has the potential to send nutrients and other pollutants into the Bay and its tributaries. According to data maintained by DCR, there are approximately 1.1 million acres of pervious urban and mixed open land (parks, athletic fields, office parks and golf courses) in Virginia. (Pervious land includes lawns and other vegetated areas not covered by concrete or pavement.) To date, DCR estimates that there are 40,300 acres in Virginia under some type of urban nutrient management plan, including water quality agreements with commercial fertilizer companies, golf course NMPs, and individual homeowner NMPs. This estimate suggests that only four percent of the urban acres in Virginia are currently covered by nutrient management. Although DCR is implementing and planning several creative initiatives to address nutrient management in non-agricultural settings, there may still be a greater need to address the potential for nutrient losses in these settings.

Not all nutrient runoff from non-agricultural settings is attributable to fertilizer applications, but the amount of fertilizer purchased in non-agricultural settings can serve as a proxy indicator of potential nutrient contributions to the State's waterways from urban sources. Results of studies assessing how often lawns are fertilized vary, indicating that as few as 38 percent or as much as 87 percent of lawns are fertilized with some level of frequency. JLARC staff analysis of FY 2003

data on fertilizer purchases indicates that fertilizer purchased for non-farm use consisted of about 19 million pounds of nitrogen and 10.4 million pounds of phosphorus. Given the effects of runoff, fertilizer use in urban and rural settings has the potential to contribute significant amounts of nutrients to the State's waterways.

In addition to being helpful for reducing nutrient runoff, urban nutrient management is also practical, according to DCR staff. DCR's nutrient management program manager explained that the alternative to using urban nutrient management as a preventive measure to reduce nutrients from urban sources is using stormwater management as a corrective measure, which is an expensive alternative. He suggested that it is better to treat urban nutrient problems at their source.

DCR's Efforts to Address Nutrient Management in Non-Agricultural Settings

DCR's current urban nutrient management activities focus primarily on increasing the number of professional lawn care groups that voluntarily agree to accept and implement DCR's standards for urban nutrient usage. According to a DCR report on urban nutrient management, lawn service companies may be the highest relative nutrient users on urban turf, so efforts aimed at influencing their nutrient behaviors are particularly important. Based on a 1998 Virginia Turfgrass Council survey, lawns cover approximately 714,000 acres in Virginia. A DCR report indicates that as many as 119,000 of these acres of land are treated by lawn service companies in Virginia.

The Water Quality Improvement Agreement program relies on agreements negotiated between lawn care companies and DCR that establish guidelines for fertilizer application rates and timing as the primary method for controlling nutrient usage. Businesses that have signed WQIAs agree to follow DCR's guidelines and offer their customers information about proper lawn care and fertilizer use.

According to DCR staff, there were 30 lawn care operators with water quality agreements covering almost 19,000 acres in 2003. As of March 26, 2004, there were 23 additional lawn care operators with water quality agreements. Several groups choose to participate in this program because they are urged by their customers or community to engage in the program. DCR claims that participating in the program offers companies promotional opportunities. One participating company that spoke with JLARC staff confirmed that they have used the program as a promotional tool. They hope that by indicating in their newsletters and on DCR's website that they participate in the program, they will be able to attract or retain customers who are environmentally conscious. Nonetheless, one survey of residential nutrient behavior in the Chesapeake Bay watershed found that only two percent of those individuals who used a lawn care company to maintain their lawn indicated that being environmentally friendly was the deciding factor in selecting their lawn care company.

Several concerns exist about the Water Quality Improvement Agreement Program. One concern that was raised during conversations with DCR staff is the difficulty of increasing awareness about this program throughout the State. For ex-

ample, of the total acreage treated by lawn service companies in Virginia, water quality agreements cover only 16 percent. Another concern with the WQIA Program is that DCR does not assess the extent to which lawn care operators are following their agreements. Furthermore, DCR does not follow-up with the groups prior to the end of the agreement (every three years) to determine whether the lawn care groups are meeting DCR's standards. These factors may prevent lawn care groups from taking the recommendations seriously.

DCR's urban nutrient management specialist has expressed the opinion that because the agreements are entered into on a voluntary basis, lawn care companies that participate are likely to meet the program's requirements. Similarly, the urban nutrient management specialist told JLARC staff that a few groups have turned down the offer to participate in the program because they do not feel that they can commit to the terms of the agreement. Based on this assessment, it seems possible that only those companies that already meet or are close to meeting DCR's standards would agree to participate in the program. If this assessment is true, DCR may be acknowledging good nutrient management practices when they issue Water Quality Agreements, but they may not be improving nutrient management practices among those groups that are not currently meeting DCR's standards.

In addition to encouraging better nutrient practices by lawn care groups, DCR also tries to limit nutrient usage on golf courses. According to the Virginia Turfgrass Council, golf courses accounted for 33,900 acres of turfgrass in 1998, or 2.5 percent of the total turf acres (Exhibit 3). Educating this community may be an important aspect of urban education because golf courses have been identified as having the highest level of nitrogen fertilization compared to other categories of public land use. Although the average nutrient use on golf courses was still within Virginia Tech's recommended nitrogen fertilization rates, some courses were fertilized more heavily than recommended.

Exhibit 3	
Virginia Turfgrass Council Estimates Of Turfgrass Acreage in Virginia (1998)	
<u>Category</u>	<u>Acres</u>
Lawns	714,000
Highway Roadsides	290,000
General Areas	215,000
Schools	43,200
Golf Courses	33,900
Parks	26,400
Churches	15,600
Cemeteries	15,400
Airports	10,200
Sod Farms	4,800
Total	1,368,500

Source: 1998 Virginia Turfgrass Council Survey.

According to DCR staff, they have developed a format for a golf NMP that outlines proper rate, timing, and application practices. In 2004, the department funded a cost-share program in the Chesapeake Bay watershed in which they paid private nutrient management planners up to \$750 per course to develop a NMP. DCR staff said that NMPs are now in place on approximately 80 courses in Virginia, out of a total of 300 to 500 courses in the State. DCR received additional funding from EPA to continue the program for a second year. DCR also published a brochure called “18 Hits for Golf Course BMPs.” DCR distributed this document at a golf tournament where a description of a BMP was posted at each hole.

In addition to targeting lawn care groups and golf courses, DCR also tries to directly increase the awareness of homeowners through educational materials. DCR estimates that “do-it-yourself” individuals fertilize 238,000 acres, or roughly 33 percent of the total lawn acres in the State. This suggests a strong potential for homeowners to influence water quality through their lawn care practices. To address this group, DCR has jointly published several educational documents with the Virginia Cooperative Extension Service and a video demonstrating environmentally responsible fertilizer and pesticide use at home. According to DCR staff, their educational pamphlets are widely available through local DCR offices, Extension offices, SWCDs, watershed groups, and homeowner associations.

Despite these efforts, DCR’s messages about nutrient management and water quality may only be reaching a limited number of fertilizer users. For instance, although these publications are available at a variety of locations, homeowners who do not visit these locations will never receive the information. One homeowner survey in Virginia found that of all sources that homeowners consult to guide their lawn care efforts, lawn experts such as the Cooperative Extension Service were consulted least often. Furthermore, it seems possible that homeowners who do not visit their local watershed and agricultural offices may be less interested or informed about water quality or landscape issues, making them potentially more important targets for nutrient management messages. In addition, according to a survey on nutrient behavior around the Chesapeake Bay, program managers do not rank brochures and flyers as highly effective outreach methods.

Other Outreach Methods Used to Limit Nutrient Use in Non-Agricultural Settings

Although State agencies have developed a variety of educational resources, there is some concern about whether these are the most effective techniques for educating its citizens about nutrient management in non-agricultural areas. For example, results from a 1999 study of the effectiveness of nutrient management education programs on participants’ behaviors in the Chesapeake Bay area suggest that sharp differences often exist between the outreach techniques that these programs offer and those to which individuals respond. According to a fact sheet published by the Center for Watershed Protection, the results of several market surveys have found that two outreach techniques—media campaigns and intensive training—have shown promise in changing homeowners’ nutrient behaviors. Evaluations of these market surveys suggest that both approaches have the capacity to produce up to a 10 to 20 percent improvement in selected watershed behaviors among their targeted

audiences. JLARC's assessment of the efforts in the State to address nutrient management in non-agricultural areas found that there are efforts underway to utilize both of these outreach techniques.

One study of residential nutrient behavior in the Chesapeake Bay area has found that residents consistently rated television programming as the most popular method for receiving water quality messages. To date, the State has not used media campaigns on a large scale to spread messages about nonpoint source pollution and nutrient management, but there is an effort currently underway that will target suburban residences in the Washington, D.C. metropolitan area. DCR staff expect that the campaign will run for about 13 weeks in early spring to target homeowners who are thinking about fertilizing their lawns. The media campaign will communicate messages about lawn care, nutrient management, proper fertilizer use, and possibly septic tank and pet waste management and may involve television, radio, or transit advertising. Although the campaign is aimed at the Washington market, its messages will penetrate Northern Virginia, as far south as Culpeper and Orange counties.

Although the campaign has the potential to reach a new market of non-agricultural landowners, its funding and messages may still be limited. All of the money for the campaign comes from the Chesapeake Bay Program. Originally, Virginia had envisioned a larger operating budget for the campaign and greater endorsement from all the Bay states. According to DCR staff, a larger operating budget could allow them to run messages in the fall and spring. If messages are run only in the spring to target homeowners who are likely to fertilize during that season, a possible result is that homeowners who have waited until spring to fertilize may not be willing to wait until the following fall, as the messages will suggest. Despite the campaign's limitations, however, DCR's public relations manager remains hopeful that the campaign will be successful and will continue in subsequent years.

In contrast to media campaigns, intensive training utilizes workshops, consultations, and guidebooks to send more complex messages to a smaller audience. In 1992 a program was developed that encouraged homeowners to participate in activities designed to educate them about proper nutrient usage and lawn care. Developed by the Prince William Cooperative Extension Service, the Water-wise program aimed at reducing nonpoint source pollution associated with over-application or misuse of nutrients (lawn fertilizer) in suburban residential areas. Results from the Water-wise program suggest that of those who participated in the program, 80 to 90 percent changed their nutrient behaviors as a result. Opportunities such as field days, demonstration lawns, and one-on-one visits from "Master Gardeners" were established to educate homeowners about how to implement recommended fertilizer techniques, integrated pest management, and other activities aimed at reducing nonpoint source pollution to the Chesapeake Bay. According to DCR's urban nutrient management specialist, this program was implemented in as many as 15 localities and resulted in the education of thousands of Virginia homeowners.

Although it appears that this program has been reduced in scope since its initiation, several Extension offices are still implementing similar programs. For

example, the Chesterfield County Extension office has a program called “Grass Roots” that offers homeowners personalized lawn management plans. The program involves soil testing, a visit with a Master Gardener volunteer who devises a lawn management plan, and the distribution of several newsletters. According to their website, the Extension office has helped over 1,000 county homeowners to adopt proper fertilizer procedures through this program.

Despite the potential of the Water-wise program to change nutrient usage patterns among participants, the number of people participating in the program is still limited by several factors. For example, a survey on residential nutrient behavior in the Chesapeake Bay area found that participatory outreach techniques seem to appeal to only a small segment of local homeowners. Additionally, the effectiveness of the program may also be limited by available resources. Although participatory programs have the potential to change nutrient usage, they often require greater staff or volunteer time than other outreach methods. A Chesterfield Extension agent said that limited resources prevented their County from involving all individuals who wished to participate in the program last year. A Henrico extension agent told JLARC staff that they receive excellent feedback about the County’s program and concluded that it is worth devoting more resources to this or similar programs.

Opportunities to Expand Outreach to Non-Agricultural Settings

Several opportunities may exist for the State to expand its outreach to non-agricultural nutrient users. As discussed previously in this chapter, roughly one-third of home lawn acres in Virginia as of 1998 were fertilized by individuals. This suggests the potential for homeowners to influence water quality through their lawn care practices. Although DCR has initiated several creative programs to improve nutrient practices among commercial fertilizer companies and golf courses, there may be some additional opportunities for educating the general public. In addition to increasing educational efforts in the State, Virginia could consider taking a stronger regulatory approach to urban nutrient management.

According to DCR, numerous studies have determined that product labels and store attendants provide significant sources of information for homeowners about proper lawn care. These findings may suggest the potential for point-of-sale distribution of educational materials and information to influence homeowners’ fertilizer practices. In the past, DCR has worked with fertilizer retail companies to promote the distribution of brochures or videos about proper lawn fertilization. DCR found that the strength of this approach was in targeting an audience that uses fertilizer without inadvertently sending messages to individuals who may not be using it. In contrast, broad efforts to educate homeowners on proper fertilizer use could backfire by causing some to increase usage.

DCR has had more success securing cooperation from individual lawn supply retailers, whereas there may be opportunities to reach larger audiences with large national retail chains. DCR staff suggested that two obstacles limited their efforts in this area. First, while working with national retail chains, DCR’s requests were often held up in their legal departments. Second, even among those smaller

stores where DCR found managers interested in promoting nutrient management, high turnover rates in retail positions often prevented ongoing support.

Although this point-of-sale approach may offer some potential benefits, DCR staff feel that a more direct point of sale approach, such as proper fertilizer labels, may be more beneficial. According to DCR, VDACS staff worked with the American Association of Plant Food Control Officials (AAPFCO) and DCR to develop model fertilizer law changes requiring fertilizer products to include instructions on their proper use. To date, however, these changes have not been brought to the legislature in Virginia. DCR staff claim that the fertilizer industry may resist making label changes for one state, so cooperation among the Bay states may make this change more realistic.

In addition to further education and outreach efforts, the State could consider taking a more regulatory approach to addressing nutrient management in non-agricultural settings. While Virginia has focused its efforts on voluntary approaches to reducing urban nutrient over-application, Maryland has adopted a regulatory approach to help address nonpoint source pollution from non-agricultural environments. Maryland requires individuals hired to apply commercial fertilizer to ten or more acres of non-agricultural land to follow the application recommendations of the Maryland Cooperative Extension (Exhibit 4). This provision covers areas like golf courses and public school athletic fields.

Exhibit 4

Summary of Maryland Cooperative Extension Recommendations

1. Test soil to determine if nutrients are deficient prior to fertilizer application.
2. Use a fertilizer containing at least 50 percent slow-release nitrogen.
3. Apply no more than 4 pounds of nitrogen per 1,000 square feet per year.
4. Remove fertilizer from paved surfaces to avoid runoff.

Source: Maryland Cooperative Extension.

Nonetheless, even regulatory programs fall short of requiring all fertilizer users to follow nutrient management plans. For example, a 1998 EPA article entitled “Maryland Law Brings Lawn Care into Nutrient Management,” suggested that critics of the Maryland law felt that it barely scratched the surface when it came to pollution from lawn fertilizers. A president of a lawn care association in Maryland explained that the new law would have little effect on the lawn care industry because most of their customers had lawns less than three acres in size. In addition, a representative from Maryland’s program claimed that it has been difficult to identify entities applying fertilizer to ten or more acres that should be regulated under their state law. Although this approach would fall short of regulating all nutrient users, a broader regulatory approach which requires all fertilizer users to have nutrient management plans may be unrealistic.

A regulatory approach may be necessary if the State intends to reach its tributary strategy goals. For example, according to the provisional tributary strategies, nutrient management needs to cover 90 to 95 percent of urban acres for the State to meet its nutrient reduction goals. Currently, nutrient management covers approximately four percent of urban acres in the State. The State's tributary strategy goals and possible policy options for achieving the stated goals will be described in more detail in Chapter V of this report.

USE AND IMPLEMENTATION OF NMPs BY STATE AGENCIES

To assess the extent to which Virginia agencies and institutions use NMPs or nutrient management guidelines, JLARC staff conducted a survey of the 47 State agencies and institutions managing State-owned land. These agencies and institutions reported responsibility for about 658,000 acres of land.

The only State land currently required to have a NMP are State agriculture operations with a permit for confined animals. Only a small portion (about 25,000 acres) of the total State-owned acreage is agricultural land, and only two operations covering 2,800 acres (the Southampton Correctional Facility farm and Virginia Tech's dairy facility) are regulated as confined animal feeding operations. In the early 1990s, though, an executive order required that State-owned or leased agriculture land should have NMPs. According to the results of the JLARC staff survey, almost all (94 percent) of State-owned agricultural land has been managed with the use of a NMP at some point. However, it is unclear if these NMPs have been properly updated over time.

With regard to State-owned non-farm land, there are opportunities for increased use of NMPs on about half of this acreage. The largest amount of acreage with this potential is land held by the Virginia Department of Transportation. In addition, there are some agencies and institutions with smaller land holdings that apply nutrients without NMPs.

Most (94 Percent) of State Agency Agriculture Land Is Operated with the Use of NMPs

In November 1993, Governor Wilder issued an executive order that directed agencies that owned or leased agricultural lands to implement conservation plans that addressed soil erosion, nutrient management, and pest management. It does not appear that this order has been cancelled or rescinded. At the same time, it does not appear that any continuing activity or updating of the conservation plans is occurring either. For example, DCR staff indicated that they were not sure whether the plans that had initially been developed by the agencies and institutions with agricultural land have been updated. In addition, no annual report is being produced by DCR and sent to the Secretary of Natural Resources Office as is required by the executive order.

Under current law, only State agencies that have a permit to operate a confined animal feeding operation (CAFO) must have a NMP. Currently, the swine op-

eration at the Southampton Correctional Center and the Virginia Tech farm operation are the only two permitted CAFOs operated by the State. The swine operation at the Southampton Correctional Center is operated by the Department of Corrections and is a confined animal feeding operation and operates under a Virginia Pollution Abatement (VPA) General Permit. It also uses a NMP that was developed by DCR staff in accordance with DCR nutrient management regulations. The NMP is written for 1,030 total acres and up to 400 beef cattle and 2,189 swine. The swine manure that is collected at Southampton Correctional Center is contained in an above-ground storage tank until it is spread on the facility's pastures. The correctional center manages the swine manure in accordance with its NMP.

DEQ Tidewater region inspectors conduct annual inspections at the Southampton Correctional Center farm operation. The most recent inspection found the farmsite in good overall condition, requiring no corrective actions. Recently, the NMP was revised by a certified nutrient management planner to allow application of liquid swine manure to pasture fields. The NMP is now current and scheduled to be revised in 2005. Overall, the farm appears to be meeting the requirements under its VPA permit.

Although only the Southampton facility and the farm operation at Virginia Tech are required to have NMPs, JLARC staff survey results indicate that NMPs are used to manage 94 percent of State-owned agricultural-lands. The Department of Corrections' (DOC) agribusiness operations, which use a NMP, constitutes the largest use of State-owned land for agriculture. DOC's agribusiness operation uses inmate labor to produce meat, milk, produce, and fish for institutional food service programs. Twenty-eight DOC facilities are involved, covering 12,000 acres of land, including pasture, crop fields, and wooded areas. According to DOC staff, 16 facilities that are involved in substantial livestock or crop production activities have used NMPs developed by DCR planners to manage the storage and application of nutrients.

In addition, Virginia Tech's College of Agriculture maintains a VPA permit for their dairy facility. The College operates a 3,200-acre farm that produces livestock and crops that are used by the university for agricultural research purposes. The farm owns approximately 50 horses, 245 swine, 800 beef and dairy cows, 1,000 sheep, and 790 chickens and turkeys. Approximately 2,650 acres of the farm are dedicated to crop production to support its livestock. The farm manages the storage and field application of the manure that is produced by its livestock in accordance with an NMP developed by a DCR planner. The NMP covers 1,800 acres (56 percent) of the farm's total acreage.

There Are Some Opportunities to Increase the Use of Nutrient Management on State-Owned Lands

At least thirty State agencies and institutions are responsible for managing non-agricultural lands. Three of those agencies, the departments of Conservation and Recreation, Forestry, and Game and Inland Fisheries maintain half of the more than 632,000 acres that were identified and do not apply any nutrients to those lands. In addition, a few other agencies are using NMPs or nutrient management

principles to guide their nutrient use on non-agricultural lands. It appears that opportunities exist for increasing nutrient management planning on roadside land maintained by the Department of Transportation and some smaller State land holdings. The Commonwealth should move to place this acreage under nutrient management plans as a way to reduce nutrient losses to State waters and to set an example for other regulated and non-regulated users of fertilizer that Virginia is committed to improved water quality.

State entities that are non-agricultural manage approximately 34,000 acres under a NMP or nutrient management guidelines. Some other states require their agencies to develop and administer State-owned lands under NMPs in certain situations. For example, Maryland requires agencies that own at least ten acres of property to manage the land in accordance with nutrient management guidelines developed by the University of Maryland. The state of North Carolina requires agencies that own at least 50 acres of land to develop and use NMPs.

DCR does not track the amount of State-owned land managed under a NMP. Forty-seven agencies and institutions that direct State projects or own land where nutrient management planning might be appropriate were surveyed by JLARC staff to determine the extent to which these organizations manage their property. These agencies were asked about their nutrient management activities on agricultural and non-agricultural land. Agricultural land is used for crop, hay, pasture, silviculture, and/or livestock production. Non-agricultural land is used for purposes such as lawns, recreational areas, roadside areas, athletic fields, forestlands (for non-economic purposes), college and university campus grounds, and general turfgrass areas. The 39 responding agencies indicated that they are responsible for managing about 658,000 acres of State-owned land, of which only about 25,000 acres are agricultural (Table 18).

Although most agencies use NMPs only for agricultural land, there are seven agencies using NMPs to manage more than 1,800 acres of non-agricultural land. In particular, James Madison University developed seven NMPs to manage 325 acres of non-agricultural land, and Radford University manages 179 acres of non-agricultural land with one NMP. Both of these institutions use NMPs to manage athletic fields and campus grounds. However, none of these agencies are using NMPs that were written by DCR-certified planners. This does not mean the NMPs are ineffective or inaccurate, but it also does not ensure they were developed in accordance with the Training and Certification requirements.

The survey also requested State agencies to provide information on their use of nutrient management guidelines. Nutrient management guidelines are a set of recommendations for the appropriate application of nutrients and soil amendments for both plant production and water quality productions, as opposed to a NMP which is more of a site-specific document. Nutrient management guidelines are often used by agencies to manage the application of nutrients on non-agricultural land. The use of nutrient management guidelines by State agencies and institutions is strictly voluntary and has never been required. As with NMPs, DCR-certified planners are available to develop nutrient management guidelines for an agency or insti-

Table 18
Use of Nutrient Management Planning by State Agencies and Institutions

	Agricultural Acreage			Non-agricultural Acreage				
	Ag- Land	Is an NMP Used?	Acres Managed	Non-Ag-Land	Is an NMP used?	Acres Managed	Nutrient Guidelines Used?	Acres Managed
Agency								
Agricultural and Consumer Services	0	No	0	114	No	0	Yes	14
Blind and Vision Impaired	0	No	0	32	No	0	Yes	0
Corrections ¹	12,549	Yes	12,549	0	No	0	No	0
General Services	0	No	0	45	Yes	25	Yes	20
Mines, Minerals, and Energy	0	No	0	12	No	0	No	0
Rehabilitative Services	0	No	0	220	No	0	No	0
State Police	0	No	0	50	No	0	Yes	20
Transportation ²	0	No	0	303,360	No	0	Yes	3,750
Veterans Services	0	No	0	250	No	0	No	0
DMHMRSAS	0	No	0	4,740	No	0	No	0
Institutions								
The College of William and Mary	1	No	0	1,200	No	0	No	0
Christopher Newport University	0	No	0	39	No	0	Yes	39
James Madison University	0	No	0	530	Yes	325	Yes	325
Longwood University	160	No	0	124	No	0	Yes	108
Norfolk State University	0	No	0	125	No	0	No	0
Old Dominion University	0	No	0	97	No	0	Yes	39
Radford University	0	No	0	179	Yes	179	No	0
University of Virginia	0	No	0	1,138	No	0	Yes	54
Virginia Commonwealth University	0	No	0	562	No	0	Yes	10
Virginia Community College System	68	Yes	65	1,359	Yes	1	Yes	271
Virginia Military Institute	0	No	0	166	Yes	60	Yes	60
Virginia State University	140	Yes	120	203	No	0	Yes	80
Virginia Tech	4,862	Yes	3,442	1,267	Yes	1,267	Yes	1,267
Other								
Frontier Culture Museum of Virginia	8	No	0	5	No	0	No	0
Science Museum of Virginia	0	No	0	9	No	0	No	0
Virginia Museum of Fine Arts	0	No	0	14	Yes	14	No	0
Virginia Port Authority	0	No	0	40	No	0	No	0
School for the Deaf and the Blind	0	No	0	58	No	0	No	0
Agencies with Most Non-Ag Land								
Conservation and Recreation ³	2,052	Yes	2,052	81,557	--	--	--	--
Forestry ³	511	Yes	496	45,450	--	--	--	--
Game and Inland Fisheries ³	5,000	Yes	5,000	190,000	--	--	--	--
Sub-total for DCR, DOF, and DGIF	7,563		7,548	317,007				
Total	25,351		23,724	632,944		1,871		6,057

¹ The Department of Juvenile Justice's (DJJ) response indicated that "the department does not have a nutrient plan. The Department of Corrections (DOC) uses part of the land at the Beaumont Juvenile Correctional Center and the Hanover Juvenile Correctional Center for farming and raising livestock. The DOC plan would include DJJ property presently in use by DOC."

² VDOT staff indicated that they have developed a NMP for their non-agricultural land although no acreage is currently managed under it. VDOT staff also stated that the department requires staff to follow site-specific nutrient management guidelines when performing land-disturbing activities, although these guidelines are not as strict as that required by DCR's training and certification regulations.

³ The departments of Conservation and Recreation (DCR), Forestry (DOF), and Game and Inland Fisheries (DGIF) do not apply nutrients to their non-agricultural lands (nutrients are not being applied at State park land and forest land).

Source: JLARC staff survey of State agencies and institutions that responsible for managing State-owned land.

tution. However, only two agencies are using DCR-certified planners to develop nutrient management guidelines.

State agencies and institutions that reported using nutrient management guidelines manage a total of 6,057 acres of non-agricultural land, or less than one percent of the total acreage identified by the respondents. For instance, the Virginia Department of Transportation (VDOT) manages 3,750 acres with DCR-certified nutrient management guidelines, the most among agencies and institutions participating in the survey. VDOT requires its roadside management staff to follow nutrient management guidelines when spreading fertilizer and pesticides on the 3,750 acres of turf grass that the agency owns. In FY 2003, VDOT used federal funds to send 30 staff to a two-day nutrient management planning course conducted for the agency by DCR's NMP coordinator. VDOT is also negotiating with DCR to develop a nutrient management planning certification course to provide selected staff with the technical knowledge needed to manage nutrients in an environmentally friendly manner.

Three main limiting factors are given by agencies and institutions explaining why their agencies do not manage their non-agricultural land in accordance with nutrient management guidelines. First, six agencies were not aware of the existence and potential use of nutrient management guidelines. In fact, before completing the survey, many agencies without nutrient management guidelines were unsure whether their agencies were in compliance with current regulations. In contrast, Old Dominion University employees who are responsible for fertilizer application attend continuing education courses to stay current with the most recent nutrient guidelines.

Second, three agencies and institutions believe nutrient management planning guidelines are not compatible with the agency's management of non-agricultural land. The survey found that the Department of General Services, which is responsible for maintaining the grounds that surround State office buildings in downtown Richmond, does not require staff to follow nutrient management guidelines when applying nutrients on these lands. DGS staff reported that their agency has not expressed interest in developing nutrient management guidelines because the department is only responsible for maintaining approximately 60 acres of State-owned land. However, this land is highly visible to the public.

Third, three responding agencies indicated that their land management activities do not impact water quality. In subsequent conversations with these agencies, JLARC staff found that they are not applying nutrients to their non-agricultural lands. The Department of Forestry, for example, which manages more than 45,000 acres of forest land does not apply nutrients to those acres. DCR also indicated that it does not apply nutrients to the more than 81,000 acres of non-agricultural land that it manages. In addition, two agencies responded that a lack of resources was an obstacle to implementing nutrient management planning. One agency stated "we have not had the staff, funding and resources to apply nutrients to our land."

While respondents to the JLARC staff survey of State agencies indicated that 94 percent of State-owned agricultural land is managed using a NMP, they also

indicated that less than 13 percent of non-agricultural lands are managed using a NMP or nutrient management guidelines. The State's approach to nutrient management on its own acreage is problematic for several reasons. First, on those lands where nutrients are being applied, the agencies and institutions could reduce the amount of nutrient loss to State waters and therefore, assist in Virginia's stated goal of improving water quality. Second, questions of equity are raised when the Commonwealth regulates other users of nutrients but is unwilling to make those same commitments. And third, certain areas of the State are already facing substantial surpluses of poultry litter that State agencies and institutions may be able to use.

Recommendation (14). The Governor should issue an executive order directing State agencies and institutions to develop nutrient management plans and keep them updated for State-owned lands on which nutrients are applied. The Department of Conservation and Recreation should provide assistance upon request of the State's agencies and institutions concerning the proper development and implementation of nutrient management plans.

V. State Policy Options

Virginia policy-makers have indicated over the years a commitment to various water quality goals, such as achieving reductions in the nutrients and sediments entering tributary rivers and flowing to the Chesapeake Bay. Policy-makers have also indicated support for the economic viability and vitality of Virginia's farming operations.

The development and implementation of NMPs has the potential to promote water quality goals in a cost-effective way that is supportive of farm operations. A difficulty, experienced in Virginia and other states, is in obtaining – across a large area such as a watershed – such a high, consistent, and persistent level of implementation of best management practices (like NMPs) that is needed to produce major reductions in nutrients in the waterways.

As Virginia moves forward, it will need to decide the approach it wishes to take with regard to the role of NMPs in its pursuit of water quality goals. This chapter discusses three options regarding that role:

- (1) **Make a transition to “phosphorus-based” NMPs, while otherwise generally maintaining the status quo approach.** DCR is in the process of developing regulations that will change the focus of NMPs to address the potential for phosphorus loss from fields. This change could be made, while taking limited action with regard to increasing the amount of acreage covered by plans, or the degree to which mandatory NMPs are enforced.
- (2) **Increase the extent to which the use of NMPs is enforced by the State.** For example, the extent to which NMPs are required for farms could be increased, as in Maryland. Or, changes could be implemented to strengthen the current DEQ inspection and enforcement role, particularly in instances of serious and repeated violations.
- (3) **Encourage growth in the extent to which acreage is covered in Virginia by voluntarily-adopted and implemented plans.** This option involves creating or expanding various incentives promoting voluntary action, making the use of NMPs more popular by improving its ease of use, and pursuing realistically-set tributary strategy goals for the use of NMPs by 2010.

There are elements of these three options that are not mutually exclusive. For example, the State can implement phosphorus-based NMPs, increase the acreage covered by required plans and strengthen its enforcement role, and encourage the growth of voluntary plans by setting realistic goals and providing incentives. However, there are advantages and disadvantages associated with whatever approach is chosen. The remainder of this chapter describes each option, and discusses some of the issues or tradeoffs that are involved with each.

**OPTION ONE:
IMPLEMENT PHOSPHORUS-BASED NMPs,
BUT OTHERWISE GENERALLY MAINTAIN THE STATUS QUO**

Since the beginning of 2004, DCR has been developing new Training and Certification regulations in order to address the effect of phosphorus on water quality. This process has been driven by requirements in State law and changes in the federal permitting process for certain confined animal and poultry feeding operations. Changes in the participation requirements for certain federal cost-share funding have also pushed the State to implement a planning policy that seeks first to limit the potential for phosphorus runoff or leaching. Several states already use phosphorus-based planning as the controlling factor in their nutrient management programs.

The *Code of Virginia* required DCR to implement nutrient management planning using phosphorus instead of nitrogen as the restricting element for poultry operations beginning on October 1, 2001. EPA is currently requiring states to adopt phosphorus-based planning as part of the federal government's update to permitting under the National Pollution Discharge Elimination System (NPDES). The federal updates will mostly affect only the largest confined animal and poultry operations in Virginia, and will be a subset of the animal and poultry operations that are already permitted in the State. Likewise, in order for a farming operation in the State to receive federal EQIP cost-share funding for the development of a nutrient management plan, the National Resource Conservation Service (NRCS) now requires that the plan be developed using phosphorus-based planning.

Changes to federal and State requirements for nutrient management plans have occurred to address the impact of excess phosphorus in soils. As discussed in Chapter I, excess phosphorus in soil has the potential to degrade water quality and affect aquatic life. In many cases, excess phosphorus in soil occurs when farm operators apply nutrients to meet the nitrogen needs of crops. A 2001 document published by the Virginia Cooperative Extension notes that:

A buildup of soil phosphorus in soils treated with animal waste results when manure is applied at rates designed to supply crop nitrogen needs because of the imbalance between the nitrogen and phosphorus content of the applied manure as compared to the annual nitrogen and phosphorus requirements of most crops. Most animal manure contains nearly as much [phosphate fertilizer] as nitrogen, but plants take up and remove about 2.4 to 4.5 times as much nitrogen as [phosphate fertilizer].

Due to the efficiency with which plants utilize nitrogen, the phosphorus content of the soil will begin to build-up rapidly if litter is applied to meet the nitrogen needs of crops. Therefore, nutrient applications based on the concentrations of phosphorus in the manure will mean that farmers will have to reduce the overall amount of animal manure or poultry litter applied and either keep it in storage or transfer it off the farm.

As part of the NPDES changes, states must determine whether a field can receive the land application of nutrients based on a nitrogen or phosphorus limit. States must also consider whether fields should be prohibited from receiving any nutrient applications. In order to make that determination, DCR is considering the use a phosphorus index (P Index) to classify fields based on the potential for phosphorus loss. The P Index, or a variation of it, is used by 47 states. Researchers at Virginia Tech have largely been responsible for the development of the P Index that DCR has proposed to use. This research has received funding from DCR and the Virginia Poultry Federation.

According to a journal article, “determining the risk of phosphorus loss is a function of both source and transport factors.” As discussed in Chapter I, phosphorus loss can occur through erosion or as runoff, in cases where soils are already saturated with phosphorus such that the element can no longer bind with the soil. A P Index captures transportation characteristics by having a specialist identify soil erosion and runoff potential. The other component necessary to calculate a P Index is the source of the phosphorus and its incorporation method. When these components are factored together, they produce a result that indicates the probability of phosphorus loss for the field from which the readings were made.

Results from calculating the phosphorus index developed by Virginia Tech will be categorized into one of four recommendations. First, soils with low transport and source risks can receive nutrient applications according to the amount of nitrogen required by the crop (crop nitrogen removal rate). Second, fields with a medium risk for phosphorus loss are to receive no more nutrients than 1.5 times the phosphorus amount that the crops can use. Third, nutrient applications on fields associated with a high probability of phosphorus loss should only be done at the rate at which the crops can utilize the phosphorus (crop phosphorus removal rate). Finally, when the P Index calculates a very high potential for phosphorus runoff or leaching based on transport and source characteristics, Virginia Tech recommends that no phosphorus be applied. Concerns have been raised that under current statutory language, poultry operations would still be prevented from applying nutrients at a nitrogen based rate even if fields on those operations were determined to be in the lowest risk category.

While necessary for proper plant growth, phosphorus can have strong negative effects on water quality. Too much phosphorus can fuel excessive algae growth resulting in low levels of dissolved oxygen. These conditions can severely restrict the ability of aquatic life to survive. In response to growing concerns about the impact of phosphorus on aquatic habitats, the Environmental Protection Agency and the states have started focusing on ways to reduce phosphorus loss. Phosphorus-based planning seeks to reduce phosphorus losses from agricultural operations by balancing the amount of phosphorus used in animal feeds and found in animal wastes with the capacity of the soil to integrate additional phosphorus.

Implementing a P Index in Virginia has the potential to substantially affect the approximately 300 confined animal feeding operations in the State as well as any operations with significantly high soil concentrations of phosphorus. To this point, NMPs developed for confined animal feeding operations have been nitrogen

based. However, as part of the regulatory changes being considered by DCR and that have been adopted by DEQ, all NMPs developed for a State VPG Permit shall use phosphorus as the main limiting factor. (Moreover, new federal laws that will go into effect on January 1, 2006 will be requiring approximately 145 animal and poultry operations in Virginia to use phosphorus-based plans.) Additionally, operations that have fields with soil concentrations of phosphorus higher than 65 percent may be prohibited from applying manure or litter to those fields. Because of the high phosphorus content in poultry waste, the latter issue may have a larger effect on poultry operations than animal operations. Reductions in the use of poultry litter may result in a build-up of excess litter on an operation and across a region and as a result of the buildup the value of the litter will begin to fall. Farm operators and DEQ staff told JLARC staff that in DEQ's Valley region, farmers currently have to pay others to haul away their litter or they have to haul it themselves, whereas before, litter was a commodity that could be sold for a profit.

Furthermore, farming operations limited to applying at phosphorus removal rates will likely need to purchase and apply commercial nitrogen fertilizer instead of applying animal waste because the phosphorus content of animal waste is too high compared to what the crops can use. According to a farmer in Rockingham county, the NMP for the farm was "very usable and economical," when it was nitrogen-based. "Now that it is phosphorus-based, I must purchase nitrogen to produce a decent crop. This dramatically changes the economics of producing crops and puts us at a competitive disadvantage to most of the crop producers in the country."

However, the potential exists that very few fields in the Commonwealth would be classified as having soil phosphorus levels in the range requiring such restrictions. Only soils identified as having extremely high soil phosphorus saturation (greater than 65 percent saturation) would be automatically precluded from applying animal wastes or commercial fertilizers. According to DCR's nutrient management program manager, the department asked Virginia Tech to analyze the extent to which the university believed that fields in Virginia would be impacted by this change. Virginia Tech reviewed soil analyses for three counties that have a substantial amount of poultry facilities, Accomack, Amelia, and Rockingham. The university reported that the majority of fields in these three counties would not be classified as too highly saturated in phosphorus to be screened out of using a P Index computation.

Soils that are not categorized as highly saturated with phosphorus will be addressed in two ways. Those fields with soils that test as medium or high in phosphorus saturation levels would then be measured for phosphorus loss potential using the P index. It is possible that calculating the P Index for these fields could also preclude further applications of nutrients. Soil that test low for soil phosphorus would not be required to have a P Index calculated and could have nutrients applied at nitrogen-based rates.

Developing a nutrient management plan for a field using a P Index is a more time-consuming effort than developing a nitrogen based plan. Gathering the information that is required for calculating a P Index is labor intensive for planners. For example, soil erosion potential must be calculated using slope and length infor-

mation. In addition, buffer widths and distances to surface waters must also be quantified by the plan writer.

The JLARC staff survey of certified nutrient management planners asked plan writers to quantify the hours it takes them to write plans currently versus what it would take them to write a plan using a P Index. Table 19 illustrates the results. Using the median value, respondents indicated that the amount of time they need to complete the nutrient management planning process would require an additional eleven hours. Many planners stated that the time required to gather the information needed to calculate a P Index would be the main factor increasing the amount of time they spent on plan development. One planner stated that the additional time was a function of:

measuring distance to stream taking slope and slope length measurements, more info to enter into NutMan program, more info to get from the farmer, more info to explain.

Another commented that “the P Index doubled the time I spent developing plans. This is not an estimate, this is actual experience.”

DCR has tried to alleviate some of the concerns that have been raised with regard to the rigorous and time-consuming nature of using a P Index. For example, under the amendments DCR is considering to its Training and Certification regulations, planners will be able to choose between calculating soil erosion using the more

Table 19		
Median Time Spent and Projected Time Needed Using a Phosphorus Index When Developing Nutrient Management Plan		
<u>Nutrient Management Activity</u>	<u>Time Spent in NMP Development On a Typical Farm</u>	<u>Projected Time with a P Index Approach</u>
Discussions with farmer about field specifics and farming/management practices	2	3
Walking the fields to observe physical features including field slopes, water bodies, etc.	2	6
Sampling (Soil, manure, groundwater, etc.)	3	4
Writing the actual plan or entering information into the NutMan program	5	10
Explaining plan content and recommendations to the farmer and working on revisions	2	2
Total	14	25
Note: Thirteen responses from DCR staff and 28 non-DCR staff responses.		
Source: JLARC staff analysis of surveys of DCR certified nutrient management planners.		

precise, but complicated federal formula approved by NRCS or an assessment procedure to be based primarily on information currently collected for NMP development.

Currently, there are caps on the amount the State's Cost-share program will pay on a per-acre basis for plan development. These restrictions vary by: whether the plan is new or a revision to an existing plan, crop type, use of manure versus commercial fertilizer, and whether the manure was generated on or off the farm. Payment amounts for new plans range between \$3 and \$6 per acre and \$1 and \$2 per acre for revised plans. If there is a substantial increase in the amount of time to develop a plan using a phosphorus index, the department may have to consider increasing those caps in order to ensure there is a large enough supply of plan writers to meet the demand.

Recommendation (15). The Department of Conservation and Recreation should conduct a review of the time required and the costs incurred by plan writers to develop phosphorus-based plans. Through this review, the department should determine whether an increase in the cap amounts for plan development in the Agricultural Best Management Practices Cost-share Program need to be increased, to take into account changes in costs resulting from the development of phosphorus-based plans.

OPTION TWO: INCREASE THE EXTENT TO WHICH NMPs ARE ENFORCED BY THE STATE

There are two primary means by which the State could seek to rely somewhat less upon the good will of farmers and other land users to obtain the widespread, consistent, and persistent use of NMPs and resulting water quality benefits. One of these means is to increase the amount of acreage that must, under law, be managed in accordance with a NMP. Progress in achieving higher levels of nutrient management on farms has been slower than hoped for under past Virginia tributary strategies, and a voluntary approach may not achieve the level of NMP coverage that is contemplated in current tributary strategy documents. Current documents also appear to expect substantial implementation of nutrient management practices on urban land by 2010 that may not be achievable by only working with fertilizer application companies on a voluntary basis. The approach where more acreage must be managed with NMPs is being used in Maryland, for example, to help the state achieve widespread adoption of NMPs among farmers.

The second means is to strengthen the DEQ inspection and enforcement role of existing required NMPs. At a minimum, it appears to be reasonable for DEQ to obtain and manage its staff resources in a way that enables it to have more of an inspection presence at times when nutrients are actually being applied to fields. Also, at a minimum, it seems reasonable and appropriate for DEQ staff to perform a stronger enforcement role in instances where there are serious or repeated violations

of NMP provisions. However, it is also recognized that under any circumstances, the success of the NMP program will depend to an important extent upon the willing cooperation of farmers. It is also recognized that the State has not wanted the scope of its regulatory activity to become an undue burden upon farm operations.

Requiring More Acreage to Be Managed Under a Nutrient Management Plan

Virginia's experience with placing agriculture acreage under NMPs largely using a voluntary approach has had some limited success. As noted earlier in this report, in addition to about 155,000 agriculture acres that are under mandatory NMPs, Virginia has another 366,000 agriculture acres that are covered by NMPs for other reasons, including acceptance of plans on a voluntary basis by some farmers. During the 1990s, the State began to authorize and encourage private certified nutrient management planners to write NMPs and this approach had the impact of increasing the number of NMPs that are written.

However, Virginia's experience with NMPs during the last two decades is one of high hopes and expectations for growth in NMP acres that are only partially realized. For example, State tributary strategies in the mid-1990s envisioned that NMPs in the Shenandoah and Potomac River Basin would be about four times the 1994 levels of coverage by the year 2000 (see Table 20). While coverage appears to have doubled since 1994, this still leaves the basin with about 41 percent of the acre-

Basin	1994 Acreage Reportedly Covered by Plans	Acreage Currently Covered by Plans	State's 1996 Tributary Strategy Goal for Year 2000	Percent of Year 2000 Goal Now Covered by Plans
Southern Shenandoah	44,842	106,995	256,776	42
Northern Shenandoah	16,539	20,528	80,236	26
Northern Virginia	19,672	23,698	56,352	42
Lower Potomac	18,908	26,036	35,734	73
Total	99,961	177,257	429,188	41

Source: 1994 acreage is from the August 1995 DEQ, DCR, and CBLAD document *Virginia's Potomac Basin Tributary Nutrient Reduction Strategy*. Acreage currently covered by plans is from JLARC staff analysis of DCR data for 2001-03. The State's acreage goal for the year 2000 is from the December 1996 *Shenandoah and Potomac River Basins Tributary Nutrient Reduction Strategy*.

age covered now that had been envisioned under goals for the year 2000. Some parts of the basin, such as the Northern Shenandoah region, appear to have progressed very little toward the goal identified by the strategy. Also, while increasing the number of plans written, the use of private nutrient management planners to write plans did not lead to the development of as many plans as had been hoped in past tributary strategy documents.

Concerns about equity under the State's current regulatory program also exist. Farmers operating confined animal and poultry feeding operations with whom JLARC staff spoke noted that while they are required to have a nutrient management plan because of the number of animals they confine, another farmer can stay just below the thresholds and use nutrients without any restrictions. Furthermore, some regulated poultry farmers wondered why they should have to adhere to a plan, when someone receiving their litter is free to apply that litter however they choose. There are also equity issues surrounding the use of nutrients on agricultural versus urban acreage. A farm operator in Greene County responded on a JLARC staff survey that "instead of bothering the farmer, the DEQ should bother" golf courses, private homeowners, and lawn care businesses. Finally, the State does not compel its own agencies and institutions to follow nutrient management plans when applying organic or commercial fertilizers, as it does agricultural operators.

The State may reach a point where disappointments with the quantity of acres placed under NMPs under a largely voluntary approach, coupled with various equity issues, lead it to consider further increasing the population of land users who must develop and implement a plan. There are several alternatives that could be used to accomplish this goal. For example, Maryland requires that all farm operations with gross annual income greater than \$2,500 must implement a NMP. Farming operations in Delaware with more than eight animal units (Delaware defines one animal unit as being equal to approximately 1,000 pounds average live body weight) or that are applying nutrients to lands in excess of ten acres as part of a commercial venture must implement a plan, as well. Although EPA uses animal units similar to Virginia as part of its National Pollution Discharge Elimination System to require the adoption of an NMP, Virginia could also choose to lower the animal unit thresholds it already has in order to require more farming operations to implement plans.

If Virginia were to lower its current animal unit thresholds, this change could increase the amount of animal waste managed under NMPs, especially for dairy operations. For example, in one possible scenario, the State could choose to lower the animal units for regulated farms from 300 animal units (200 milk cows) to 150 animal units (100 milk cows). According to the 2002 Census of Agriculture, there are currently 110 farms with 200 or more milk cows in Virginia. These farms represent seven percent of the total farms with milk cows and 23 percent of the total milk cows. Lowering the animal unit to 150 (100 milk cows) in this example would result in the regulation of 409 total dairy farms with approximately 67,000 total milk cows. In this new scenario, 26 percent of the dairy farms, and 58 percent of the milk cows would operate under NMPs. Lowering animal units in Virginia would have less impact on the poultry and swine industries because a larger proportion of these farms (and manure) are already regulated under current laws.

Additional acreage may also be captured under plans if the requirements for NMP implementation were expanded as part of the Chesapeake Bay Preservation Act (Bay Act). Currently under the Bay Act, nutrient management plans are only required to be implemented if agricultural activity extends into the 100-foot buffer portion of the resource protection area (RPA). The amount of acreage required to be managed under a plan could be increased if plan implementation was mandated for any agricultural activity within each locality's entire Chesapeake Bay Preservation Area (an area encompassing the RPA and contiguous lands that also have the potential to degrade water quality, known as Resource Management Areas) and not just the 100-foot buffer. While these land designations present incremental opportunities to increase the number of acres under a NMP, properly enforcing plan implementation under the Bay Act may be difficult. The Bay Act is established as a State-local partnership and as such, enforcement of the Act's agricultural components is a local function. New statutory or regulatory language would probably need to be developed that is not part of the Bay Act to accomplish such a goal.

Another option would be to require farms that obtain litter from confined poultry feeding operations to have a nutrient management plan. As discussed in Chapter III, approximately 411,000 tons of litter is annually transferred off of farms that have an approved NMP in Virginia. JLARC staff were told that the decision not to require NMPs on receiving farms was a compromise between the poultry industry and the State during the development of the Poultry Waste Management Act. It was agreed at the time that doing so would likely create a disincentive for farmers to take the litter. However, the poultry waste transfer requirements of Maryland's and Delaware's nutrient management programs require the end user to have a NMP in place, and these are considered successful programs.

Requiring more farming operations to implement plans would likely require increases in the number of positions at DCR to handle the increase in plan writing requests, and the number of positions at DEQ to handle the increased numbers of inspections. For example, if Virginia adopted Maryland's approach of requiring plans on all operations earning more than \$2,500 annually, data mentioned by the Virginia Agricultural Statistics Service reflect that the number of regulated facilities would increase from 1,080 to more than 29,100. Decisions on how many facilities would be required to obtain plans obviously affects the number of additional staff and funding that would be required.

Making Changes to the Current DEQ Inspection Process

This review identified several instances in which enforcement of the State's nutrient management requirements was not or could not be effectively carried out. Ideally, State inspectors would be at each operation to verify the amount of nutrients being used when a field application occurs. However, this would be impractical given the number of permitted farming operations, the number of State inspectors, and several other factors. JLARC staff did identify some alternative actions that may help to improve the enforcement of the nutrient management program during the course of this review. The remaining part of this section is dedicated to identifying those options.

Some improvements to DEQ's current inspection process were identified earlier in this report. However, during the course of the review, some alternative approaches that would represent a departure from the current approach were suggested to JLARC staff. Additionally, maintaining the status quo approach, but developing a formal enforcement policy for identified deficiencies, such as is done in the Valley regional office, provides another alternative.

The current inspection approach is based on a review of each farm operator's records to identify the amount of nutrients that were land applied. When no records are kept or insufficient information is collected by the farmer, then the inspector cannot determine compliance. Scheduling inspections to coincide with actual farming applications, or shortly thereafter, might help DEQ to address that issue. The inspections would allow DEQ staff to better verify the actual application rates.

Pursuing this alternative inspection approach would have to be done in a way that reflected the importance of the farmer's need to get crops planted and fertilized. Therefore, a scaled-back inspection focused just on application rates should be considered. Soil and waste analyses could be collected later as part of the annual inspection or provided by the farmer or plan writer to DEQ staff. Instead of inspecting all farm operations in this manner, DEQ could randomly select a proportion of operations. Staffing workloads could be considered as a factor when determining the number of facilities to inspect in this manner.

DEQ could also develop a strategy to address highly critical areas when the department or regional offices are faced with resource issues that would otherwise prevent them from meeting the annual inspection requirement in State law. As this report has illustrated, inspections have gone undone in some regional offices as a result of staffing issues. While the department should complete all required inspections, there are instances in which that may be difficult. The department should be prepared for events when they arise.

During extraordinary circumstances, the department should consider a plan for using statewide resources to focus on watersheds of particular concern that also have high levels of agricultural activity. These types of locations might be watersheds or areas that have already been identified as having a high potential for nutrient loss, such as the Shenandoah Valley region. Alternatively, the focus could also encompass agricultural and non-agricultural activities near rivers and streams that are required to have Total Maximum Daily Load limits, for example. DEQ has already staffed its CAFO program to reflect the varying levels of farming operations in the State. By having inspections focused on those facilities that are located within critical areas, the department may be able to ensure that at least these important sites are inspected annually. The annual inspection requirement could be amended to allow DEQ to inspect those facilities not identified as being located in critical areas over a longer time period or as part of a random selection process.

**OPTION THREE:
ENCOURAGE MORE VOLUNTARY NMPs,
IN PART BY SETTING REALISTIC ACREAGE GOALS**

Beginning with discussion papers released in 1993, the State has undergone several iterations of tributary strategy planning for Virginia's tributary rivers to the Chesapeake Bay. Greatest State attention over the years has gone to the Potomac Basin, with the Shenandoah and Potomac Rivers. However, tributary strategy documents have also been developed relating to the James River, the Rappahannock River, the York River, and the Eastern Shore. The strategy documents consider various means for achieving nutrient and sediment reduction goals for the tributary rivers and the Chesapeake Bay. The State has worked in cooperation with the Chesapeake Bay Program and that program's Chesapeake Bay Watershed Model (CBWM) in assessing various best management practices (BMPs) that might be implemented, the nutrient reduction efficiencies of those BMPs, and the amount of nutrient reductions that might be attained by increasing the use of BMPs.

Nutrient management planning for agricultural land is one of the BMPs that has played a major part in tributary strategy planning. The voluntary development and implementation of nutrient management plans has been a key ingredient in the State's strategy documents over time. Nutrient management plans are considered one of the most cost-effective ways of achieving nutrient reductions. For example, a 1995 Virginia tributary strategy document compared the cost per pound of nitrogen and phosphorus reduced among 15 different BMPs, and found that nutrient management plans had the lowest cost per unit of reduction for both nutrients.

Some of the assumptions about BMP implementation – including assumptions about NMPs – that have been used in the CBWM and in various State tributary strategy planning documents have been questioned as overly optimistic. Questions have arisen partly based on the nature of some of the assumptions made, fertilizer sales and manure generation trend data that have not been consistent with model and strategy assumptions, and even water quality measurement results that have suggested less progress in achieving nutrient reductions than has been suggested by the model and the strategies. Exhibit 5 shows some of the concerns that were raised in a 1997 JLARC report on Virginia's progress toward Chesapeake Bay nutrient reduction goals, as well as similar concerns raised in a recent white paper by the Bay Program's scientific and technical advisory committee.

Several issues surrounding the number of NMPs that should be credited in assessing the impact of nutrient management planning for agriculture can be seen in Virginia's recent tributary strategy work. Issues include: (1) the assumptions and accuracy of the data that are used for determining the number of acres under NMPs that are currently credited by the CBWM for Virginia (and other states), (2) a lack of recognition of potentially countervailing factors that may offset some of the reductions in fertilizer or manure use that might otherwise result from NMPs, (3) the extent to which calculations are adjusted to take into account the interaction of

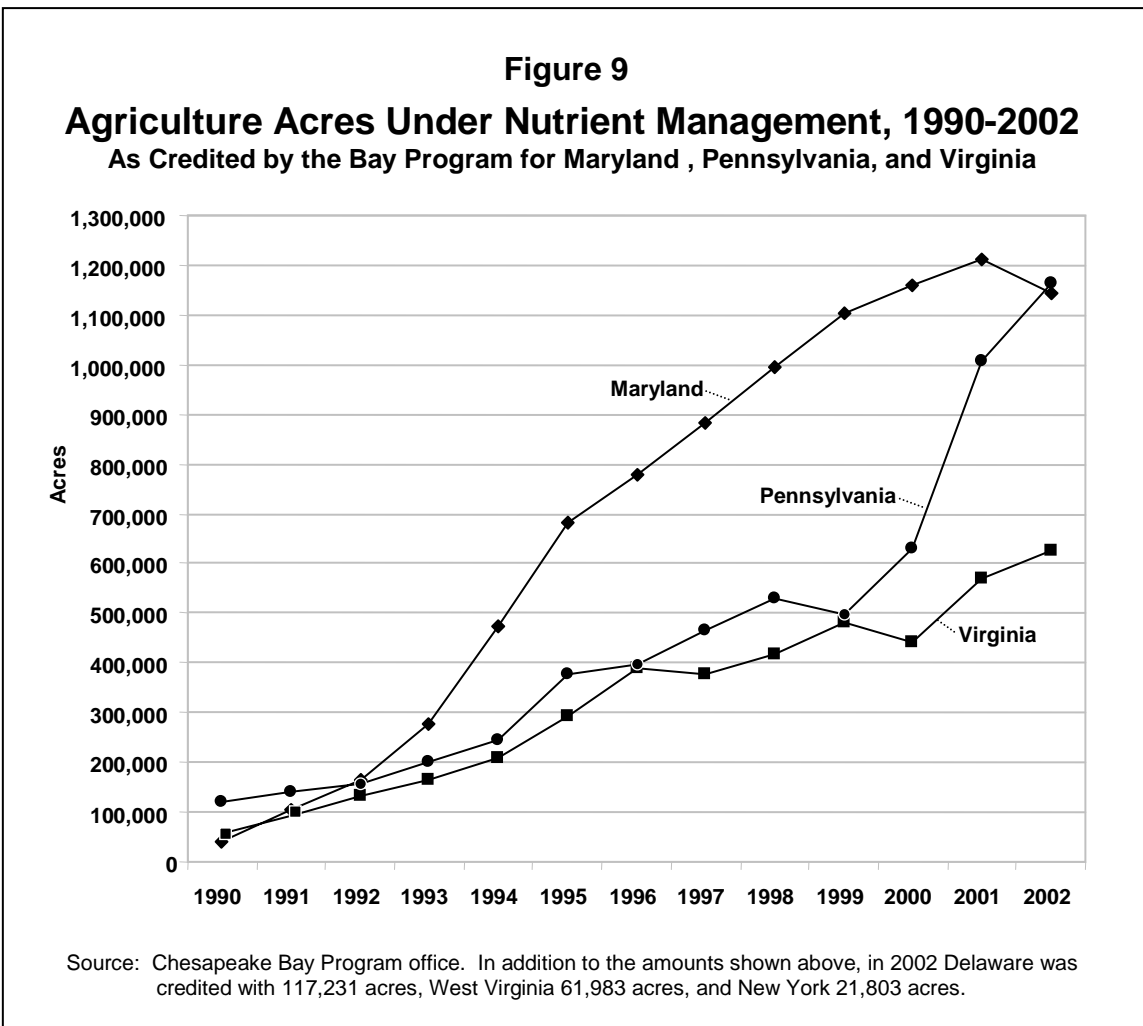
Exhibit 5		
1997 JLARC Report and 2004 Bay Program Committee Comments on Bay Model BMP Assumptions		
Issue	JLARC's February 1997 report on <i>Virginia's Progress Toward Chesapeake Bay Nutrient Reduction Goals</i>	Chesapeake Bay Program STAC (Scientific & Technical Advisory Com- mittee) White Paper, February 2004
Improvements Across Entire Watershed Are Often Less Than Can Be Seen in Individual Small-Scale Projects	"In general, it appears that studies to assess the success of nonpoint pollution control efforts have found, especially on a micro-level, that implementation of specific nonpoint source best management practices (BMPs) have helped to improve water quality. However, on a larger-scale, such as a county or watershed, the impacts of nonpoint source best management practice programs have been variable, and it appears that results are characterized as small or moderate."	"The efficiencies of practices newly implemented on a research plot scale are likely to be much higher than those implemented on a watershed scale. As a result, it is difficult to extrapolate plot scale results directly to field scale practice efficiency... It is apparent that more long-term research on a range of watershed scales is needed to more realistically estimate actual reductions... There are substantial data indicating that BMP efficiencies are highly site specific and can vary widely under different agricultural and physiographic conditions."
Additive Use of BMP Reductions on Same Farms Can Overstate Reductions	"In the calculation of reductions by DCR, the BMPs are assumed to have an additive effect... The calculations should take into account the interactive effects between best management practices, such as in agriculture."	"There is concern that the double-counting of certain practices may be occurring if cases of multiple activity on the same acreage or animal operation occur..."
Use of Planned BMP Use Without Regard to Actual Implementation Is Problematic	"... assuming complete implementation of written plans appears to be overly optimistic... it is questionable to rely on reduction estimates for a voluntary strategy that are based on an assumption of no 'shirking' in the implementation of BMP controls."	"Reported progress is usually based on plans written or structures designed, not on actual implementation. There is much concern that this results in the substantial overestimation of implementation."
Maintenance of BMP Activity Over Time	"There are many areas of uncertainty that surround any projections of accomplishments for the future... These areas of uncertainty at this time include... land-user response to participating in the effort and following-through over the long-term with nutrient abatement actions."	"Further, all practices are assumed to be implemented and maintained as prescribed and to function at design efficiency over time and in all types of storm events."
Potential Need for More Objectivity and More CBP Involvement with the Assumptions Used by the States	<p>"... over time, best management practices have been added, and assumed reduction percentages have changed to some extent, and State actors invested in achieving the reduction goal have had a major role in these changes."</p> <p>"It is not clear the extent to which the interactive and cumulative impact of these BMP determinations, as they are getting applied by states in tributary strategies, has received or will receive skeptical scrutiny from those who have no professional or organizational stake in the achievement of the reduction goal... "</p>	<p>"The CBP accepts state-reported implementation rates without question except when implementation in a model segment exceeds available acres."</p> <p>"Recommendation 4. Evaluate state reporting and tracking approaches; implement a third party review of state progress reporting."</p> <p>"Recommendation 5. Revise reported progress based on surveys of implementation rates quality of implementation."</p>
Overly Optimistic Assumptions May Be Leading to an Overestimation of Nutrient Reductions	<p>"For the nonpoint source components, there are a number of instances in which questionable or overly optimistic assumptions are built into the reductions calculated by the strategy..."</p> <p>"... the strategy utilizes some questionable assumptions that lead to the calculation of greater nutrient reductions than are likely to be achieved."</p>	"It is apparent that BMP efficiencies and implementation assumptions result in the overestimation of nutrient reduction progress. The extent is likely substantial but difficult to quantify."

key assumptions within the strategy itself, and (4) the extent to which the count of future plans are dependent upon strong increases in plan implementation on a voluntary basis.

Number of Nutrient Management Plans Credited by the Bay Program May Be Too High

The Chesapeake Bay Program indicates that between 1985 and 2002, 3.1 million acres of cropland in the Bay watershed have been placed under nutrient management plans. “This acreage,” the Bay Program indicates, “represents the cropland and hayland on which nutrient management has been implemented.” Figure 9 shows the increase over time in the acreage under NMPs that is credited by the Bay Program for Maryland, Pennsylvania, and Virginia.

Virginia is currently credited with having about 624,000 acres under NMPs in its portion of the Chesapeake Bay watershed. The total, however, is basically a



cumulative count of the plans that have been written. The problem with this is that the plans are not written to be effective in perpetuity. The number of plans that can be considered currently effective is basically a function of the life expectancy of the plans as written, combined with the extent of nutrient management plan writing activity that is on-going in the state.

Table 21 shows some alternative estimates of the number of NMPs that might be credited in the Chesapeake Bay watershed to Virginia. The level of activity in writing new and revised plans over FY 2001, 2002, and 2003 would only be sufficient to sustain about 374,000 acres in the Virginia portion of the watershed, if all plans have a three-year life as recommended by DCR and excluding pasture NMPs (as is done in the Bay model), or 438,000 acres if pasture NMPs are counted. Only under an assumption of a five-year life expectancy for all plans not required by CAFO regulations, and with pasture NMPs credited, can the State sustain a count of NMPs at or above the acres credited by the Bay Program. Another concern is that NMP activity declined from 2001 to 2002 to 2003, so that the amount of acreage that could be sustained at 2003 activity levels is about three-fourths of the overall average activity level.

Table 21		
Count of NMPs in Virginia's Chesapeake Bay Watershed Using Differing Assumptions		
Assumptions About Plan Life Expectancy	Average Activity Level, 2001 - 2003, Excluding Pasture Acre NMPs (124,799 per year)	Average Activity Level, 2001 - 2003, Including Pasture Acres (146,114 per year)
	The Bay Program does not count pasture NMP acreage, because these NMPs do not achieve the types of NMP efficiencies that are covered in the model.	
Three-year cycle, all plans (Counting approach recommended by DCR staff)	374,397	438,342
Three-year cycle, required plans Four-year cycle, other plans	457,845	543,105
Three-year cycle, required plans Five-year cycle, other plans	541,293	647,868

Source: JLARC staff analysis of DCR data on acres of NMP coverage.

Assumption that Written Plans Will Be Implemented, Without Adequate Recognition of Countervailing Factors that May Increase Nutrient Use

The historical baseline against which nutrient reduction progress by Bay states has been measured is 1985. The CBWM, and Virginia tributary strategies, have sought to estimate nutrient reductions in terms of the reductions that might be achieved from 1985 nutrient levels through the implementation of BMPs like nutrient management plans.

A 1997 JLARC report on Virginia's progress toward Chesapeake Bay nutrient reduction goals noted that one of the expectations of nutrient management planning is that, all other factors being equal, a reduction in the application of nutrients is expected. However, the report also noted that data maintained by the Department of Agriculture and Consumer Services indicated a disconcerting increase in the pounds of nitrogen and phosphorus nutrients in fertilizer purchases in Virginia at the same time that more and more NMPs and other nonpoint source best management practices were being credited under the Bay Model and tributary strategies. A table in that report contrasted the sharp reductions in nutrients that were expected under nonpoint source BMP implementation in each of four regions of the Potomac Basin with the fact that overall nitrogen in fertilizer purchases was up about 20 percent in the basin, and phosphorus in fertilizer purchases was only down six percent in the basin.

Data in the first chapter of this report showed that there has not been a strong downward trend statewide in the pounds of commercial fertilizer nitrogen and phosphorus that have been sold over the years during which the number of credited written NMPs rose rapidly. This finding does not suggest that the written NMPs are not effective per se. What it does suggest, however, is that there may be some countervailing factors that induced some greater fertilizer use, at least compared to 1985 levels, despite the presence of NMPs. However, the Bay Model and the tributary strategies have almost exclusively focused on identifying and counting land use actions that reduce the amount of nutrients applied. One of the countervailing factors could be less than 100 percent implementation of the plans that are written.

In Some River Segments, the Farm Acreage to Be Covered by NMPs Under the Strategy in 2010 Exceeds the Strategy's Available Acreage

One of the methods that Virginia's proposed tributary strategy uses to reduce nutrients by 2010 is the conversion of certain farm acres to other uses. As a consequence, however, the total amount of farm acreage in some river segments goes down substantially from current acreage.

Nonetheless, the tributary strategy calculations appear to assume nutrient reductions by 2010 that will come from the implementation of NMPs on farmland that will no longer exist as farmland. Table 22 shows some of the river segments where the strategy calculates more acres of NMPs than acres of cropland and hayland that will be available.

Table 22

Examples of River Segments with Unrealistic NMP Acreage Figures in Virginia's Current Tributary Strategy Plans for 2010

<u>County</u>	<u>River Segment</u>	<u>Acres Under NMP in Strategy by 2010</u>	<u>Total Crop and Hay Acres in 2010</u>	<u>Difference</u>	<u>NMP Acres as Percent of Crop and Hay Acres</u>
Westmoreland	980	21,536	19,033	2,506	113 %
Rockbridge	270	21,323	19,069	2,255	112 %
Northumberland	980	10,835	9,588	1,247	113 %
Botetourt	270	11,211	10,198	1,014	110 %

Note: River Segment is a Chesapeake Bay Program reference to a specific section of a river and the designated land area associated with that section of the river in the Chesapeake Bay model.
Source: JLARC staff analysis of DCR tributary strategy data.

Virginia Tributary Strategies Indicate a Level of Increase in Agriculture NMP Coverage on a Voluntary Basis That May Be Unrealistic

Table 23 provides summary data on the following for Virginia tributary rivers or portions thereof: the acreage covered by newly written or revised agriculture NMPs during the last three years, the number of acres currently credited with NMPs by the Bay Program, the number of acres that are planned for coverage in

Table 23

Agriculture NMP Acres Under Tributary Strategies in 2010 Compared to Current Acreage and Acres "Eligible" for Coverage in 2010

<u>Tributary</u>	<u>NMP Acres, Last Three Years</u>	<u>Current NMP Acres Credited</u>	<u>NMP Acres in Strategy, 2010</u>	<u>Percent Coverage in 2010</u>
Middle Potomac	19,767	79,643	105,165	94.5 %
Lower Potomac	18,566	39,561	38,834	110.0
Shenandoah	124,546	166,812	204,158	88.5
Rappahannock	102,503	143,799	191,307	81.5
York	84,704	75,908	150,157	71.8
Upper James	12,814	4,275	60,855	110.6
Middle James	41,134	69,606	184,210	82.7
Lower James	6,782	11,351	33,849	49.5
Eastern Shore	27,526	33,457	51,470	78.7
All Tributaries	438,342	624,412	1,020,005	82.7

Source: JLARC staff analysis of DCR data.

2010 under the latest version of the Virginia tributary strategies, and the percentage of eligible acreage that will therefore be covered by NMPs in 2010. Overall, 2010 NMP acreage will need to be more than double the number of acres that are covered by NMPs written or revised during the last three years, and will need to increase by 63 percent over the acreage currently credited by the Bay Program.

The strategy does not appear to contemplate that the added plans will come about due to regulatory requirements. Rather, the planned increases need to stem from major increases in voluntary plan acreage. Some of the issues surrounding voluntary implementation therefore are important to the success of the strategy.

The tributary strategy nutrient reduction goals for 2010 are very challenging. If there is a desire to pursue these goals, then non-agricultural land is a source of nutrient pollution for which the existing Nutrient Management Program could be expanded to reduce the impact of nutrients on State waters.

Tributary Strategies' Goals for Urban Nutrient Management Seem Unrealistic

The State's efforts to improve the water quality of the Chesapeake Bay, as documented in the tributary strategies, now include a substantial commitment for the use of urban nutrient management practices. For example, the revised strategies apply nutrient management to a much larger percentage of urban acres than in previous strategies. The revised strategies may, however, require a greater level of nutrient reduction in urban areas than can be achieved by relying on Virginia's current policy of voluntary agreements with lawn care professionals and homeowner educational programs. Despite existing programs to address nutrient management in non-farm settings, the State may not reach existing water quality goals without expanding current efforts.

In March of 2001, the *Draft Interim Nutrient Cap Strategy for the Shenandoah and Potomac River Basins* noted that achieving and maintaining additional reductions would require Virginia to shift its emphasis for reductions to areas other than agriculture, such as managing stormwater runoff and implementing nutrient management on urban lands. According to the draft strategies, urban nutrient management involves the reduction of fertilizer to turf grass areas including home lawns, businesses, and public lands such as municipal parks, playing fields, and schools. Urban nutrient management can be applied to lands designated as "pervious" or "mixed open" acres. Pervious land includes lawns and other vegetated areas not covered by concrete or pavement. Areas designated as pervious acres may include some impervious structures. For example, suburban developments are often designated as pervious areas, whereas downtown areas are considered impervious. Mixed open areas include parks, athletic fields, office parks, and golf courses. A key assumption with mixed open acres is that these areas may be designated for different land uses.

As part of the provisional tributary strategies, nutrient management is applied to 90 to 95 percent of pervious urban acres in the Chesapeake Bay Water-

shed and a similar percentage of mixed open acres. This represents a substantial increase from previous strategies. For example, the 1996 Tributary Strategy for the Shenandoah and Potomac River Basins applied nutrient management to 10-13 percent of urban acres. Considering DCR's estimate that urban nutrient management plans currently cover only four percent, or 40,341 out of 1,077,229 pervious urban and mixed open acres in the State, the tributary strategies' goal of applying urban nutrient management to 95 percent of urban acres seems unlikely.

DCR staff told JLARC staff that the 95 percent goal was the result of a calculation of the acres of land available for a variety of BMPs (including nutrient management planning) that would need to be covered by the BMPs to meet the State's nutrient reduction goals. DCR staff also told JLARC staff that 95 percent may represent an unrealistic goal because not all designated land is actually available for the best management practice. For example, some of the pervious acres designated for urban nutrient management may be vacant lands or lands vegetated with natural landscapes. In these areas, nutrient management planning would be impractical and would not result in any desirable changes. Furthermore, even in those designated areas where nutrient management could be possible, such as lawns receiving commercial fertilizer, it is unlikely that enough homeowners would be willing to participate in order to address 95 percent of the Commonwealth's urban acreage.

Recommendation (16). The Secretary of Natural Resources and the Department of Conservation and Recreation should review the acreage assumptions for agriculture nutrient management plans from which nutrient management planning reductions are anticipated by 2010. The Secretary's Office and DCR should ensure that the nutrient reductions anticipated by the strategy: (1) are based on reasonable assumptions about the life expectancy of plans and the level of plan writing activity that can be conducted by DCR staff and other certified nutrient planners, (2) are calculated using NMP acreage figures that are reasonable relative to the total crop and hay acres eligible for coverage by 2010, and (3) take into account slippage based on more realistic assumptions (as is planned by the Chesapeake Bay Program) regarding the proportion of written plans that can be expected to be fully implemented.

Increased State Financial Assistance for Nutrient Management

Greater State financial assistance is another alternative for increasing the amount of acreage administered by a nutrient management plan. This assistance could take several forms:

- (1) increased funding and/or resources specifically for plan development, or
- (2) funding a litter transport program that paid higher rates than were available during the pilot program, or

- (3) increasing the State's investment in exploring alternative uses, or
- (4) targeting Virginia's urban areas with a media campaign to raise awareness about the potential for nutrient loss from over-application of commercial fertilizers, or
- (5) introducing programs that insure farmers against lower than expected crop yields for applying no more nutrients than the crop can use.

The Commonwealth has primarily used two methods for funding plan development, (1) making monies available through the Agricultural BMP Cost-share program, and (2) directly paying certified nutrient management planners to write NMPs. Since FY 2000, new plans have been written for almost 32,000 acres using \$93,000 in Cost-share funding. Between 1998 and 2000, DCR contracted directly with certified specialists for plan development. Using this approach, new plans were written for almost 39,000 acres of cropland and hayland. Furthermore, new and revised plans were written for more than 105,000 acres of cropland, hayland, and pastureland at a cost of more than \$525,000 as part of this approach.

The State could increase the rate at which it reimburses farmers for developing nutrient management plans. Currently, farmers are reimbursed up to 75 percent of the cost associated with developing a NMP. In Maryland, where nutrient management planning is required for all farms grossing more than \$2,500, the reimbursement rate is 87.5 percent of the cost of a nutrient management plan developed by a private consultant. Maryland funded more than 330 cost-share applications in 2002 and another 500 in 2003 covering a total of more than 315,000 acres. Furthermore, the maximum State payment is higher for the development of new plans versus that for revised plans. DCR staff have stated that this difference reflects the Chesapeake Bay Program's decision to only account for newly planned acres in the Bay Model. Nonetheless, DCR has acknowledged the importance of revised plans by recommending that plans should be written using a three year cycle for cropland and five years for hayland. Reducing the incentive for revised acreage appears to unduly discount that importance.

However, the Chesapeake Bay Program recently criticized the use of BMP cost-share programs for the "generally generic plans without sufficient implementation and maintenance incentives." Additionally, CBP noted that funding is not directed to critical areas most in need of water quality improvement. Therefore, future cost-share funding in Virginia could be administered in such a way to address these concerns.

In addition to more funding, the State could also increase the number of positions at DCR that would be available to write plans. Farm operators often prefer plans written by DCR staff because the plans are free. As a result, some DCR regional staff currently face a backlog of requests for developing new or revising old NMPs. It is likely that this backlog will increase with the introduction of phosphorus-based planning. In addition, DEQ inspectors told JLARC staff that if a facility with an expired plan is identified during an inspection, but the farm operator indicates that he or she is waiting on the plan writer (including DCR staff) to update the

plan, DEQ staff will not cite the operation for having an expired plan. Increasing the amount of positions capable of writing plans would alleviate some of this backlog. Furthermore, having additional staff to write plans for free would serve as a financial incentive to farmers to have plans developed.

In addition, the State could provide greater amounts of funding for a poultry litter transport program and alternative uses. The State could also seek the financial support of the five poultry processors in Virginia to expand this pool of potential funding. As discussed earlier, an assessment of the poultry litter transport programs in Maryland, Delaware, and Virginia appears to suggest that farmers will be more willing to accept litter in return for a higher cost-share amount. In FY 2004, Maryland put \$250,000 towards their transport program and Delaware provided \$246,000. DCR staff stated that the department offered another \$25,000 available in 2004, but that amount was not matched by the industry.

State assistance with the costs of developing alternative uses might also be beneficial. For example, the use of phytase in poultry feeds, which the State helped to fund, has reduced the phosphorus content in poultry litter by as much as 30 percent. Also, Delaware contributed \$3 million for construction assistance and transportation subsidies to the Perdue AgricRecycle plant, which appears to be effectively reducing the amount of poultry litter in the region. As other states face similar waste disposal issues, opportunities may exist for states to coordinate their research activities.

In North Carolina, the Animal and Poultry Waste Management Center was created at North Carolina State University to support research, demonstration, and educational efforts related to environmental impacts of animal production agriculture. This center strives to build research-based partnerships among 12 states, including Virginia, as well as agribusiness companies, environmental groups, and pork and poultry associations. State, federal, and industry grants support the center and its infrastructure, a waste processing facility with laboratory and classroom. In 2000, two major hog producers agreed to allocate \$17.3 million with the state to develop and evaluate “environmentally superior technologies” for animal waste management. Additional collaborative efforts among states and the industry may lead to creative solutions to the animal waste problem.

Increased State funding for public service announcements targeting urban areas about the appropriate use of nutrients and fertilizers may also result in reduced nutrient applications. Virginia’s tributary strategies recognize the need to reduce nutrient losses in urban areas as an important component of the State’s attempt to reach the Bay Agreement’s 2010 goals. DCR plans to begin targeting homeowners in Northern Virginia localities using a combined media campaign beginning in the spring of 2005. Matching these efforts in other parts of the State where sales of commercial fertilizer are high would also appear to make sense.

In addition to the techniques described above, there may be other opportunities for the State and agricultural community to address the issue of excess nutrients. NMP crop insurance may offer one solution for farmers who fear that following NMPs may result in costly yield losses. Currently there is a Nutrient BMP En-

dorsement pilot insurance program available to corn farmers in Pennsylvania, Iowa, and Wisconsin. As part of the program, farmers apply the recommended rates of nitrogen and phosphorus to the insured acreage while applying their usual amounts of fertilizer on test strips. If the farmers believe the yield is lower on the fields with nutrient management, they can request an adjustment. If the difference between the fields and test strips is greater than the deductible, the farmers are paid an indemnity. This type of insurance could reduce the risk that some farmers associate with following their NMP recommendations, resulting in potentially higher implementation and compliance rates.

A similar type of program, called Yield Reserve, has been proposed in Maryland. This program offers financial incentives to farmers for reducing fertilizer applications below recommended rates for field crops such as corn. According to a policy group chaired by the Chesapeake Bay Commission, the program is based on the understanding that crops are relatively inefficient nutrient users at high yield levels, so substantial reductions in nutrient applications result in limited to no reductions in yield. In addition, according to researchers from the Chesapeake Bay Program, current recommended application rates include an insurance level of 35 percent more than what crops actually need. In the yield reserve program suggested in Maryland, the farmer would reduce nitrogen application rates by 15 percent. An incentive would then be used to cover the risk of yield loss.

Make the Current Nutrient Management Process Simpler and More Flexible to Encourage Greater Participation

Throughout the course of this review, JLARC staff heard numerous times that the plans were too complicated for farmers to understand and too restrictive on how a farm operator could respond to changing conditions, such as the weather or crop prices. Restrictions such as being required to submit modifications to the plan to DCR for approval prevent some farmers from developing and implementing plans, according to some of the people contacted as part of this review.

It has also been suggested that allowing planners to make plan modifications in the face of changing conditions, without needing to contact DCR, would make it more likely that the plan would be implemented and followed. This approach appears to have some merit. This change would probably resonate with farmers and their concerns about plan flexibility. A respondent to the JLARC staff survey of certified nutrient management specialists stated:

In most cases [farmers] want to do what is correct. They do not have time to wait for someone in Richmond to make a decision on making a change in their plan, so in most cases [farmers] just make the adjustment themselves and do not follow the plan.

If the timeliness of the modification approval process is causing farmers to reject their plan entirely, then allowing the plan writer to make modifications without prior approval from DCR may lead to greater implementation and compliance.

This approach does not intend to suggest that DCR should give up its oversight of plan modifications. In fact, if such a change were to be adopted, plan writers should be required to provide DCR with the modifications within a short time frame. Furthermore, DCR should still review those modifications for consistency with the regulations. Changes that are found to violate the intent of the regulations could be handled by DCR through the authority given to the department in the Training and Certification regulations to take action against certified planners or in coordination with DEQ regional inspectors as potential issues for enforcement action.

Reducing the complexity of the plans was also suggested as a way to improve implementation, because in some cases the farm operator may not understand what is being recommended in the plan. A DEQ inspector stated that a farm typically needs: maps, application summaries, balance sheets, and special conditions [the elements required by law]. This suggests that the other information such as the manure summary sheet, the soil test summary and waste analysis do not need to be included in the farmer's copy of the NMP.

Appendixes

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Appendix A
Study Mandate

2004 SESSION

HOUSE JOINT RESOLUTION NO. 72

Directing the Joint Legislative Audit and Review Commission to study the effectiveness of the implementation, performance, and enforcement of Virginia's Nutrient Management Plans. Report.

Agreed to by the House of Delegates, February 17, 2004
Agreed to by the Senate, March 9, 2004

WHEREAS, the Virginia Department of Conservation and Recreation (DCR) first began the use of Nutrient Management Plans (NMPs) in 1989; and

WHEREAS, the goal of NMPs is to address nonpoint source pollution, and specifically to encourage efficient use of nutrient sources utilized for agricultural and urban purposes in order to protect and improve Virginia's water quality, through the use of best management practices; and

WHEREAS, 4,318 stream miles in Virginia are "impaired" under the Clean Water Act, and such impairment is due primarily to nonpoint source pollution, and the Chesapeake Bay watershed has been on the Clean Water Act's list of impaired waters since 1999; and

WHEREAS, Virginia and other Bay states signed the Chesapeake 2000 Agreement, and agreed to remove the Chesapeake Bay from the list of impaired waters by 2010; and

WHEREAS, in December 2003, Virginia endorsed a goal of removing 28 million pounds of nitrogen and 3.6 million pounds of phosphorous annually; and

WHEREAS, NMPs are being implemented and used effectively by some landowners in Virginia, as evidenced by the practices of those Virginia farmers who have been the recipients of the annual "Basin Grand Winner" awards under DCR's Clean Water Farm/Bay Friendly Farm Award Program; and

WHEREAS, more widespread implementation of NMPs may help Virginia succeed in reducing the amounts of nutrients entering its waters, including those within the Bay watershed; and

WHEREAS, NMPs are currently required under several Virginia statutes and regulations, including the Chesapeake Bay Preservation Act, the State Water Control Law's provisions for combined animal feeding operations, and the poultry waste management law; and

WHEREAS, the Joint Legislative Audit and Review Commission has experience in reviewing nonpoint source pollution issues, in studies such as the Costs of Expanding Coastal Zone Management in Virginia (1995), Virginia's Progress Toward Chesapeake Bay Nutrient Reduction Goals (1997), Review of the Department of Conservation and Recreation (1998), and Implementation of the Chesapeake Bay Preservation Act (2003); now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Joint Legislative Audit and Review Commission be directed to study the effectiveness of the implementation, performance, and enforcement of Virginia's Nutrient Management Plans.

In conducting its study, the Commission shall include among other things an evaluation of (i) the current level of participation, compliance and enforcement of the NMP program; (ii) the adequacy of the requirements for the collection, recordation, and compilation of data on animal waste disposal and transfer, and shall include in this review the perspective of farmers and farming organizations on these issues; (iii) the use and implementation of NMPs by state agencies on state projects and state lands; (iv) the use of and need for nutrient management practices and related educational efforts in urban and rural environments; and (v) as applicable, examples of the effective use of NMPs in Virginia and other states. The Commission shall also make recommendations concerning improvements to nonpoint source pollution that comply with the nutrient management program.

Technical assistance shall be provided to the Commission by the Department of Environmental Quality and the Department of Conservation and Recreation, including making available all records and information necessary for the completion of the study by the Commission. All agencies of the Commonwealth shall provide assistance to the Commission for this study, upon request.

The Joint Legislative Audit and Review Commission shall complete its meetings by November 30, 2004, and the Director of the Commission shall submit to the Division of Legislative Automated Systems an executive summary of its findings and recommendations no later than the first day of the 2005 Regular Session of the General Assembly. The executive summary shall state whether the Commission intends to submit to the General Assembly and the Governor a report of its findings and recommendations for publication as a document. The executive summary and report shall be submitted as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents and reports and shall be posted on the General Assembly's website.

Appendix B

Poultry Waste Tracking and Accounting Sheet

VPG Permit No. _____

This sheet, or a copy of the grower's poultry waste transfer record sheet, may be used to track poultry waste transfers. DEQ has an obligation to compile and make available to the public "the amount of poultry waste transferred in Virginia, the nutrient content of the waste, and the geographic distribution of the transferred waste", as published in the *Virginia Register, Volume 17, Issue 3*.

Date	Tons	Litter Analysis (N-P-K)	Locality Where Waste Will Be Used (town or city and zip code)	Nearest Waterbody To Litter Application Area

Appendix C

Poultry Transfer Activities in Four DEQ Regions

	Litter Transferred					
	Tons of Litter	% of Tons Moved Within Region	% of Tons Moved Outside Region	Tons Moved Out-of-State	Tons Moved Without Enough Information	Tons Moved to Broker
Piedmont – Total (n = 8)	812	96%	4%	0	0	0
FY 2001	N/A	N/A	N/A	0	N/A	N/A
FY 2002	617	100	0	0	0	0
FY 2003	130	77	23	0	0	0
FY 2004	65	100	0	0	0	0
Valley – Total (n = 101)	48,963	68	5	393	3,271	10,005
FY 2001	6,402	79	3	51	0	1,130
FY 2002	18,412	66	6	198	1,193	3,995
FY 2003	20,752	66	5	144	2,064	3,782
FY 2004	3,397	61	6	0	14	1,098
South Central – Total (n = 16)	5,967	81	19	0	60	0
FY 2001	585	89	11	0	0	0
FY 2002	3,349	69	31	0	0	0
FY 2003	1,716	100	0	0	0	0
FY 2004	317	81	0	0	60	0
Tidewater – Total (n = 13)	3,463	96	1	0	133	0
FY 2001	868	100	0	0	0	0
FY 2002	2,108	94	1	0	115	0
FY 2003	330	95	0	0	18	0
FY 2004	157	100	0	0	0	0
TOTAL	59,205			393	3,464	10,005

Note: Analysis was conducted using information contained in 227 DEQ inspection reports reviewed by JLARC staff.

Source: JLARC staff analysis of DEQ poultry facility inspection files.

Appendix D

Report Glossary

Agricultural Best Management Practices Cost-Share Program (Cost-Share Program): reimburses farm managers for funds expended to implement certain best management practices, including the development and writing of nutrient management plans.

Agricultural land: land used for crop, hay, pasture, silviculture, or livestock production.

Application rates: the quantity of major nutrients, nitrogen, phosphorus, and potassium that is placed upon the land on a per acre basis in order to supply crop or plant nutrient needs, and to achieve realistic expected crop yields.

Best management practices (BMP): a conservation or pollution control practice that manages soil, nutrient losses, or other potential pollutant sources to minimize pollution of water resources, such as the use of cover crops to trap available nitrogen and reduce soil erosion.

CAFO: See definition below for “Confined animal feeding operations.”

Chesapeake Bay Preservation Act (Bay Act): The Bay Act is codified in Sections 10.1-2100 to 10.1-2116 of the *Code of Virginia*. The act is administered in 84 of Virginia’s eastern-most localities, and it seeks to ensure sound local land use and development in environmentally sensitive areas.

Chesapeake Bay Program (CBP): Regional partnership between Maryland, Pennsylvania, Virginia, the District of Columbia, the Chesapeake Bay Commission, and EPA that strives to restore the Chesapeake Bay.

Chesapeake Bay Watershed: region that drains into North America’s largest estuary, the Chesapeake Bay. About half of the Bay’s water volume comes from the Atlantic Ocean, while the other half drains from the streams and rivers of Delaware, the District of Columbia, Maryland, New York, Pennsylvania, Virginia, and West Virginia.

Chesapeake Bay Watershed Model (CBWM): seeks to estimate nutrient reductions in terms of the reductions that might be achieved from 1985 nutrient levels through the implementation of BMPs like nutrient management plans.

Confined animal feeding operations (CAFO): means a lot or facility together with any associated treatment works, where both of the following conditions are met:

1. Animals have been, are, or will be stabled or confined and fed or maintained for a total of forty-five days or more in any twelve-month period; and
2. Crops, vegetation, forage growth or post-harvest residues are not sustained over any portion of the operation of the lot or facility.

Confined poultry feeding operation: any confined animal feeding operation with 200 or more animal units of poultry. This equates to 20,000 chickens or 11,000 turkeys.

Environmental Quality Incentives Program (EQIP): offers financial and technical assistance to participants to install or implement best management practices and structures on agricultural land. Administered by USDA's National Resource Conservation Service.

EPA: Environmental Protection Agency.

Feedlot: a confined area for the controlled feeding of animals. Feedlots tend to concentrate large amounts of animal waste that cannot be absorbed by the soil and, hence, may be carried to nearby waterways by runoff.

Integrators: See poultry processor.

Leaching: nutrients in the soil dissolve into ground water and can be carried into local waterways.

MDOA: Maryland Department of Agriculture.

Non-agricultural land: used for non-agricultural activities such as lawns, recreational areas, roadside areas, athletic fields, forestlands (for non-economic purposes), college and university campus grounds, and general turfgrass areas.

Nonpoint source: source of pollution, such as a farm or forest land runoff, urban storm water runoff or mine runoff that is not collected or discharged as a point source.

NRCS: National Resource Conservation Service.

NutMan: a computer decision aid that helps [plan writers] develop nutrient management plans. It automates virtually all of the calculations involved in balancing nutrient production, needs, and use, and it produces several reports for use in farm management, record-keeping, and compliance with nutrient-related regulations.

Nutrient management guidelines: a set of recommendations for the appropriate application of nutrients and soil amendments for both plant

production and water quality protection. Nutrient management guidelines are usually based on site-specific soil and climatic conditions. The guidelines are usually used by organizations to manage the application of nutrients on lawns, recreational areas, roadside areas, athletic fields, forestlands, college and university campus grounds, and other turfgrass areas.

Nutrient management plan (NMP): a site-specific document that identifies how major plant nutrients, such as nitrogen and phosphorus, will be managed for both crop production and water quality protection. Nutrient management plans are typically used by organizations that are engaged in agricultural production, but may also be used on other types of lands where fertilizer is applied.

Nutrient management planning: a method or type of planning that seeks to comprehensively identify the amount, placement, timing, and application of animal wastes, fertilizers, sludge, or residual soil nutrients that is appropriate for a particular piece of land. The planning work that is done leads to the development of a document (plan) that can be followed by a person receiving it who wishes to use or dispose of substances containing nutrients. The purpose of the planning is to minimize nutrient loss potential and environmental risks from the use of the land and these substances, while maintaining the productivity of the land for the land user's intended purposes.

Phytase: an enzyme that improves the ability of chickens and turkeys to utilize phosphorus in feeds that, when used in combination with phosphorus reductions in feed, can result in a decrease in the phosphorus level in their waste.

Poultry litter broker: a person, other than the poultry grower, who possesses more than ten tons of poultry waste in any 365-day period and who transfers some or all of the waste to other persons.

Poultry processor: a business operation that contracts with someone to raise chickens or turkeys. Cargill Turkey, Tyson Foods, George's, Perdue, and Pilgrim's Pride are the five commercial poultry processors currently operating in Virginia. (Also called integrators)

Poultry Waste Management Act (Poultry Act): requires that a copy of DCR's letter approving the nutrient management plan and a copy of the plan itself be included in the registration statement provided to DEQ prior to a confined poultry feeding operation obtaining a General Permit to operate. Under the Poultry Act, farm operators who transfer more than 10 tons of poultry litter to a single person in a 365-day period must report to DEQ the nutrient content of that waste in addition to reporting other information. The Act also requires each commercial poultry processor operating in Virginia to file a plan with the State Water Control Board detail how that processor would assist with certain activities.

RPA: Resource Protection Area.

State-owned land: purchased with public funds by State agencies and institutions for agricultural and non-agricultural purposes. For the purpose of the JLARC survey of State agencies, only land that does not contain permanent fixtures such as buildings, roads, parking lots, or other impervious was included.

State Water Control Board (SWCB): responsible for administering Virginia Water Control Law. The Board adopts regulations and considers special orders resolving violations of its regulations and permits.

SWCDB: Soil and Water Conservation District Board.

Total Maximum Daily Load (TMDL): a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

Tributary strategies: basin wide water quality attainment plans developed to reduce the flow of nitrogen, phosphorus, and sediment into local waters. In this report, the tributary strategies are strategies developed by Virginia and other partners pursuant to the commitments of Chesapeake Bay Agreements.

USDA: United States Department of Agriculture.

Virginia Agronomic Land Utilization Evaluation System (VALUES): a system used to identify soil productivity for all soil types in the Commonwealth. VALUES was designed to provide a predictor of long-term yield potential based on average soil fertility patterns.

Virginia Cooperative Extension (VCE): a cooperative among land grant universities (Virginia Tech and Virginia State University) and local, state, and federal governments to involve the community in the planning, implementing, and evaluating of educational programs focusing on areas including agriculture and natural resources.

VDACS: Virginia Department of Agriculture and Consumer Services.

VDOT: Virginia Department of Transportation.

Voluntary Nutrient Management Training and Certification Program (Training and Certification Program): enacted by the General Assembly in 1994 and requires DCR to establish criteria for the development of nutrient management plans for various agricultural and urban agronomic practices and the certification of persons to develop those plans.

Virginia Pollution Abatement General Permit (VPG Permit): must be obtained to operate a confined animal or poultry feeding operation in Virginia; prior to receiving a permit the facility operator must submit to DCR for approval a nutrient management plan outlining how the facility will address the efficient use

of nutrients. This permit can be issued to confined animal feeding operations with 300 or more animal units utilizing a liquid manure collection and storage system or confined poultry feeding operations with 200 or more animal units of poultry.

Virginia Pollution Abatement Individual Permit: the Department of Environmental Quality may require the owner of a confined animal feeding operation to obtain an individual permit if the operation is in violation of the provisions of the general permit or if coverage under an individual permit is required to comply with federal law.

Water Quality Improvement Fund (WQIF): the purpose of the fund is to provide water quality improvement grants to local governments, soil and water conservation districts, and individuals for point and nonpoint source pollution prevention, reduction, and control programs. A primary objective of WQIF is to fund grants that will reduce the flow of excess nitrogen and phosphorus into the Chesapeake Bay through the implementation of the tributary strategies. WQIF funds are provided, in accordance with the guidelines, to help stimulate nonpoint source pollution reduction through the Virginia Agricultural Best Management Practices Cost-share Program and water quality improvement projects within the regions listed above.

Water Quality Improvement Agreements (WQIA): aims to restore and improve the quality of state waters and to protect them from impairment and destruction for the benefit of current and future citizens of the Commonwealth of Virginia. WQIA are agreements negotiated between lawn care companies and DCR that establish guidelines for fertilizer application rates and timing as the primary method for controlling nutrient usage.

Appendix E

Agency Responses

As a part of the extensive validation process, State agencies and other entities involved in a JLARC assessment effort are given the opportunity to comment on an exposure draft of the report. Appropriate technical corrections resulting from comments provided by these entities have been made in this version of the report.

This appendix contains the written responses of the Department of Conservation and Recreation and the Department of Environmental Quality. Also included is a copy of the remarks made to JLARC by the Secretary of Natural Resources after the staff briefing of this study to the Commission. Any page numbers referenced in the written comments pertain to an earlier draft of the report and may not correspond to the pages of this report.

W. Tayloe Murphy, Jr.
Secretary of Natural
Resources



Joseph H. Maroon
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

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Phone: (804) 786-6124 Fax: (804) 786-6141

November 2, 2004

Philip A. Leone
Director
Joint Legislative Audit and Review Commission
Suite 1100, General Assembly Building
Capitol Square
Richmond, Virginia 23219

Dear Mr. Leone:

The Virginia Department of Conservation and Recreation (DCR) appreciates the opportunity to provide the attached comments on the October 21, 2004 exposure draft of the JLARC *Review of Nutrient Management Planning in Virginia* report. We wish to commend the JLARC staff team on the quality of the report they have prepared and their understanding of this issue. As the report indicates, proper nutrient management planning has been and will continue to be relied upon to make improvements in water quality and the Chesapeake Bay, while at the same time offering economic benefits to those who employ it.

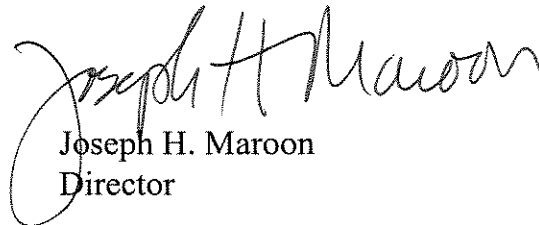
In general, DCR is supportive of the recommendations outlined in the report and will work towards implementing these actions in a timely manner and provided that staff resources are available. Several of the JLARC report recommendations may be addressed in the Department's proposed revisions to the DCR's Nutrient Management Training and Certification Regulations that are currently under review and which are set to be released in draft form in the coming weeks.

The one major weakness in the JLARC report that we noted is the omission of an evaluation of biosolids. While we understand that your staff decided to limit your research scope to other matters, DCR wishes to point out that biosolids represent a significant source of agricultural organic nutrients that is second only to poultry litter.

Philip A. Leone, Director
November 2, 2004
Page 2

DCR wishes to thank you and your staff for the information contained in the report and we look forward to working with you and the Commission in the implementation of the recommendations.

Sincerely,

A handwritten signature in black ink that reads "Joseph H. Maroon". The signature is written in a cursive style with a large, looping initial "J".

Joseph H. Maroon
Director

cc: The Honorable W. Tayloe Murphy, Jr., Secretary of Natural Resources
Mr. Robert G. Burnley, Director, Virginia Department of Environmental Quality

Department of Conservation and Recreation

Comments Relative to the JLARC Report: Review of Nutrient Management Planning in Virginia

Recommendation (1). The Department of Conservation and Recreation should include in its Training and Certification regulations a requirement that all nutrient management plans contain a map indicating the location of waste storage facilities and fields where waste will be applied on the operation for which the plan is written as is required for confined animal and poultry feeding operations by §62.1-44.17:1 (E)(2) and §62.1-44.17:1.1 of the Code of Virginia.

DCR Response: DCR concurs with this recommendation for plans related to the two permit programs listed.

Completion Date: Fall 2005, as part of current regulatory review process.

Recommendation (2). The Department of Conservation and Recreation should amend its Training and Certification regulations to require that nutrient management plans contain a legible and clearly marked map identifying all environmentally sensitive sites and buffer areas on the fields for which the plan is written.

DCR Response: DCR generally concurs with this recommendation. Implementation could increase staff time to develop NMPs and result in some increase in nutrient management planning costs to the agency.

Completion Date: Fall 2005, as part of current regulatory review process.

Recommendation (3). The Department of Conservation and Recreation, in conjunction with the Department of Environmental Quality, should analyze a sample of NMPs, to examine the extent to which the terms of existing NMPs may call for or allow over-applications

of nutrients that could be harmful to water quality. The analysis could be used to determine whether there is a need for greater stringency with regard to allowing adjustments to basic NMP recommendations.

DCR Response: DCR concurs with this recommendation and will work with DEQ in reviewing this practice as stipulated in the draft JLARC report.

Completion Date: To be determined.

Recommendation (4). The Department of Conservation and Recreation should reinstate the component within NutMan that will automatically flag instances in which crop yield values have been manually adjusted upward.

DCR Response: DCR concurs with this recommendation. For plans developed using the NutMan software program, the change should reduce review time needed to evaluate compliance of plans with the requirements of the regulations.

Completion Date: Fall, 2005.

Recommendation (5). The Department of Conservation and Recreation should reconsider the language in the Training and Certification regulations that permits farm operators to make upward adjustments to expected crop yields, and hence increase nutrient application rates, on up to 20 percent of a farm's fields based solely on previous experience. If the Department wishes to continue providing farm operators this opportunity, it should consider limiting undocumented upward adjustments to field productivity in a more restrictive manner, such as limiting changes to a percentage of acreage or requiring that the plan identify the areas and describe the agricultural activities intended to take place there. Moreover, the Department may want to consider requiring farmers to keep field productivity records.

DCR Response: DCR generally concurs with this recommendation. The Department acknowledges that upward adjustments were previously allowed as an accommodation to farm operators. However,

with the advent of very ambitious water quality goals for the Chesapeake Bay and its tributaries by 2010, such accommodations may no longer be prudent.

Completion Date: Fall 2005, as part of the current regulatory review process.

(NOTE: Recommendations 6 –10 do not apply to DCR.)

Recommendation (11). The Department of Environmental Quality, in conjunction with the Department of Conservation and Recreation, should develop a procedure for identifying potential misuse of litter that is transferred and should develop a policy to prevent it. Requiring the name and address of the poultry litter recipient should be considered.

DCR Response: DCR concurs with this recommendation and will work with DEQ to address this recommendation.

Completion Date: To be determined.

(NOTE: Recommendation 12 does not apply to DCR.)

Recommendation (13). The state may wish to consider offering financial incentives to integrators to incorporate phytase in all their feed.

DCR Response: DCR has to date provided about \$1 million in matching grants to the poultry and swine industries for the installation of Phytase injection equipment and other start-up costs for incorporating Phytase in feeds. As noted in the JLARC report, “Virginia was the first state to form a partnership with poultry producers to implement the feeding phytase”. While significant opportunity exists to reduce phosphorus levels in manure using this technology, it is clear as stated in the draft JLARC report that current usage of Phytase varies widely in the industry. While state financial incentives have already been tried, DCR believes that further discussion and engagement is needed with the poultry and swine industries in order to obtain a substantially higher use of Phytase in feed. Given the need to achieve substantial nutrient reductions, DCR believes it is critical that additional reductions be realized to the fullest extent feasible.

Completion Date: To be determined.

Recommendation (14). The Governor should issue an executive order directing State agencies and institutions to develop nutrient management plans for State-owned lands on which nutrients are applied. The Department of Conservation and Recreation should provide assistance upon request of the State's agencies and institutions concerning the proper development and implementation of nutrient management plans.

DCR Response: DCR concurs with this recommendation. A similar Executive Memorandum was issued during the Wilder Administration and provided for an initial round of nutrient management plans on many state-owned lands. Given Governor Warner's emphasis on making state government an example, a new Executive Order would again promote the need for such plans to be written. DCR would also recommend that the Executive Order call for nutrient management plans on state lands to be renewed every three years, similar to private lands. Implementation of this recommendation will require an additional FTE in nutrient management in order for DCR to offer assistance of this kind to other state agencies.

Completion Date: To be determined.

Recommendation (15). The Department of Conservation and Recreation should conduct a review of the time required and costs incurred by plan writers to develop phosphorus-based plans. Through this review, the department should determine whether an increase in the cap amounts for plan development in the Agricultural Best Management Practices Cost-share Program need to be increased, to take into account changes in costs resulting from the development of P-based plans.

DCR Response: DCR concurs with this recommendation and will address this matter as the current regulatory review process proceeds.

Completion Date: July, 2006.

Recommendation (16). The Secretary of Natural Resources and the Department of Conservation and Recreation need to review the acreage assumptions for agriculture nutrient management plans from which the nutrient management planning reductions are anticipated by 2010. The Secretary's Office and DCR need to ensure that the nutrient reductions anticipated by the strategy: (1) are based on reasonable assumptions about the life expectancy of plans and the level of plan writing activity that can be conducted by DCR staff and other certified planners, (2) are calculated using NMP acreage figures that are reasonable relative to the total crop and hay acreage eligible for coverage by 2010, and (3) take into account slippage based on more realistic assumptions (as is planned by the Chesapeake Bay Program) regarding the proportion of written plans that can be expected to be fully implemented.

DCR Response: DCR acknowledges the legitimate concerns identified in the draft JLARC report that led to this recommendation. The Department recognizes that the assumptions and estimates are extremely ambitious and challenging and will require unprecedented levels of participation to achieve the 2010 Chesapeake Bay tributary goals. The development and implementation of the tributary strategies will include ongoing updates based on the latest information available.

Completion Date: Not determined at this time.

Other Significant Issues Identified by DCR in review of the draft JLARC Report:

The omission of an evaluation of the nutrient management planning practices currently utilized for biosolids weakens the JLARC report's review of the statewide nutrient management program. Biosolids, which are regulated under the State Health Department, represent a significant source of organic nutrients applied to agricultural operations that is second only to poultry litter in quantities of nutrients applied and greater than organic nutrients generated by confined hogs, dairy and beef. As such a significant source of nutrients, the JLARC Commission may wish to consider a review of nutrient management planning practices as applied to biosolids in order to complete its evaluation of the Commonwealth's nutrient management planning efforts.



COMMONWEALTH of VIRGINIA

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Robert G. Burnley
Director

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November 2, 2004

Mr. Philip A. Leone
Director
Joint Legislative Audit and Review Commission
Suite 1100, General Assembly Building
Capitol Square
Richmond, Virginia 23219

Re: Department of Environmental Quality Response to Recommendations Included in the JLARC Report: Review of Nutrient Management Planning in Virginia

Dear Phil:

Thank you for the copy of the Exposure Draft of the JLARC Report: Review of Nutrient Management Planning in Virginia. Please find attached our responses to applicable recommendations presented in the report.

We welcome your interest and the recommendations for ways to improve the effectiveness of nutrient management in the Commonwealth. I would, however, like to clarify the Department of Environmental Quality's enforcement policies and their effectiveness at gaining compliance with the regulations and promoting nutrient management in Virginia. The Department's enforcement mission is to take fair and consistent enforcement actions to ensure compliance with Virginia's environmental laws and regulations in a manner that most effectively promotes the health and well being of the Commonwealth's citizens and protects the environment.

Our primary goal is to obtain regulatory compliance. We, of course, have the authority to pursue formal enforcement actions and negotiate cash penalties and exercise that authority whenever appropriate and necessary. DEQ has found, however, that in many instances compliance can be achieved by identifying the problem areas and notifying the regulated entity about what is required. When a facility is not responsive to this approach, when a violation is egregious or when there is an environmental impact from the noncompliance, then more formal enforcement actions are appropriate. This approach has proven to be very effective in achieving compliance in Virginia.

Your report offers sound evidence of the success of the Department's efforts to gain compliance. JLARC's review of "deficiencies" needing corrective action (Table 12, p. 77) indicates that during the most recent inspections, the *worst* compliance rate is associated with not having a current waste analysis, and 91.9% of the facilities reviewed were *in compliance* with this requirement. Regarding more serious violations, such as over-application of nutrients, 95.2% of the facilities reviewed were in compliance. While our goal is 100% compliance, we should all be very proud of this success, particularly considering that the poultry industry has been regulated by this program for only four years.

The Department will be working hard in the coming months to improve the effectiveness of the nutrient management plans written for permitted facilities and our programs to enforce those plans. Please contact me if you have any questions about these programs or, if JLARC staff has questions regarding the implementation of these recommendations, they may contact Neil Zahradka, CAFO Program Coordinator, at 804-698-4102.

Sincerely,

A handwritten signature in black ink that reads "Bob". The signature is written in a cursive, slightly slanted style.

Robert G. Burnley

RGB:dIm



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DEPARTMENT OF ENVIRONMENTAL QUALITY RESPONSES TO JLARC'S EXPOSURE DRAFT: REVIEW OF NUTRIENT MANAGEMENT PLANNING IN VIRGINIA

NOVEMBER 2, 2004

The Department of Environmental Quality is providing responses to each of the individual recommendations that also address combined recommendations found in the report summary.

Recommendation (1). Page 54 (DCR)

Recommendation (2). Page 54 (DCR)

Recommendation (3). Page 61 The Department of Conservation and Recreation, in conjunction with the Department of Environmental Quality, should analyze a sample of NMPs, to examine the extent to which the terms of existing NMPs may call for or allow over-applications of nutrients that could be harmful to water quality. The analysis could be used to determine whether there is a need for greater stringency with regard to allowing adjustments to basic NMP recommendations.

DEQ Response:

The variation in nutrient application allowed in approved nutrient management plans is intended to allow for site-specific variations in nitrogen applications that would not be accounted for in the Virginia Agricultural Land Use Evaluation System (VALUES), upon which nitrogen recommendations in Virginia NMPs are based. Water quality should not be impacted if yield increases are associated with the nitrogen increase, the crop retains the additional nitrogen, or cropping practices such as cover crops are used to reduce nitrogen loss.

VALUES is based upon balancing the economic cost of increasing commercial fertilizer application rates with diminishing yield returns. Applying commercial fertilizer at rates above the VALUES recommendation will result in reduced profit, but may not result in nitrogen being lost to the environment. The farmer is usually the person most familiar with the appropriate amount of nitrogen variation. The Department of Conservation and Recreation is correct, however, in stating that if every farmer used the top end of the recommended range, water quality issues could result, as there are various site specific reasons to increase nitrogen application, and the degree of nitrogen loss will vary.

The Department of Environmental Quality will cooperate with the Department of Conservation and Recreation in the analysis of nutrient recommendations in existing NMPs. The Department of Environmental Quality will provide inspection data associated with the plans and assist in the analysis of threat to water quality.

Completion Date: Not yet determined.

Recommendation (4). Page 61 (DCR)

Recommendation (5). Page 61 (DCR)

Recommendation (6). Page 75 The Department of Environmental Quality should ensure that each region meets the *Code of Virginia's* annual inspection requirements.

DEQ Response:

During the period reviewed, the Department of Environmental Quality did not meet the annual inspection requirements in four of the seven regions due to staffing issues and inspection suspensions related to animal disease outbreaks. The Department is addressing this situation on several fronts.

Both the Valley and Piedmont regional offices are preparing to fill additional full-time inspector positions, which will allow these regions to meet the inspection goals aligned with the current inspection strategy. The remaining regional offices are currently staffed to meet the current inspection goals. A full-time CAFO inspector is not warranted in all regions due to the number of CAFO permits issued in a specific region.

Even if an ideal number of inspectors is employed, some degree of employee turnover is inevitable; thus, future lapses in full-time inspector coverage will occur. The Department has experienced some difficulty in recruiting qualified applicants, which extends the time the positions are vacant. Inspectors are required to have a current nutrient management certification, or be able to obtain that certification. The Department of Conservation and Recreation normally offers the certification exams only once each year, so it may require up to a year to have the new inspector certified. Contingency plans that address these lapses will be developed, to include consideration of inter-region sharing of inspector resources during those periods.

Inspection schedule interruptions due to disease outbreak or suspected outbreak will also impact the Department's ability to conduct inspections. The Department will investigate contingency plans to address this issue. One potential response is to modify the inspection to allow for reduced exposure to inoculants during these events, such as off-site recordkeeping inspections followed by site visits after the disease threat is reduced. Input regarding modified inspection procedures during disease outbreak will be sought from the Virginia Poultry Disease Task Force. This task force has representation from the Virginia Poultry Federation, poultry integrators, U.S. Department of Agriculture, Virginia Department of Agriculture and Consumer Services, the Department of Environmental Quality, and others. Guidance developed for disease events will be included in the CAFO Inspections Manual.

The recently filled Department of Environmental Quality Central Office position of CAFO Program Coordinator will coordinate the development of the annual inspection schedule

and documenting regional inspection activity. Beginning in October 2004 quarterly summary reports will be prepared to document inspection progress. These reports will also be used to provide recommendations related to workloads and schedules.

In order to complete the required number of inspections with existing staff, some CAFOs must be inspected during periods when no land application is occurring. To address that problem, inspection schedules are staggered so that, for example, if a facility receives a winter inspection one year, that facility would receive a spring or summer inspection the next year.

The changes in inspection strategy recommended in the report, such as aligning the timing of inspections with regard to field activities being performed or conducting a seasonal field visit in addition to a recordkeeping inspection, would require additional inspection staff. Also, additional time will be necessary during each inspection to review and ensure compliance of phosphorus based NMPs on all permitted operations beginning in 2006.

Completion Date: Ongoing, with guidance fully implemented by December 31, 2005.

Recommendation (7). Page 89 The Department of Environmental Quality should take stronger enforcement action against facilities with serious or repeated violations.

DEQ Response:

The goal of the Department's compliance and enforcement programs is to bring facilities into compliance. While penalties can play a valuable role in assuring compliance, the Department has found that education and compliance assistance based approaches are the most effective tools to obtain compliance with new regulatory programs. JLARC's review confirms the effectiveness of the Department's approach by citing a decrease in noncompliance at reviewed permitted facilities from 48 percent in one year to 30 percent in the next (page 80).

Due to the nature of the permit requirements, many deficiencies can be detected that do not necessarily result in an immediate threat to water quality. For example, if a manure analysis is not taken in two consecutive years, and no land application has occurred during that time period because adequate storage is available, then the permittee has not complied with the regulation, but there has been no threat to water quality. Collectively, however, such issues may demonstrate an overall tendency towards non-compliance, the severity of which is a subjective determination. In order to reduce the associated subjectivity, the Department will develop additional compliance and enforcement guidelines for CAFOs.

For more serious violations, enforcement activity has accelerated with each inspection cycle of the VPA General Permit for Poultry Waste Management. This trend will continue for future inspections that reveal continued non-compliance. In addition, single

instances of non-compliance discovered at any CAFO that impact water quality have been and continue to be the subject of formal enforcement action, including the assessment of civil penalties.

Based on figures reported in the US Environmental Protection Agency's Sector Indexing Notebook for the Agricultural Livestock Production Industry, the Virginia Department of Environmental Quality's rate of enforcement actions with respect to the number of non-poultry VPA facilities that the Department regulates is three times the national average. That means there are three times as many enforcement actions for these facilities in Virginia than other states on average. The Department acknowledges, however, that improved guidance and more consistent implementation of guidelines will assist staff in determining the appropriate strength of compliance and enforcement actions.

Completion Date: Ongoing, with guidance fully implemented by December 31, 2005.

Recommendation (8). Page 90 The Department of Environmental Quality should develop guidelines for enforcement activity that promote greater consistency across regions.

DEQ Response:

Consistency across regions in all Department of Environmental Quality programs is a very high priority. The Department will take steps to improve consistency between regions and ensure compliance with the laws and regulations. Plans include, but are not limited to the following:

- 1) coordination between enforcement and compliance staff in the development of revisions to compliance and enforcement guidance,
- 2) development of additional guidance that provides standard criteria for when non-compliance issues should be referred for formal enforcement action,
- 3) annual training sessions for inspectors and enforcement staff who work with CAFOs, and
- 4) revision of the Department managers' performance plans to emphasize consistency

Completion Date: Ongoing, with guidance fully implemented by December 31, 2005.

Recommendation (9). Page 111 In accordance with §62.1-44.17:1.1 of the *Code of Virginia*, the Department of Environmental Quality should develop and implement a statewide accounting system for poultry waste that compiles and analyzes the amount of poultry waste transferred in Virginia and the geographic distribution of the transferred waste.

DEQ Response:

The Department of Environmental Quality initiated a procedure on October 5, 2004, by which an electronic record of the poultry waste transfer information will be maintained.

This record will be updated monthly with waste transfer data as it is collected and provided to the Central Office by regional inspectors. These data will be used to illustrate waste transfer pathways in Virginia. The first annual poultry waste transfer report will be prepared after poultry waste brokers submit their reports for the calendar year in February 2005.

The potential to link poultry waste transfer data with a geographic information system to evaluate the spatial distribution will be investigated, and progress towards this goal will be detailed in the annual report for calendar year 2004.

Completion Date: Ongoing, with annual report produced by March 31, 2005.

Recommendation (10). Page 111 The Department of Environmental Quality should monitor the transfer of poultry litter to poultry litter brokers to ensure that they are annually submitting copies of their poultry transfer records required by subsections A and C of section nine of the Virginia Administrative Code 25-630-60.

DEQ Response:

The central poultry waste transfer recordkeeping procedures initiated by the Department on October 5, 2004, will facilitate the identification of poultry waste brokers. The Department will initiate correspondence with the identified brokers to ensure that they are aware of the requirements. This timely communication will increase the brokers' awareness, and facilitate the brokers' ability to provide complete year-end reports.

Those permitted under the VPA Poultry Waste Management General Permit are also being educated during each annual inspection regarding the requirements of poultry waste brokers. A summary document was distributed to the regional inspectors on October 8, 2004, that will be given to permittees during annual inspections. The permittee can provide this information to those to whom waste is transferred. The document defines a "broker" in the context of Virginia law, and lists the associated reporting requirements.

Completion Date: Ongoing.

Recommendation (11). Page 117 The Department of Environmental Quality, in conjunction with the Department of Conservation and Recreation, should develop a procedure for identifying potential misuse of litter that is transferred and should develop a policy to prevent it. Requiring the name and address of the poultry litter recipient should be considered.

DEQ Response:

With the approval of the State Water Control Board on August 31, 2004, the Department of Environmental Quality recently completed amendments to the VPA General Permit Regulation for Poultry Waste Management that reduces the opportunity for litter misuse. Language was added to the regulation stating that poultry waste generated by the permitted facility "shall not be applied to fields owned by or under the operational control of either the poultry grower or a legal entity in which the poultry grower has an ownership interest unless the fields are included in the facility's approved nutrient management plan." This restriction limits the ability of a permittee to transfer litter under the veil of a legal entity and apply the material outside the guidelines of a nutrient management plan.

The Department of Environmental Quality will examine its inspection strategy to identify opportunities that would allow for further identification of litter misuse. There is significant difficulty in documenting environmental impact (and thus grounds for initiating enforcement action) on an operation not subject to permit requirements or otherwise required to keep application records, calibration records, etc., as would a permitted facility. Identification of environmental impact due to litter misuse on such an operation may be limited to impact caused by direct discharges to state waters. Identifying issues on non-permitted facilities, beyond those reported through complaints, would require additional inspectors.

The Department of Environmental Quality will consult with the Department of Conservation and Recreation to develop a policy that addresses poultry waste misuse. It should be noted that any policy developed is limited by the legislative authority granted by the General Assembly. Development of this policy may require future amendments to the Poultry Waste Management regulation.

Completion Date: Ongoing, with completion date of policy not yet determined.

Recommendation (12). Page 117 The State Water Control Board should amend 9 VAC25-630-60 to include a section stating that if a poultry waste broker stores litter from two or more farming operations together, the broker should provide an updated nutrient analysis reflecting the content of the aggregated litter.

DEQ Response:

Through improvements in the process by which poultry waste transfer is documented, the Department of Environmental Quality will be increasing communications with poultry waste brokers. This increased communication will foster education of the brokers, including the importance of providing accurate waste analyses to the end user. The existing regulatory language requires the broker to provide a current waste analysis of the litter transferred, thus if the broker is mixing two litter sources, he should be providing two analyses that could essentially be averaged. The Department of Environmental Quality is of the opinion that this issue can be adequately addressed through education of the brokers. When the regulation is reopened, this issue will be considered for inclusion.

Completion Date: Ongoing.

Recommendation (13). Page 139 The State may wish to consider offering financial incentives to integrators to incorporate phytase in all their feed.

DEQ Response:

The Department of Environmental Quality would support ways to reduce the amount of phosphorus available to affect water quality and believes that the use of phytase is one viable way to achieve that result. DCR cost-share funds to install phytase equipment in certain swine and poultry integrator feed mills were used to offset the capital cost of phytase use. If the cost of phytase use is greater than that of the inorganic phosphorus that would be necessary if phytase were not included, it may be appropriate to offer additional financial incentives to use phytase.

Financial incentives for other means to reduce phosphorus should be considered in addition to phytase. Incentives for research and development of alternative use projects should be considered, as many of the federal grants available for these types of projects are contingent upon proven technology. For many of the potential projects, the technology is not yet proven. In the case of proven technology, such as methane recovery for liquid dairy or swine manure, financial incentives to enable producers to afford the capital costs would also encourage implementation.

Department of Environmental Quality staff have co-chaired a working group with the Virginia Cooperative Extension beginning in 2001 that has focused on exploring alternative uses for poultry litter, including electricity generation or as a heating fuel. Other potential technologies have been examined by this group that includes representatives from the Department of Conservation and Recreation, the Division of Mines, Minerals, and Energy, poultry growers, poultry integrators, rural electric cooperatives, entrepreneurs and private consulting firms. There have been recent developments in starting two pilot scale projects in Virginia utilizing gasification and pyrolysis technologies.

The Department of Environmental Quality is also working with Virginia Tech, Virginia Cooperative Extension, environmental groups, industry organizations and other state agencies in a Waste Solutions Forum to be held in April 2005. This forum's objective is to examine the available technologies and strategy for addressing the challenges posed by excess manure in the Shenandoah Valley.

Completion Date: Ongoing.

Recommendation (14). Page 164 The Governor should issue an executive order directing State agencies and institutions to develop nutrient management plans for State-owned lands on which nutrients are applied. The Department of Conservation and Recreation should provide assistance upon request of the

State's agencies and institutions concerning the proper development and implementation of nutrient management plans.

DEQ Response:

The Department of Environmental Quality concurs that a mandate requiring NMPs for state-owned lands would have a positive impact on water quality as well as provide an example for private landowners to implement NMPs.

Further, the use of organic fertilizers on such lands should be encouraged and incentives provided. There is a tremendous potential market, for instance, to use poultry litter compost in road projects. This use has been hindered in the past due to a procurement process that uses a one-year cost benefit analysis that does not recognize the multi-year cost advantage of a prolonged release organic fertilizer source.

Completion Date: Not applicable.

Recommendation (15). Page 173 (DCR)

Recommendation (16). Page 192 (DCR)



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Secretary of Natural Resources W. Tayloe Murphy, Jr.
REMARKS TO THE JOINT LEGISLATIVE AUDIT AND REVIEW COMMISSION
REGARDING NUTRIENT MANAGEMENT
General Assembly Building
November 8, 2004

Mr. Chairman and members of the Commission,

I first want to thank Delegate Cox for introducing HJR 72 and bringing the issue of nutrient management to the attention of JLARC and the General Assembly. As a former member of JLARC, I know how important its reports are in improving our programs and I thank you, Mr. chairman, and Mr. Leone and his fine staff at JLARC for this excellent report. The control of nutrients from land runoff is a critical element of our ongoing efforts to restore the quality of Virginia's waters, including the Chesapeake Bay. It is also a management practice that can yield economic benefits to those who use it.

While we have made a good deal of progress in advancing nutrient management in Virginia through both incentives and regulation, as the report indicates, more needs to be done.

The bay has perhaps had more monitoring and study than any other estuary in the world, and as a result our water quality experts tell us that we cannot improve conditions in the Chesapeake Bay and its tidal tributaries unless we cap annual nitrogen and phosphorous loadings at 175 million pounds and 12.8 million pounds, respectively. In order to accomplish this objective, we must control nutrient pollution from all sources. While the report before you today specifically addresses nutrients from land, the efforts that will be required go well beyond nutrient management. In short, in order to meet our goals, we must change the ways we protect our waters from runoff which means that we must change the way we farm, the way we develop land, and treat wastewater, use septic tanks, manage stormwater, and control air pollution.

Despite our efforts at nutrient reduction since the signing of the first Chesapeake Bay Agreement in 1983 and the subsequent 1987 agreement, in 1999 the Environmental Protection Agency added the Chesapeake Bay and its tidal tributaries to its list of "impaired waters" because excessive amounts of nitrogen and phosphorous were causing violations of water quality standards.

The placement of the Bay on the EPA impaired waters list occurred contemporaneously with the entry of a consent decree the provisions of which are binding on Virginia. In July 1998, two environmental organizations sued the EPA stating that EPA and the Commonwealth of Virginia had failed to identify Virginia waters that did not meet water quality standards, and had failed to establish TMDLs for the pollutants that had caused the impaired water quality. Similar lawsuits were filed in other states.

In June of 1999 the parties to the suit entered into a court approved consent decree, which gives Virginia the opportunity to develop a number of identified TMDLs by 2010, but requires EPA to establish these TMDLs in 2011 if Virginia fails to meet the schedule contained in the decree.

In light of this decree, in 2000, Virginia and its Bay Program partners reaffirmed their intent to resolve the Bay's water quality problems pursuant to the terms of the Chesapeake 2000 Agreement. The choice of the year 2010 as the completion date in Chesapeake 2000 intentionally coincided with the deadline imposed under the TMDL consent decree. It was anticipated that through the development and implementation of the tributary strategies, the Bay states and the District of Columbia would achieve the nutrient and sediment reductions necessary to meet the Bay's water quality standards, which will then allow the Bay and its tidal tributaries to be removed from the impaired waters list

Although we are now under a legal imperative to improve water quality in the Chesapeake Bay, I believe we also have a moral and economic obligation to restore the Bay simply because it is the right thing to do for ourselves and for future generations of Virginians. Failure to do so would be a catastrophe for the state and the nation.

The tributary strategies we have developed for each of Virginia's river basins --the Potomac, which includes the Shenandoah, the Rappahannock, the York, the James and the smaller creeks and rivers of the Eastern Shore -- propose stringent levels of treatment for wastewater discharges, know as "point sources" and placement of best management practices on land to address "nonpoint" sources, such as runoff of nutrients and sediments from agricultural and urban lands.

Nutrient management is a key practice in all basins in our tributary strategies. In order to achieve our reduction goals, it must be practiced across the spectrum of land uses. I agree with the conclusions in the report that given current resources and programs we will not achieve our ambitious goals. The report affirms what I have been saying for a long time, first as a member of the General Assembly and now as Secretary of Natural Resources. Unless we substantially increase our investment in our water quality programs we will not improve the health of our waters, and we will not remove the Bay and its tidal tributaries from the list of impaired waters.

You have received detailed comments from DCR and DEQ on the recommendations contained in the report, but I would like to take a moment to highlight several issues raised in the report from the perspective of these agencies.

I would first note, as the detailed comments by the agencies indicate, DCR and DEQ have already taken steps to implement a number of these recommendations.

Both agencies are supportive of the recommendations outlined in the report and will work diligently to implement these actions in a timely manner, albeit within the constraints of staff and resources. I would say that several of the report recommendations may be addressed in the proposed revisions to the Department of Conservation and Recreation's Nutrient Management Training and Certification Regulations that are currently under review, and which are scheduled to be released in draft form in the coming weeks.

In our view, the one area we wish had not been omitted from the study is an evaluation of the management of biosolids, formerly known as sewage sludge. While we understand that this was a deliberate decision to make the scope of research manageable, I would point out that biosolids represent a significant source of agricultural organic nutrients that is second only to poultry litter, and we must be sure those nutrients are properly managed. There are significant concerns and issues related to biosolids applications and related nutrient management practices and requirements that have been raised by localities, by biosolids generators, by environmental groups and by the farm community. JLARC may wish to review these issues in the near future.

And now I would like to take a moment to comment on the implementation and enforcement of the CAFO and poultry waste management regulatory programs.

The Department of Environmental Quality's enforcement goal is to obtain compliance with Virginia's environmental laws and regulations, and I believe they have been very effective in accomplishing that goal. Compliance can be achieved through many means, including both educational and punitive steps. DEQ has found that in many instances, compliance can be achieved by identifying the problem areas and explaining to the facility what is required. When a facility is not responsive to this approach, when a violation is egregious, or when there is an environmental impact from the noncompliance, then more formal enforcement actions are called for.

Obviously, our goal is 100% compliance with any program; however, I hope we can put the report's findings in perspective. The report indicates that the most recent inspection files reviewed revealed compliance well above 90%. The worst compliance rate identified in the report is associated with facilities that did not have a current waste analysis, and 91.9% of the facilities reviewed were in compliance with this requirement. Regarding more serious violations, such as over-application of nutrients, 95.2% of the facilities reviewed were in compliance.

I know DEQ is committed to assuring that adequate staffing and guidance are available to improve implementation. The Department is in the process of filling vacancies and working on guidance to be implemented this winter.

In addition, this Secretariat will continue to support incentives for research and development of alternative uses for litter.

Further, I concur with JLARC that a mandate requiring Nutrient Management Plans for state-owned lands would have a positive impact on water quality as well as provide an incentive for private landowners to implement Nutrient Management Plans. Full implementation of this

recommendation will likely require additional staff resources in order for DCR to assist state agencies in achieving and maintaining compliance.

I support the utilization of phytase feed additives to reduce the phosphorus contents of swine and poultry waste and DCR has to date provided about \$1 million dollars in matching grants to the poultry and swine industries for installation of phytase injection equipment for feed production. However, as the report points out, the use of the feed additive is mixed throughout the industry. I support additional mechanisms whether by regulation, or additional incentives, to ensure that the phytase technology is being implemented by the poultry and swine industries to the fullest extent practicable as a cost effective pollution prevention practice.

Finally, the report outlines concerns related to the tracking and enforcement of poultry waste management and appropriate nutrient management planning requirements. I would support improvements in the tracking and management of poultry waste particularly since it is recognized that greater than 70% of this waste is transported off of the farm of origin. I remain concerned that much of this waste is transported without adequate tracking and nutrient management planning creating the potential for significant water quality concerns. This is particularly relevant in the Chesapeake Bay watershed where most of the poultry operations are located, and where the impact of improper utilization of these nutrients is contributing to the impairment of the Bay and where proper management of these nutrients is critical.

It is my sincere hope that this report, along with the ongoing work of our agencies, will bring the issue of nutrient management to the attention of the General Assembly and the public. As I have said, unless we substantially expand the extent to which this, and other practices, appears on the landscape, we will not achieve the level of water quality that our citizens demand.

Thank you again, Mr. Chairman, for the opportunity to speak to you today on this vital matter. I would be happy to answer any questions you have, and in addition, DCR Director Joe Maroon is also here to take questions along with DEQ Deputy Director Rick Weeks.

JLARC Staff

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