INTRODUCTION

The Senate Committee on Agriculture, Conservation and Natural Resources continued legislation (HB 1207) from the 1998 session which would establish a general permit for poultry waste management. In response to a request from Senator Madison Marye, the Department of Environmental Quality agreed to assist the Committee by providing information which should be considered if the regulatory program proposed by HB 1207 or any other regulatory program is adopted and approved by the Governor.

The preliminary question that must be answered is whether Virginia needs to regulate poultry growers or if technical assistance, financial incentives and voluntary initiatives are sufficient to protect Virginia’s waters from the impacts of poultry litter. Some say that the manure generated by large-scale poultry producers poses a significant threat to water quality and enforceable measures are needed to ensure the nutrient rich litter is properly stored and utilized. Others say that poultry growers are responsible stewards of their environment and are implementing the necessary environmental controls voluntarily so imposing a regulatory structure would only increase costs to the Commonwealth and to the farmers with little or no environmental benefit.

The General Assembly may determine that no further regulation is needed. However, if the General Assembly decides that further regulation is needed, then it must decide how to structure such a program. To assist with these deliberations, this document contains background information on the poultry industry, descriptions of approaches that have been taken by other states, and issues that should be considered if the General Assembly decides a regulatory program is needed. The information and issues it contains were developed based upon the discussions surrounding HB 1207, the current general permit for confined animal feeding operations, and comments received from the interested groups.

The Department of Environmental Quality appreciates assistance provided by the Chesapeake Bay Foundation, the Farm Bureau of Virginia, the James River Association, the Virginia Agribusiness Council, the Association of Soil and Water Conservation Districts, the Delmarva Poultry Industries, Inc. and the Virginia Poultry Federation as well as the Departments of Conservation and Recreation and Agriculture and Consumer Services in preparation of this report.
BACKGROUND INFORMATION

**Poultry - Total Statewide Annual Production** (Virginia Agriculture Statistics Bulletin, 1996)

<table>
<thead>
<tr>
<th></th>
<th>1992</th>
<th>1996</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chickens - broilers</td>
<td>238,200,000</td>
<td>259,100,000</td>
<td>+ 9%</td>
</tr>
<tr>
<td>Chickens (layers &amp; pullets)</td>
<td>6,147,000</td>
<td>5,142,200</td>
<td>- 17%</td>
</tr>
<tr>
<td>Turkeys</td>
<td>19,300,000</td>
<td>25,000,000</td>
<td>+ 30%</td>
</tr>
</tbody>
</table>

Although there has been an increase in poultry production in recent years, some have noted that the models of nutrient loadings from agricultural sources indicate a decrease in loading amounts during the same time period. This can be attributed to the voluntary implementation of nutrient management plans and agricultural best management practices.

**Growers** (Estimates provided by the Virginia Poultry Federation)

Number of Farms Raising Poultry (Contract Growers)

- Broilers: 933
- Turkeys: 376
- Total: 1309

Location of Poultry Growing Operations

<table>
<thead>
<tr>
<th>Location</th>
<th>Broilers</th>
<th>Turkeys</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accomack</td>
<td>82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amelia</td>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appomatox</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Augusta</td>
<td>138</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brunswick</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buckingham</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charlotte</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chesterfield</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumberland</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dinwiddie</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goochland</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greene</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greensville</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hanover</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highland</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isle of Wight</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunenburg</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madison</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mecklenburg</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nottoway</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>190</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powhatan</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prince Edward</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rockbridge</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rockingham</td>
<td>567</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shenandoah</td>
<td>74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southampton</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suffolk</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sussex</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warren</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louisa</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- A grower can raise 4-6 cycles or groups of poultry per house in a one year period.
- An average farm has 2 houses.
- Generally, one house house contains 20-25,000 chickens; recent trends are for houses containing 50-60,000 chickens.

**Top Ten River Basins in Virginia Ranked by Average Number of Poultry**
98% of Virginia’s concentrated poultry operations are located in the Chesapeake Bay watershed.

<table>
<thead>
<tr>
<th>Location</th>
<th>Phosphorus (lb/yr)</th>
<th>Nitrogen (lb/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Potomac/ Shenandoah</td>
<td>148,555,960</td>
<td></td>
</tr>
<tr>
<td>Appomattox</td>
<td>35,514,376</td>
<td></td>
</tr>
<tr>
<td>Middle James - Piedmont</td>
<td>15,327,135</td>
<td></td>
</tr>
<tr>
<td>Chowan</td>
<td>2,779,978</td>
<td></td>
</tr>
<tr>
<td>Atlantic Coastal</td>
<td>1,457,000</td>
<td></td>
</tr>
<tr>
<td>Ches. Bay Coastal</td>
<td>1,456,935</td>
<td></td>
</tr>
<tr>
<td>York</td>
<td>1,005,004</td>
<td></td>
</tr>
<tr>
<td>Holston</td>
<td>835,554</td>
<td></td>
</tr>
<tr>
<td>Lower James - Tidal</td>
<td>741,934</td>
<td></td>
</tr>
<tr>
<td>Upper James - Mountains</td>
<td>122,775</td>
<td></td>
</tr>
</tbody>
</table>

**Estimated Nutrients Produced from Animal Waste in Virginia (Confined Operations)**

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Phosphorus (lb/yr)</th>
<th>Nitrogen (lb/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chickens - layers &amp; pullets</td>
<td>1,785,600</td>
<td>4,687,200</td>
</tr>
<tr>
<td>Broilers</td>
<td>8,651,220</td>
<td>36,705,833</td>
</tr>
<tr>
<td>Turkeys</td>
<td>6,161,040</td>
<td>17,844,444</td>
</tr>
<tr>
<td><strong>Poultry Total</strong></td>
<td><strong>16,597,860</strong></td>
<td><strong>59,237,477</strong></td>
</tr>
<tr>
<td>Dairy Cattle</td>
<td>6,284,880</td>
<td>26,460,000</td>
</tr>
<tr>
<td>Swine</td>
<td>2,602,620</td>
<td>7,932,250</td>
</tr>
</tbody>
</table>

Of animals generally kept in pasture, Beef Cattle produce an estimated 42,113,662 lbs/yr of phosphorous and 133,455,000 lbs/yr of nitrogen, Sheep produce an estimated 198,660 lbs/yr of phosphorous and 1,344,000 lbs/yr of nitrogen.

Nitrogen content of the manure may decline by 25-45% if the manure is stored or composted prior to land application. No reductions in Phosphorous would be expected.

If all poultry growers were to use feed containing phytase or similar additives, the available phosphorus content would be reduced by 15-35%.

In the entire Potomac-Shenandoah River Basin, animal manure accounts for approximately 29% of the nitrogen loadings and 45% of the phosphorous loadings. Commercial fertilizer, municipal and industrial wastewater discharges, atmospheric deposition and septic systems account for the remainder. In the Great Valley region (which includes the Shenandoah Valley), animal manure accounts for approximately 50% of the nitrogen and phosphorous inputs.
**Beneficial Use of Poultry Litter**

Poultry Litter is a nutrient rich product used for fertilizer and for cattle feed. There is also some interest in using it as a fuel for steam or power generation.

The Virginia Poultry Federation estimates that in 1997, 50,000 tons of poultry litter were brokered from poultry growers to other users. This estimate is based upon a survey of poultry litter handlers in the Shenandoah Valley. Other transfers occur without the services of an intermediary.

**Estimated Amount of Commercial Fertilizer Sold in Virginia (FY 96-97, VDACS)**

**Note, these are total weights, including filler and additives. These figures cannot be used for a direct comparison of nutrient content.**

<table>
<thead>
<tr>
<th>Type</th>
<th>TOTAL SOLD</th>
<th>FARM</th>
<th>NON-FARM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen based</td>
<td>371,702,000lbs</td>
<td>368,568,000 lbs</td>
<td>3,132,000 lbs</td>
</tr>
<tr>
<td>Phosphorous based</td>
<td>7,080,380 lbs</td>
<td>6,964,280 lbs</td>
<td>115,240 lbs</td>
</tr>
<tr>
<td>Multi-Nutrient</td>
<td>744,616,000 lbs</td>
<td>662,334,000 lbs</td>
<td>82,280,000 lbs</td>
</tr>
</tbody>
</table>

**Nutrient Management Plans** (provided by Dept. of Conservation and Recreation)

- Number of Poultry Growers with NMPs Prepared in Accordance With DCR guidelines: 600
- Number of Poultry Growers with Other Nutrient Management Plans: 250
- Total Number of Growers: 1309

The poultry industry has made a voluntary commitment that all of their contract growers will have nutrient management plans by the year 2000. Three of the four integrators in the Shenandoah Valley have already incorporated this into their contracts. The Department of Conservation and Recreation is working with the growers to ensure all are covered by nutrient management plans prepared by certified nutrient management specialists as soon as feasible.

The Commonwealth does not currently require nutrient management plans or inspect agricultural operations for implementation of the plans once developed, except for confined animal feeding operations covered by a permit from the State Water Control Board.

- Number of Certified Nutrient Management Planners (2/3 private, 1/3 state or local govt): 123

Not all certified nutrient management planners are available to prepare nutrient management plans for poultry growers; they may be employed in fertilizer sales or other related activities or work in areas other than poultry. The Virginia Poultry Federation estimates that there are currently 11 certified nutrient management planners working on nutrient management plans for poultry operations.
**Cost Share Funding for Best Management Practices**

In FY 1998, $6.75 million was available to farmers statewide for the implementation of best management practices; $2.5 million was available in FY 1997. Funding is derived from a combination of federal grants, state general funds and the Water Quality Improvement Fund.

Funding is available for 75% of the costs to purchase or construct BMPs such as litter sheds and calibratable litter spreaders. Farms can use their own labor as “in-kind” match for the funding.

Money is allocated to and distributed by the Soil & Water Conservation Districts.

**Water Quality Impacts**

There is significant evidence that animal waste, including waste from cattle, poultry, pigs and wildlife, contributes to water quality degradation; however, based on the existing evidence, we are not currently able to differentiate between water quality problems caused by poultry litter versus other animal waste streams. Because of the extensive volume of water quality data available, this discussion will focus on the water quality data available in the region with the highest concentration of poultry operations, the Shenandoah Valley. The water quality information discussed below is based upon samples taken through 1996 and 1997 and does not reflect any improvements in water quality which will be realized from implementation of the voluntary measures included in the Commonwealth’s strategy for nutrient reduction in the Shenandoah-Potomac River Basins.

When evaluating the water quality impacts of animal growing operations such as poultry growers, the primary focus is Nitrate-Nitrite Nitrogen (NN) which comes from runoff and leachate from animal waste and commercial fertilizers applied to agricultural fields and leachates from septic drainfields; Nitrogen in organic and ammonium forms (TKN) which can be an indication of contamination by human and animal wastes; Total phosphorus levels (TP) which can be affected by runoff from agricultural fields and animal operations and effluent from sewage treatment facilities that do not have tertiary treatment for phosphorous, and the presence of fecal coliform which indicates contamination by human or animal wastes.

In the Shenandoah-Potomac Basin, the Chesapeake Bay Water Quality Model (1994) estimates that point sources account for 55% of the controllable nitrogen loadings and nonpoint sources account for 45% of the controllable nitrogen loadings; of the nonpoint source portion, 79% can be attributed to agricultural operations (animal and crop). In the Great Valley region (which includes the Shenandoah Valley), animal manure accounts for approximately 50% of the nitrogen and 60% of the phosphorous inputs from nonpoint sources, commercial fertilizer accounts for approximately 35% of the nitrogen and 40% of the phosphorus inputs from nonpoint sources, septic systems account for less than 2% of the nitrogen and phosphorous inputs from nonpoint sources, and atmospheric deposition accounts for approximately 15% of the nitrogen inputs from nonpoint sources. *U.S.G.S., Water Quality in the Potomac River Basin 1992-96, circular 1166.*

Subsurface or ground water discharges into streams and other water bodies represent a
significant share of stream flows. Depending on the topography, soils and geology, the water being discharged directly into a water body may be several years old. Therefore, the surface water quality benefits of some nonpoint source controls may not be realized immediately, particularly in areas of Karst topography such as the Shenandoah Valley.

U.S. EPA has set a maximum contaminant level (MCL) of 10 milligrams per liter (mg/L) for nitrate nitrogen. Drinking water containing nitrate in excess of this concentration may cause health problems in infants and small children. Excessive nitrogen or phosphorus in streams can cause eutrophication, a condition where aquatic plants and algae are overproduced. To control eutrophication, U.S. EPA recommends that a total phosphorus concentration in flowing waters not exceed 0.1 mg/L.

**Special Studies (ground water and surface water)**

In 1992-1996, the U.S.G.S. found that Nitrate concentrations in sampled streams of the Potomac River Basin were generally below the maximum contaminant level, but concentrations were typically highest in tributaries draining agricultural land with carbonate bedrock. Ground water in agricultural areas underlain by carbonate rock, such as the Great Valley region of the Shenandoah Valley, however, is particularly susceptible to nitrate contamination. The U.S.G.S. found that nearly 25% of ground water samples from domestic wells in such areas of the Potomac River Basin contained nitrate in excess of the maximum contaminant level (10 mg/L). *U.S.G.S., Water Quality in the Potomac River Basin 1992-96, circular 1166.*

A study conducted by the University of Virginia indicates a nitrate problem for both surface and ground water in the North River Watershed in Rockingham County. Nitrate levels above the maximum contamination level were recorded in the upper reaches of Muddy Creek and the 10 mg/l nitrate-nitrogen maximum concentration level was violated within five miles of the Town of Bridgewater’s drinking water treatment plant intake during certain low flow conditions. The study determined that the sources of the nitrate-nitrogen were agricultural runoff from row crops, dairy operations and poultry operations and a single point-source discharge; the single point-source does make significant contributions to the overall levels, but has no impact on the exceedences recorded in the upper reaches of Muddy Creek. The report also cites a recent survey by the Shenandoah Valley Soil and Water Conservation District showing that 50-60% of wells surveyed in the area had nitrate levels of 10 mg/l or higher. *Yu et al, Assessment and Transport of Nitrate: North River Watershed in Rockingham County, April 1998.*

**Impaired Waters**

Virginia’s 1998 listing of impaired waters, which is based upon 1996 water quality monitoring data, indicates that of the 2,166 total miles of impaired waterways statewide, 712 miles can be attributed to agricultural (crop and animal) nonpoint sources and 278 miles to runoff from areas of mixed urban and agricultural characteristics; the remainder is attributed to urban runoff (260 miles), mineral extraction (142 miles), combined sewer overflows (71 miles), point sources (33 miles), unknown sources (528 miles), and other sources such as silvicultural activities and abandoned industrial sites (142 miles). In the Shenandoah Valley, 356 miles of streams are impaired due to nonpoint source agricultural (crop and animal) pollution; 107 miles are impaired by urban and/or industrial sources and 21 miles are impaired by a combination of urban and agricultural nonpoint sources. This listing is based upon water quality monitoring data and
comparison of the results to Virginia’s Water Quality Standards. Waterways are listed as impaired when they do not support one or more of EPA’s five designated uses (i.e., aquatic life, fish consumption, shellfish consumption, swimming, and drinking).

The 1996 water quality monitoring data indicates that there are elevated levels of fecal coliform and nitrate nitrogen in the Shenandoah Valley. The major poultry production drainage areas in the Shenandoah Valley are the North River in Augusta County, the North Fork of the Shenandoah in Rockingham County and the South Fork of the Shenandoah in Page County. Water quality monitoring data from these areas indicates that its waterways are impaired because of fecal coliform levels which is attributed to agricultural non-point sources. DEQ and DCR, Virginia 303(D) Total Maximum Daily Load Priority List and Report, DRAFT, June 1998.

The following map compares impaired waterways and Nitrogen produced from animal waste in the Shenandoah Valley. As discussed above, not all of the impairment is necessarily caused by animal waste; nor can it be said that any of the impairment is, or is not, caused by poultry litter. The maps merely show impaired waterways and estimated nutrient loadings from animal manure. The classification of these waterways is based upon 1996 monitoring data.

**Water Quality Trend Analysis**

Recent trend analysis of nutrient levels in the Shenandoah-Potomac River Basin indicate that levels of nitrogen in the surface waters have remained fairly constant over time. Flow-adjusted nutrient concentrations in the Potomac River at Washington, D.C. for 1979-1996 indicate that total phosphorus concentrations have decreased, nitrogen in ammonium and organic forms has decreased slightly, but nitrate concentrations have increased. U.S.G.S., Water Quality in the Potomac River Basin, circular 1166. Analysis of water quality trends in the Shenandoah Valley indicate only slight changes in nutrient levels; a few stations showed an slight increase in recent years, but most have remained fairly constant over the past 20 years. It is important to note, however, that the authors of these reports caution against their use for evaluating site-specific or local water quality other than where the monitoring stations are located. Simple numerical comparisons of increasing and decreasing trends cannot be interpreted as a direct representation of overall change in statewide water quality. The trend analysis may not accurately reflect any short-term water quality trends or changes. Zipper et al, Long-Term Water Quality Trends in Virginia’s Waterways, 1998.

**Nutrient Reduction Strategies**

Virginia has made a commitment, along with other Bay drainage states, to reduce nutrients flowing into the Chesapeake Bay from point and non-point sources by 40%. In 1997, Virginia agreed to work with the other Bay states to evaluate whether this 40% reduction was sufficient to restore and protect water quality. Along with the need to evaluate the sufficiency of the 40% reduction goal, Virginia and the other states are confronted with the issue of how continued growth of population, industry and agriculture in the Chesapeake Bay drainage will impact the maintenance of those levels once the reductions are achieved.

Based upon models of the expected benefits from Best Management Practices (BMP) implemented in the Shenandoah Valley, this area realized an estimated 26% reduction in nitrogen run-off and a 23% reduction in phosphorus run-off between 1985 and 1994. Based on the
Commonwealth’s projections for full implementation of the Shenandoah and Potomac Nutrient Reduction Strategies, there will be a 51% reduction in nitrogen and a 44% reduction in phosphorus (from 1985 levels) from both point and nonpoint sources in the Shenandoah Valley. As part of this voluntary initiative, the Virginia Poultry Federation has committed to having nutrient management plans in place for all growers by the year 2000.

These strategies include the limited use of Phytase. Several of Virginia’s poultry integrators have either committed to or begun installation of injection equipment into feedmills for the addition of Phytase or other enzymes to feed. The Commonwealth has provided matching Water Quality Improvement Act grants to these integrators to decrease the financial impact of this change. The use of this additive allows for more efficient animal use of phosphorus contained in feeds and lowering the available phosphorous from manure. This new source reduction technology may reduce manure phosphorus content by 150-35%. If use of Phytase or other additives were expanded, the reductions in Phosphorous realized could be significantly higher.

These computer generated models are estimates based upon several assumptions, including full implementation of each agricultural best management practice, nutrient management plan and other nutrient reduction initiative contained in the Potomac-Shenandoah nutrient reduction strategy. Water quality data are actual nutrient concentrations within the water.

<table>
<thead>
<tr>
<th>MODELED/ESTIMATED NONPOINT SOURCE NUTRIENT LOADINGS</th>
<th>SHENANDOAH AND POTOMAC TRIBUTARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>% change</td>
</tr>
<tr>
<td>Nitrogen (lbs)</td>
<td>4,966,000</td>
</tr>
<tr>
<td>Phosphorus (lbs)</td>
<td>895,000</td>
</tr>
</tbody>
</table>

PROGRAM ALTERNATIVES

Based upon comments received by the Department of Environmental Quality in preparing this paper, there is a need for increased outreach in order to assist poultry farmers in understanding the water quality implications of their farming practices and what can be done to minimize those impacts. There is also a need to educate communities on the steps growers take to protect the environment. In addition, market-based nutrient trading programs, county and state supported nutrient recycling programs and feed technology innovations should be investigated and employed along with traditional nutrient management planning. While the elements of an environmentally sound litter management program may be easily identified, there are several procedural alternatives for how any such program should be administered. If the decision is made that a regulatory program is needed, the following options should be considered:

**Agricultural Stewardship**

All agricultural operations in Virginia, except those permitted by the State Water Control
Board, are covered by the Agricultural Stewardship Act. The Act is initiated when a complaint is received that a farming activity is causing or will cause surface water pollution through sedimentation, nutrient enrichment, or the delivery of toxins. If investigation by the local Soil and Water Conservation Board or the Department of Agriculture and Consumer Services produces substantial evidence that there is a problem, then the Commissioner of Agriculture and Consumer Services requires the farmer to develop a site specific plan to control water pollution. If the owner fails to implement the plan, the Commissioner must issue an order requiring implementation. Operators who do not implement a plan as ordered may be subject to a penalty of $5,000 per violation per day and the Commissioner may seek an injunction requiring the farmer to correct the problem.

The Act went into effect on April 1, 1997. As of August 1998, 56 complaints have resulted in official investigations, four of which involved poultry litter. Of the four poultry related complaints, three were determined to be unfounded. The other complaint was dismissed because the poultry litter pile which was the subject of the complaint had been removed by the time of the investigation. Typically, the poultry litter complaints involved a pile of poultry litter which the complainant believed was situated too close to a water body or possible pollution from improper land application of litter. The solutions were relatively simple and inexpensive.

This approach requires no additional regulation. It differs from the approaches below in that it is based upon responses to pollution rather than pollution prevention and that it relies upon the ability of local citizens to recognize water pollution problems and local concerns about water quality to ensure effective implementation. Because of the definition of pollution used, the program does not currently not address water quality problems caused by pathogens such as fecal coliform.

Local Ordinances

Under the Chesapeake Bay Preservation Act and related local ordinances, agricultural landowners (including poultry growers) within the Tidewater Area (East of I-95) are required to establish and maintain a 100-foot wide vegetated buffer separating agricultural land from environmentally sensitive features and to obtain a soil and water quality conservation plan addressing erosion, nutrients and pesticides; implementation of the plan is only required if a reduction in the 100-foot buffer is sought. Based upon the information provided by the Virginia Poultry Federation, fewer than 5% of Virginia’s poultry growers are located within the area covered by this Act.

Some localities with intensive animal operations have adopted their own ordinances regarding the location and operation of these facilities. Counties such as Rockingham and Augusta include requirements for litter storage (these counties allow for 60 days open storage before the requirements apply) and application.

As with the Agricultural Stewardship Act, this approach relies upon local responses to concerns about water quality and local expertise in evaluating water quality impacts to ensure effective implementation.

Registration or Notification
Another approach would be to require poultry growers to register with a state agency. The grower would file a form identifying himself and certifying that his operation is in compliance with standard practices for litter management and utilization which could be established through regulation. The agency could ensure compliance by periodically inspecting the facilities. This is similar to the way Virginia and the US EPA regulate hazardous waste generators. This approach was considered and rejected by the 1994 General Assembly when they addressed the issue of confined animal feeding operations.

This approach differs from the general permit program described below in that it relies solely upon the agency’s inspection of ongoing operations to determine compliance; there are no provisions for evaluation by the agency or completion of certain requirements prior to commencing operations.

**Certification**

Virginia could require poultry growers to provide certification that they meet certain standard practices for litter management and utilization. The agency could ensure compliance by periodically inspecting the facilities. As with any of the other options, growers who fail to provide such certification or certified growers who do not operate according to the minimum performance requirements, could be subject to enforcement action.

This approach differs from the general permit described below in that it does not require review or approval from the agency before a grower is covered or eligible to operate.

**General Permit**

As amended by the Senate Committee on Agriculture and Conservation, HB 1207 directs the State Water Control Board to develop a general permit for poultry operations which incorporates nutrient management planning and litter storage.

Currently, DEQ administers a general permit for confined animal feeding operations which utilize liquid manure storage systems; poultry growers generally utilize a dry manure storage system and are not covered by this general permit. Farms covered under a poultry litter general permit could be required to meet standard requirements for litter storage and utilization that would minimize the potential for water quality degradation.

Use of a general permit requires approval by the agency before the facility is covered and able to operate, but the application and review is generally simpler and completed more quickly than with individual permits.

**Individual Permits**

Currently, confined animal feeding operations which fail to comply with the general permit discussed above are required to obtain coverage under an individual permit. An individual permit differs from a general permit in that the application and review process are more extensive and time consuming for an individual permit, but there is also more opportunity to design a permit that accounts for the specific characteristics of a particular operation.
Programs in Other States

Oklahoma has recently enacted legislation governing poultry litter management which incorporates features of a certification and a registration program requiring poultry growers to register with the state and to re-register if operations increase by more than 10%, to operate in accordance with an Animal Waste Management Plan (similar to Virginia’s nutrient management plans), attend training and obtain certification in poultry waste management from the state extension service. Application rates for poultry waste are limited by nitrogen and phosphorous. Operations are required to utilize Best Management Practices and maintain records of poultry wastes applied on their own land or sold or given to others, and provide a waste nutrient analysis to the recipient. Integrators are prohibited from contracting with operators who are not in compliance with those requirements. Only certified poultry waste applicators can land apply poultry waste and they must do so in accordance with agronomic rates. The legislation also established a fund to encourage or assist with the transfer of poultry litter out of designated nutrient-limited watersheds.

Maryland has enacted legislation requiring farms using chemical fertilizer to have a phosphorus and nitrogen based nutrient management plan by 12/31/01 and farms using sludge or animal manure to have a nitrogen based nutrient management plan by 12/31/01 and a phosphorus and nitrogen based nutrient management plan by 7/1/04. The legislation also requires all contract feed for chickens to contain phytase or other phosphorus-reducing enzymes by 12/31/00, establishes a state cost-share program to modify commercial feed mills for the use of feed additives, provides funding for a poultry litter transportation pilot project, and establishes tax incentives for manure spreading equipment. The legislation also provided funding for 110 additional nutrient management planning specialists.

Pennsylvania regulates all concentrated animal operations, including poultry, when the ratio of animal units to land available for waste utilization exceeds a set amount. Such operations are required to obtain and operate in accordance with nutrient management plans. Pennsylvania has proposed a new permit program, based upon the federal NPDES permit program, that would apply to all concentrated animal feeding operations, including poultry. The program requires individual permits for certain livestock operations, including poultry, based on the size and potential pollution impact. An additional $25 million in low interest loans has recently been made available to Pennsylvania farmers for the implementation of best management practices.

Delaware requires agricultural operations, including poultry growers, who are found to be in violation of that state’s Agricultural Stewardship Act to obtain coverage under a general permit which requires compliance with nutrient management plans. Delaware has recently initiated a program to provide low interest loans to poultry growers for litter storage structures, composters, calibratable manure spreaders, and other poultry waste related best management practices. Delaware poultry integrators have agreed to make the loan repayments on behalf of their growers.

Alabama is promulgating new requirements for poultry operations. The program will require all operations to comply with standard litter management practices and will require all operations with more than 125,000 birds to obtain permit coverage.

North Carolina has promulgated a regulation which would require all agricultural operations, including poultry growers, to implement Best Management Practices such as dry litter
storage and land application in accordance with agronomic rates. Operations which meet minimum size requirements (for poultry, it’s 30,000 birds and only if using a liquid manure system) must obtain a permit. Facilities which are not, based upon size or nature of operation, required to obtain permit coverage, can be required to obtain permit coverage if they have an adverse impact on water quality. North Carolina also provides free testing for drinking water wells located near intensive livestock operations.

**Federal Initiatives**

U.S. EPA is considering the regulation of large poultry growing operations (1,000 animal units or 100,000 chickens) under their NPDES permit program. EPA proposes to prioritize all Animal Feeding Operations (including poultry) so that Large Facilities (those with more than 1,000 animal units) will be required to obtain an NPDES permit, Bad Actors (those with unacceptable conditions posing a risk to water quality) will be required to obtain permit coverage, and significant contributors to water quality impairment will be required to obtain permit coverage.

**ELEMENTS OF A POULTRY LITTER MANAGEMENT PROGRAM**

Regardless of what approach is taken, the basic practices for environmentally sound litter management remain the same; the waste should be properly stored and applied in accordance with agronomic rates at times when significant crop uptake will occur so as to minimize leaching into ground water and run-off from storm water. The following sections discuss related issues in further detail.

**LITTER STORAGE**

One of the most basic pollution prevention practices for poultry growing operations is to store poultry litter in ways that reduce or eliminate contact with rainfall in order to prevent discharge of nutrients and other pollutants to surface or ground water. The litter can be kept dry by covering litter piles with waterproof tarps that are anchored against wind or constructing sheds that allow composting as well as storage; placing the piles upon impervious materials such as compacted clay or cement and ensuring the piles are placed so as to not come in contact with surface water or ground water; and grading the ground around the litter pile to prevent storm water from running onto or under the pile. The Virginia Cooperative Extension Service recommends that storage sites be located on high ground with good surface drainage, at least 100 feet from flowing streams or drainage ways, at least four feet above the seasonal high groundwater table, down slope from wells or other sources of drinking water, and that they include a concrete or other impermeable base. *Storing and Handling Broiler and Turkey Litter*, Virginia Cooperative Extension Publication Number 442-054, October 1996.

**LAND APPLICATION**

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Whether Growers And Non-growers Who Utilize The Litter Should Both Be Included

In some cases, the poultry grower will also have cropland on which to utilize the manure generated by the poultry. In others, the grower does not have access to enough land on which to use all of the litter produced on the farm. This excess litter may be sold or given away to others for use on cropland or as a feed supplement. In addition, litter generated outside of Virginia is brought into Virginia for use or disposal. The litter that is not utilized by the grower under his own nutrient management plan still has the potential to cause water quality problems if it is stored improperly or misapplied.

If one takes the position that once the litter leaves the grower's possession it is merely fertilizer and need not be further regulated, then the need for a nutrient management plan would depend on the secondary user’s operation. The grower could provide the secondary user with an analysis of the nutrient content of the litter and leave it up to the user to handle it properly.

If, on the other hand, one believes that poultry litter has a potential to cause a water pollution problem regardless of who has ownership of it, then perhaps everyone who utilizes more than a minimum amount of the litter should operate under a nutrient management plan. Virginia’s concentrated animal feeding operation general permit requires farmers to utilize the waste on his own farm in accordance with a nutrient management plan and to identify any off-site recipients of the manure; all waste generated must be accounted for.

Whether Land Applications Rates Should Be Limited By Phosphorus As Well As Nitrogen

Most people recognize that both nitrogen and phosphorus in poultry litter pose potential pollution problems if improperly stored or applied; they disagree, however, on whether land application should be limited by the litter’s phosphorous content as well as by its nitrogen content. According to the DCR Nutrient Management Training and Certification Regulation, "nitrogen application rates in NMPs must not exceed the crop nutrient needs and phosphorus application rates should be managed to reduce adverse water quality impacts. Whenever possible, phosphorus applications from organic nutrient sources [such as poultry litter] should not exceed crop needs, based on a soil test, over the duration of the crop rotation. If this is not possible, preference should be given to routing phosphorus in organic nutrient sources to fields having the lowest phosphorus soil analysis...".

Common practice is to evaluate the nutrient application in terms of both nitrogen and phosphorus, but it is typically the nitrogen content that limits the application rate. If one were to let the most stringent requirement control the application rate, then in many cases it would be phosphorus. If phosphorus content were used as the limiting factor in determining litter application rates to cropland, then each ton of litter would have to be spread over roughly twice the acreage that is needed when nitrogen is the determining nutrient. This has obvious implications for farmers who have a limited land base on which to apply their litter.

Excess phosphorus is bound to soil particles in the top layer of the field and is subject to moving into surface waters when soil particles erode during rain storms. There is a maximum capacity for phosphorus in the soil which varies based on the type of soil. Once that capacity is reached the excess phosphorus could be dissolved in runoff and leave the field more rapidly than when it was bound to the soils. Some feel that after years of nitrogen-based nutrient application rates, many fields in Virginia are approaching this phosphorus saturation point.
Recent studies conducted by Virginia Polytechnic and State University have concluded that 65% of the corn fields and 60% of the alfalfa fields in Rockingham County require no further Phosphorous. Analysis of 3,766 Rockingham County soil tests from 3 fertilizer dealers and the Virginia Tech Soil Testing Laboratory for 1993 and 1994 show that 89 percent of all samples rated either “very high” or “high” in phosphorous. J. Pease, *Economic and Environmental Impacts of Nutrient Loss Reductions on Dairy and Dairy/Poultry Farms*, Virginia Cooperative Extension Publication 448-231/REAP R033, 1998.

A great deal of research is being done to develop methods for determining when a field has reached its phosphorus capacity. A soil phosphorus index has been proposed by the US National Resources Conservation Service (NRCS) and one is being developed by Virginia Tech for use in Virginia. Ongoing research into the use of enzymes such as Phytase and additives like alum shows promise for controlling either the available phosphorus content of the litter or the phosphorus holding capacity of soils. Most people involved in this issue urge caution in moving immediately to a phosphorus-based application rate until these studies are completed. They disagree, however, about the current state of the art and the anticipated time frame for a switch from nitrogen-based application rates to those driven by phosphorus. One approach would be to phase in implementation of phosphorus-based application rates in NMPs beginning in areas where surface water or soil data indicate high phosphorus levels.

A 1998 study by Virginia Polytechnic and State University indicates that limiting application of litter by Nitrogen content would reduce potential Nitrogen losses through runoff or leachate by 18-50 percent, reduce potential Phosphorous losses by 3-15%, and, based upon the current market value of litter, actually increase net income by as much as 5%. The study also indicates that limiting application by Phosphorous content would reduce potential nitrogen losses by 21-56%, reduce potential phosphorus losses by 28-43% and decrease net income by 11-23%. J. Pease, *Economic and Environmental Impacts of Nutrient Loss Reductions on Dairy and Dairy/Poultry Farms*, Virginia Cooperative Extension Publication 448-231/REAP R033, 1998.

**GENERAL ISSUES**

**What Size Of Operation Should Be Addressed**

The current confined animal feeding operation general permit regulates operations that have at least 300 animal units. According to the Virginia Pollution Abatement Permit Regulation, 9 VAC 25-32-10 et seq., 300 animal units equals 30,000 chickens (layers or broilers) or 16,500 turkeys.

When a grower grows chickens on a commercial scale, he typically does so in houses that contain 20,000 to 25,000 birds each. The 300 animal unit (30,000 chicken) cut-off contained in the Concentrated Animal Feeding Operation General Permit would exclude growers with only one house. If all concentrated poultry growers are to be covered by a program, then a lower number of animal units should be chosen; 200 animal units equals 20,000 chickens. Either option would exclude farms that grow poultry for personal or local consumption. In addition, if the program is to include those entities such as litter brokers and secondary litter users other than the grower, then some criterion other than the number of animals must be included.

Consideration should also be given as to how farms raising more than one animal type and
utilizing both wet and dry manure storage systems would be regulated (ie. operations may raise both dairy cattle and poultry). If a minimum animal unit count is utilized, should it be calculated separately for different types of litter storage systems or should the total be aggregated in order to compare the total nutrient production to land available for application?

To What Extent Should Litter and Nutrients Be Tracked

The nutrient management plans that are developed according to the DCR guidelines strive to assure that animal waste is utilized in a manner that prevents excess nutrients from entering state waters. These plans essentially establish a "nutrient budget" for the animal feeding operation and the farms to which it distributes its animal waste which identifies the land available for application and how much waste can be utilized in accordance with agronomic rates developed based upon soil and crop type. Growers are required to track their waste production, application and distribution. Under Virginia’s regulation for Confined animal feeding operations, owners are required to list any off-site recipients of the manure and track the amount used on-site and sent to each of the listed recipients. An important distinction to make between wet and dry manure is that it is unlikely the wet manure would be transported a great distance for utilization; dry litter is significantly easier to transport.

If the litter is distributed from the grower to another person who uses or markets the litter it will be more difficult to track. Assuming that some minimum threshold level would be established below which no tracking would be needed, those who handle volumes of litter above the threshold could be required to maintain a system for tracking the litter after it leaves the grower which identified the volumes of waste handled and its disposition. Secondary users could be required to track litter through a nutrient management plan or by maintaining records of the volume of litter received and how it is used. If the system is set up based on the premise that poultry litter is nothing more than fertilizer or feed and should be handled the same as other fertilizers and feeds, then litter use by secondary users would not be tracked once it left the grower.

Some have expressed concerns that litter tracking or budgeting beyond what is already included in nutrient management plans would unduly burden growers without improving environmental protection.

Whether and How to Allocate Responsibility for Excess Litter Between Integrators And Growers

When a poultry grower produces birds under contract to a processing plant, the question arises of how much responsibility the processing plant bears for the litter that is produced at the growing operation. There are a number of possibilities to address this issue. Some argue that the integrator has no responsibility for management of litter since it is produced on the grower's farm. The integrators own the birds and provide the feed to the grower, but the contract between them and the grower does not assign ownership of the waste material generated by the growing process. Bringing integrators into the litter management process could add a dimension to their contracts that many growers don't want. Growers may prefer to establish their contracts strictly on the basis of the quality of the product they produce for the integrator and leave the issue of litter management out of the contract. Litter is a commodity which can be sold and growers have
expressed some concern over maintaining control over this. In the Shenandoah Valley there is an established network of litter brokers who buy and sell the material.

If legislation mandates some responsibility for litter management on the part of the integrator, the degree to which the integrator should be involved is uncertain. Because the integrator provides the feed to the grower, the integrator could be required to amend the feed with additives, such as the enzyme Phytase, that are designed to reduce the pollution potential of the litter. Use of Phytase in feed is currently being partially paid for by state funds. While there is still some research to be completed on the costs and benefits of additives like Phytase, this concept appears promising. Some have proposed getting the integrators involved in transporting any excess litter to nutrient poor areas that could benefit from the additional fertilizer.

**Statewide Applicability vs. Chesapeake Bay Drainage Applicability**

While 98% of Virginia’s poultry growing operations is currently located within the Chesapeake Bay watershed, there are operations outside of the Bay watershed. If the regulation of poultry waste is restricted to the Bay area, it could result in a competitive advantage for those outside the Bay watershed. Because the pollution potential from poultry operations is the same regardless of which drainage basin they are located in, most say that any regulatory program should be applied statewide.

**How to Consider Buffer Zones and Environmentally Sensitive Areas**

The purpose of establishing buffer zones is to separate the regulated activity from areas that are especially vulnerable to degradation. The primary objective in setting buffer zones should be protection of human health and the environment. Nutrient Management Plans developed in accordance with state standards account for topography, soil types and other characteristics. The current animal feeding operation general permit sets minimum setbacks for land application of animal waste from occupied dwellings, water supply wells or springs, surface water courses, rock outcroppings and sinkholes. The setbacks for structures associated with the growing operation, such as poultry houses and litter sheds, are dictated by local zoning ordinances rather than the general permit. Concerns have also been raised regarding the consideration of the unique geological character found in the region where poultry growers are concentrated.

**Other Best Management Practices**

There are practices other than nutrient management planning and proper litter storage that could be considered for poultry growing operations.

**Composting** Composting poultry litter helps stabilize and reduce the nitrogen levels, reduce the volume of litter and control pathogenic organisms.

**Additives** With the increasing enthusiasm for the use of chemical additives such as Phytase and alum, questions arise about the secondary effects of these additives on the environment. Before these additives are used industry-wide, there may be more research needed on the long-term effects of their presence in the litter.

**Litter Management in the Houses** Proper management of litter in the poultry houses can reduce the need to remove litter between flocks and can aid in developing a clean out schedule that allows direct application of manure to cropland without intermediate storage. These practices are
largely dictated by integrator schedules and may vary between companies and regions.

**Method of Application** The machinery that is used to apply the litter to cropland must be properly calibrated to assure the proper application rate. Some consideration could be given to determining the best method of spreading.

**How to Verify Compliance**

Many of the elements addressed in this document are recommended by DCR for proper nutrient management, but there are no requirements for implementation or mechanism for verification of compliance. Any regulatory program must be designed so that it is enforceable. This means that the regulated party must know what his responsibilities are and the process must provide for information to be gathered or provided to the regulating agency to verify compliance. The regulating agency must have the authority to examine this information and to take action against regulated persons who fail to comply. The following are some specific methods which may be utilized to document and evaluate compliance:

**Waste and Soil Analysis** If a regulatory program is adopted which requires operation under a nutrient management plan, it will be necessary to verify that farms are following the NMP recommendations. Because litter application rates in the NMP are dependent upon the nutrient content of the litter and of the soil to which it is applied, some nutrient monitoring of litter and soil would seem to be warranted. The current confined animal feeding operations general permit and DCR’s model poultry nutrient management plan recommend soil samples for manure application fields at least once every three years and annual manure samples. In addition, the farmer must maintain records of the location and rate of waste application to cropland as well as the type of crop to which it was applied. Nutrient management plans for larger animal feeding operations require annual soil testing and semiannual waste analyses. This information is used to adjust the application schedule and application rate for maximum benefit to the crop and minimal loss of nutrients to surface or ground water.

**Ground Water Monitoring** While ground water monitoring does not directly relate to the decisions about nutrient management for maximum crop yield, it can be useful for evaluating the effect of an operation on the environment. Migration of nutrients to ground water, primarily nitrogen, can occur in the vicinity of manure storage areas and at land application sites if not properly designed and managed. This is particularly important in areas with carbonate rocks such as the Great Valley area of the Shenandoah Valley. The current animal feeding general permit requires ground water monitoring at certain manure storage lagoons once every three years, but does not require any monitoring of application sites.

It is important to recognize some fundamental differences between the liquid manure systems at dairies and hog growing operations and the dry litter system used by most poultry growers. Liquid manure is typically stored in an earthen lagoon that may be excavated to a depth near or into the seasonal high water table. By its nature and proximity to the ground water, liquid manure storage areas are more likely to contribute nutrients to the ground water than poultry litter which is virtually dry and is stored on top of the ground. When it is properly protected from contact with storm water and surface drainage, stored poultry litter should have a low potential to leach nutrients to the ground water or to contribute to high surface water nutrient levels.

**Inspections** In almost any type of regulatory program the regulating agency will have
personnel who either review information submitted by the regulated person or who visit the regulated activity to inspect records maintained by the facility to verify compliance first hand. For example, if poultry growers were required to operate in accordance with a nutrient management plan, these inspectors could review the grower’s compliance with the nutrient management plan by inspecting the facility and by examining the grower's records to verify that he has done the monitoring included in the NMP and kept the necessary information on crop rotation and litter application rates. Growers who are not following the requirements of the program should be given an opportunity to come into compliance and, if they continue to operate outside the requirements should be subject to some enforcement action. This basic approach is embodied in the guidelines for implementation of the Agriculture Stewardship Act as well as in the process used by DEQ to enforce its permits for animal feeding operations.

Enforcement

The State Water Control Law currently allows $25,000 per day per violation and allows judicial penalties only for violation of permits or certificates issued by the Board. The Confined Animal Feeding Operation General Permit legislation provides for maximum penalties of $2,500 per day per violation. If a permit option is selected, but the provisions are not incorporated in the current animal feeding operation general permit legislation, the penalty amount will be $25,000 per day per violation unless special provisions are made.

Public Notice

With a growing public awareness of large contract animal feeding operations, this is a controversial issue. Some feel that local zoning ordinances give the public enough protection from unwanted activities. The law that mandates the current animal feeding operation general permit was recently amended to require that persons desiring to locate a new operation must notify owners of property adjacent to the land on which the operation would be located and provides for a 30 day public comment period. For individual permits issued by the Board, the agency notifies riparian property owners of any proposed new or modified discharge. If a regulatory program for poultry litter is not incorporated into the existing general permit, consideration should be given as to what type of notification and comment period, if any, is appropriate.

What Additional Resources Are Needed To Implement A Regulatory Program

Any new program would impose costs on the state agencies charged with implementation and on the individuals regulated. Under the scenarios discussed here, the Department of Conservation and Recreation may require additional staff and incur additional expenses in the development and/or approval of nutrient management plans, increased training and certification demands for nutrient management planners as well as training and outreach for growers. The Department of Environmental Quality may require additional staff and incur additional expenses for permit or certification review and for any inspections required for regulated facilities as well as for any outreach needed for the successful implementation of a new program. Depending on the approach taken, local Soil and Water Conservation Districts may also be asked to incur additional
Consideration should also be given to what it would cost poultry growers to comply with any regulatory program adopted. For example, a recent study done by VPI indicates that limiting land application of litter by phosphorous content would decrease a grower’s net income by 11-23%. On the other hand, it also indicates that limiting application based upon nitrogen content actually increased farm net income by 0-5%. J. Pease, *Economic and Environmental Impacts of Nutrient Loss Reductions on Dairy and Dairy/Poultry Farms*, Virginia Cooperative Extension Publication 448-231/REAP R033, 1998. The cost of a litter storage shed varies significantly depending upon factors such as site circumstances, design, size, and construction methods. The average cost of a litter shed is $6.18 per square foot plus 10%. A small shed is approximately 1,500 square feet, a medium shed approximately 3,500 square feet, and a very large shed could be as big as 9,000 square feet. Thus the cost of a shed ranges from $10,000-20,000 for a small shed, $20,000-30,000 for a medium shed, to $50,000-60,000 for a large shed. According to the Virginia Poultry Federation, the average poultry grower, who has 2-3 houses, would need a shed of approximately 3,500 square feet.

State cost share monies are available for 75% of best management practices and nutrient management costs.
SUMMARY OF THE ISSUES

If the General Assembly decides to impose a regulatory program for the management of poultry litter, the following issues should be considered:

WASTE STORAGE ISSUES:

How to ensure litter is stored to reduce or eliminate contact with rainfall and prevent discharge of nutrients and other pollutants to surface or ground water?

LAND APPLICATION ISSUES:

Should both growers and non-growers who utilize litter be regulated?

Should land applications rates be limited by phosphorus as well as by nitrogen?

GENERAL ISSUES

What size of operations should be regulated?

To what extent should litter and nutrients be tracked?

Whether and how responsibility for litter management should be allocated between integrators and contract growers?

Should a regulatory program apply state-wide or just in the Chesapeake Bay Drainage?

How should buffer zones and environmentally sensitive areas be considered?

What Best Management Practices (other than nutrient management planning and litter storage) should be considered?

How should compliance with a regulatory program be verified? Waste and soil analysis? Ground water monitoring? Inspections?

How would the program be enforced and what penalties would apply for violations?

What public notice should be required?

What additional resources would be required by the Commonwealth and by poultry growers in order to implement the program?