

**REPORT OF THE  
VIRGINIA COOPERATIVE EXTENSION SERVICE  
OF VIRGINIA POLYTECHNIC INSTITUTE  
AND STATE UNIVERSITY ON**

**Pesticides and Fertilizers  
in the  
Urban Environment**

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



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# **Pesticides and Fertilizers in the Urban Environment**

A study of the application practices of lawn chemicals and household and garden pesticides in residential properties and a plan to reduce the potential impacts of household and garden pesticides and lawn chemicals in the urban environment.

*Virginia Polytechnic Institute and State University*

*College of Agriculture and Life Sciences*

*Virginia Cooperative Extension Service*

*Blacksburg, Virginia*

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<b>PREFACE</b>
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This report is the result of a review of the application methods used by the amateur and professional pesticide and fertilizer user in certain residential areas of Virginia. This report is presented by the Virginia Cooperative Extension Service of the Virginia Polytechnic Institute and State University on behalf of the Virginia General Assembly and the Governor. The request for this study was documented in House Joint Resolution Number 62 of the 1990 Virginia General Assembly.

This study, although limited in scope, puts the current situation into perspective, presents the findings, and provides a set of recommendations which address the findings. In general, the application practices associated with lawn care and pest control in the urban environment are not causing major problems in the Commonwealth. However, there are a number of areas where improvement is necessary or desirable to improve the services and quality of life for many communities in Virginia. Most recommendations address the great need for adequate information and educational opportunities for all Virginians involved in home, lawn, and garden pest control and the use of fertilizers in the urban environment. In addition, there are a number of potential concerns that should be addressed through regulatory means. If implemented, the recommendations would certainly improve the current situation.

I would like to thank all those who provided input into this report. The committee included:

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On behalf of Virginia Tech and the Virginia Cooperative Extension Service, it is a pleasure to pass this report to the Virginia General Assembly and the Governor to support their important role as our Commonwealth's leaders.

Sincerely,



James F. Johnson, Director  
Virginia Cooperative Extension Service

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## EXECUTIVE SUMMARY

The 1990 Virginia General Assembly passed House Joint Resolution Number 62 (HJR62) to direct the Virginia Polytechnic Institute and State University, Virginia Cooperative Extension Service to study the application practices of lawn chemicals and household and garden pesticides in residential properties and to develop a plan to reduce potential impacts of household and garden pesticides and lawn chemicals in the urban environment.

The Extension Service Committee on HJR62 reviewed the existing background and situation in Virginia, conducted surveys to establish a base of Virginia data, and hereby reports the findings of the study. The findings are followed with a set of recommendations which represent the survey results and the knowledge of the committee members and Extension agents in 65 local Extension Units.

The use of pesticides in the urban environment is a sensitive issue due to the perceptions by the general public that all pesticides and chemicals are harmful to the environment and to public health, that their use is unnecessary, and that the applicator, whether they are a professional applicator or amateur, is poorly prepared to conduct such applications. These perceptions are not all unfounded, however, they are not totally accurate and in most cases instill an unwarranted fear among the public at large. It would be an understatement to say that this issue is controversial.

Public opinion has initiated a number of government studies including, most recently, a study by the General Accounting Office (GAO) to determine the safety and practices of lawn care companies; a non-occupational pesticide exposure study by the U.S. Environmental Protection Agency (EPA); and, a national EPA survey of pesticides and fertilizers in drinking water. The results of these studies do not put the issue to rest -- that will never happen as long as there are differences of opinion. However, they do indicate within the statistical limitations of the studies that for the most part the problem is not at the point that warrants public hysteria or outrage. The problems associated with the industry and possible impacts on the environment are manageable within the existing legal system and within a reasonable period of time.

The studies associated with HJR62 were not as sophisticated as the government studies and have their limitations. They did indicate trends and needs associated with the way Virginia deals with this issue. Many of these trends will need to be changed, while others are not a problem. In addition, there are a number of needs of a monetary and regulatory nature that must be implemented to bring about change. The findings and recommendations of the study are as follows:

**Finding #1:** Most homeowners and professional applicators use granular fertilizers and liquid pesticides to treat lawns for various pest and nutritional problems.

**Recommendations:** The Commonwealth should expand HB279 (*House Bill 279 is a new tax law which establishes an income tax credit of 25 percent of the cost of purchasing improved equipment for more precise pesticide and fertilizer application*) to also include pesticide and fertilizer applicators that use new technology in the form of advanced chemistry, packaging, and handling equipment and facilities that reduce chemical exposure, waste, and provide environmental protection. Examples include: new low-rate chemicals; slow-release encapsulated formulations; returnable or refillable containers; water soluble packets; soil immobile and non-persistent chemicals; application equipment based on injection and closed system technology; advanced mixing, loading and calibration devices and systems; jet rinsers; new storage facilities; and, rinse and waste minimization stations.

The Commonwealth should greatly increase funding for research and Extension programs in the Virginia Tech College of Agriculture and Life Sciences to support the development and dissemination of alternative pest control programs.

The Commonwealth should provide tax incentives to promote the implementation of alternative pest controls by homeowners and professional applicators alike. A similar program is being conducted in Virginia for multiflora rose control.

**Finding #2:** Most homeowners and some professional applicators are using unprotected home water supplies to fill and apply pesticides and fertilizers, or apply chemicals in a manner that could jeopardize surrounding water sources due to runoff.

**Recommendations:** The Commonwealth should mandate that anti-siphon devices be installed on all accessible home water supply outlets in order to protect municipal water supplies and local aquifers from contamination by chemicals, wastes and microorganisms entering water systems through backsiphoning.

The Commonwealth should mandate that professional pest control companies and lawn care services not be permitted: to use unprotected water supplies to dilute chemical tank mixes; to clean equipment at a customer's site; or, to leave chemical or chemical containers behind at a job site, whether the site is a residence or commercial site.

The Commonwealth should continue to take measures to reduce the amount of nitrates and pesticides in areas where water supplies are vulnerable to leaching and run-off from lawn and garden chemicals. Currently, much of this work is being done through the Chesapeake Bay Initiative, however, benefits need to be extended to other parts of the state. Education plays an important part in this effort. All homeowners and applicators should be informed of making proper selection of pest controls in order to reduce the risk of contamination from improperly used pesticides and fertilizers. Both groups should also be encouraged not to apply pesticides and fertilizers prior to or during periods of heavy rainfall or watering.

**Finding #3:** Most homeowners are not fully aware of the amount of nitrogen they apply to their lawns annually, do not read pesticide labels adequately, and are unaware, or do not have an opportunity to obtain further information and education on these subjects either from their local chemical supplier, through the Extension Service, or from other sources. Most obtain some information through newspaper articles.

**Recommendations:** The Commonwealth should fund four (4) integrated pest management Extension agent positions to be placed in four metropolitan areas (Northern Virginia, Richmond/Petersburg, Tidewater, and Roanoke/Lynchburg) to educate the public and professional applicators in new pest controls and pesticide safety.

The Commonwealth should significantly increase funding for the Extension Service to develop environmental and chemical safety educational programs and materials for delivery to the public at the point-of-sale of home and garden chemicals, supplies, and plant materials. The Extension Service should work closely with the industry to develop and deliver this program.

The Commonwealth should significantly increase funding for the Extension Service to expand its existing program to provide the mass media with more information to promote the safe and proper use of pesticides and to encourage the use of alternative pest controls.

The Commonwealth should require that each retail agricultural, home, lawn and garden chemical outlet have sales personnel certified as pesticide applicators in a special retail dealer category. There should be at least one person certified and available to the

customers during regular business hours. This would provide customers with a source of consistently reliable information about the products they are buying; something that is not often available at many outlets of home and garden chemicals.

**Finding #4:** Most professional pesticide and fertilizer applicators do not provide the customer enough information about the chemicals they will apply in and around a potential customer's home.

**Recommendation:** The Commonwealth should mandate that the professional applicator be required to: provide detailed information to the client about chemical safety, identity, and characteristics; see that the client removes or protects vulnerable materials, animals and persons from areas prior to treatment; notify the client when the treatment will take place and when it will be safe to enter treated areas; advise the client of any restrictions or limitations regarding watering procedures, clean-up, or re-use of treated areas; and provide a phone number and the name of a contact to call if they have any questions about the treatment. These requirements and an explanation of how they will be met should be provided in printed form to prospective clients prior to their commitment to any initial services and annually for continued services.

**Finding #5:** All pesticide applicators, professional and amateur, need more information and educational opportunities to reach a certain competency level in the necessary use of all pest controls and fertilizers in the residential environment.

**Recommendations:** The Commonwealth should significantly increase funding for the Virginia Tech Extension Pesticide Applicator Training Program to deliver programs to all applicators who seek training and information. The existing program is inadequately funded to support the needs of the public. Part of this funding should be used to expand the current efforts to deliver a statewide continuing education program for pesticide applicator training by satellite directly to business, community colleges, and other facilities to educate applicators on proper use and handling of pesticides and alternative pest controls. The satellite training program is the only one of its kind in the country and over the past several years has been received by over 25 states on eight occasions and has trained over 5,600 pesticide applicators. The expanded program should involve multiple contact hours and professional accreditation.

The Commonwealth should fund one (1) additional faculty position in the College of Agriculture and Life Sciences at Virginia Tech to provide pesticide applicator training directed at clientele in the urban environment - both homeowner and professional pesticide applicator. This position should also include an adequate operating budget to allow for the development of educational materials and programs to support this effort.

The Commonwealth should provide funding to expand the current research being conducted at Virginia Tech to develop computer-based, prescription-form pest control recommendations. The current efforts involve the use of CD-ROM and expert system technology to manipulate large pesticide label databases in order to deliver accurate pest control recommendations to the public. The ultimate goal is to deliver pest control and fertilizer recommendations in a prescription form directly to the user or local Extension office by computer. This research is part of a USDA-Extension funded National Pesticide Information Communication Project (NPICP), a multi-year effort to enhance pesticide information delivery through use of advanced communications technology. NPICP is part of the Virginia Tech Pesticide Information Program.

The Commonwealth should provide a tax incentive to businesses to build or renovate space for on-site classroom instruction, or who install satellite receiving equipment,

videotape recorders, monitors, computers, and other audio-visual equipment for the sole purpose of use for employee continuing education. These facilities would allow for direct instruction to pest control technicians and supervisors to encourage best management practices and safety in handling pesticides and fertilizers.

The findings and recommendations of this Committee indicate a number of needs which cannot all be adequately served under the constraints of the current system. If the Commonwealth is to take action to change public behavior when dealing with pesticides and fertilizers and to adequately protect the public and the environment, then a number of steps need to be taken to address this issue. It isn't the purpose of this report to provide a shopping list of needs at Virginia Tech, however, the Virginia Tech College of Agriculture and Life Sciences is the primary source of pesticide and pest control expertise and research in Virginia; its programs in pesticide and pest management are recognized nationally. The overall opinion of the Committee is that the situation within Virginia is caused by misinformation and miscommunication of the issue by the public, pesticide applicators, government officials, and the news media. There are many areas where improvements can be made which could make a significant impact on the situation in order to improve the quality of life in Virginia. These changes have been the focal point of this report.



## INTRODUCTION

The 1990 session of the Virginia General Assembly passed House Joint Resolution Number 62 to direct the Virginia Polytechnic Institute and State University, Virginia Cooperative Extension Service to study the application practices of lawn chemicals and household and garden pesticides in residential properties and to develop a plan to reduce potential impacts of household and garden pesticides and lawn chemicals in the urban environment. This resolution was agreed to by the Senate on March 7, 1990 and the House of Delegates on March 9, 1990. A copy of the original HJR62 is available in Appendix A of this report.

The text of the HJR62 included the following:

*"Whereas, the Commonwealth of Virginia is committed to the protection of its natural resources and the safeguarding of the health and welfare of its citizens; and*

*Whereas, a study by the Natural Resources Defense Council states that non-point source pollution from applications of lawn chemicals and pesticides threatens 4,000 miles of Virginia's rivers and streams; and*

*Whereas, nitrogen and phosphorus runoff from fertilizers enters storm sewers and finally flows into rivers and streams; and*

*Whereas, the threat to human health and welfare from lawn chemicals and pesticides has not been determined; now, therefore, be it*

*Resolved by the House of Delegates, the Senate concurring, that the Virginia Polytechnic Institute and State University Extension Service is requested to study the application practices of lawn chemicals and household and garden pesticides in residential properties and to develop a plan to reduce the potential impacts of household and garden pesticides and lawn chemicals in the urban environment.*

*The Extension Service shall complete its work in time to submit its findings and recommendations to the Governor and the 1991 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for processing of legislative documents."*

In response to this request, the Virginia Cooperative Extension Service organized a committee of specialists with a background and training associated with the subject matter. The team included a pesticide and chemicals specialist (Ph.D. Plant Pathologist), a turf specialist (Ph.D. Agronomist), a pest control specialist (Ph.D. Entomologist), a consumer horticulturist (Ph.D. Horticulturist), an Extension Agent (Ph.D. Entomologist), and an IPM specialist (Ph.D. Entomologist). The committee reviewed the literature and where necessary conducted new studies as time and limited resources permitted; the study did not have a budget. The committee's findings and recommendations summarize this information.

## SITUATION AND BACKGROUND

The public controversy surrounding the use of pesticides in and around the home is a complicated and highly emotional issue. In Virginia, one direct result over concern for this issue was the 1988 Report to the Governor by the Virginia Council on the Environment on "Pesticide Management in Virginia". This report resulted in the implementation of the Virginia Pesticide Control Act of 1989 and the formation of the Virginia Pesticide Control Board. The events that led to this action were an accumulation of problems that included inadequate government controls, applicator carelessness, an uninformed public, poor business practices, and a sudden increase in media coverage of an issue that had been all but ignored since the 1970's -- pesticides and the environment. The situation came to a climax with the death of a Galax, Virginia couple after they had their home fumigated by a pest control operator in 1987. This event was followed by a series of articles published by the Roanoke Times and World News in August, 1988 which exposed the whole issue of pesticides and their management in Virginia. The articles alarmed the public, embarrassed and enraged some industry and government officials, and moved Virginia into a new era in the regulation of pesticides and their use throughout the Commonwealth.

At the same time that Virginia was dealing with this controversy, other states either had already experienced the same changes or were in the process. Nationally, the federal government had changed its posture on the pesticide issue from the lack of action in the early years of the Reagan Administration to a renewed effort which is just now being implemented to re-register old pesticide products and place a new emphasis on environmental protection, public health, and worker safety. Part of this effort was to look more closely at the issue of pesticides used in and around the home. The U. S. Environmental Protection Agency (EPA) and the U. S. General Accounting Office (GAO) have conducted several very extensive studies which shed some light on this issue.

The EPA concluded the Non-Occupational Pesticide Exposure Study (NOPES) in 1990 which was designed to determine the risk of 32 commonly used pesticides on the health of the occupants in a home environment. The pesticides monitored included those used to control pests in the home, in the soils around the foundation, and in lawns around the home. The studies were conducted with a representative sample of two cities; one with high pesticide use (Jacksonville, FL) and the other with relatively low pesticide use (Springfield/Chicopee, MA). NOPES was a very elaborate study using a very sophisticated method developed by EPA to measure chemical contaminants in the home environment -- the Total Exposure Assessment Methodology (TEAM). The results of the NOPES project indicated very little if any risk resulted from the very low levels of pesticides found in the homes from monitoring the air in the home and through a sampler placed on each of the occupants. Details of the NOPES project can be obtained from Andrew E. Bond, NOPES Project Officer, USEPA, EMB/ERD/AREAL (MD-76), Research Triangle Park, NC 27711, (919) 541-4329.

On March 23, 1990, the GAO released a report responding to a request, by U.S. Senator Harry M. Reid, for information on protecting the public from the risk of exposure to lawn care pesticides. Senator Reid asked the GAO to review the information that the lawn care pesticides industry provided to the public about the safety of its products and the federal enforcement actions taken against false and misleading lawn care pesticide safety claims. The GAO reviewed the re-registration status of 34 widely used lawn care pesticides to determine what progress had been made in reassessing the long-term health risks associated with their use.

The report addressed the three concerns which are summarized as follows.

1. Information provided to the public about the safety of its products.

"The GAO found that the lawn pesticides industry continues to make prohibited claims that its products are safe or nontoxic. Such claims are prohibited by FIFRA (Federal Insecticide, Fungicide and Rodenticide Act) because they differ substantially from claims allowed to be made as part of the approved registration. EPA considers these claims to be false and misleading. GAO also found that EPA has yet to establish an effective program to determine whether pesticide manufacturers and distributors are, in fact, complying with FIFRA requirements. In addition, EPA does not have authority over safety claims made by professional applicators."

2. Federal enforcement actions against lawn care pesticide safety advertising claims.

"The Federal Trade Commission (FTC) can act against false and misleading pesticide safety advertising by manufacturers and distributors, but it has taken no enforcement action in this area since 1986. FTC officials told GAO that it prefers to defer to EPA in such matters because of EPA's expertise and legislative authority. FTC has not acted against professional applicator claims because it believes EPA has been handling such claims on an informal basis."

3. The re-registration status of 34 of the most widely used lawn care pesticides.

"EPA is still at a preliminary stage in reassessing the risks of lawn care pesticides under its re-registration program, which FIFRA '88 requires to be completed in 9 years. Of the 34 most widely used lawn care pesticides, 32 are older pesticides and subject to re-registration. Not one of these, however, has been completely reassessed."

Details of the GAO study are available from the U. S. General Accounting Office, P. O. Box 6015, Gaithersburg, MD 20877, (202) 275-6241. Please reference the report entitled, "Lawn Care Pesticides, Risks Remain Uncertain While Prohibited Safety Claims Continue," March 1990.

On November 15, 1990, the EPA released the findings of its two-year nationwide survey of pesticides in drinking water wells. EPA tested 1,300 community water systems (CWS) and rural domestic wells for the presence of 101 pesticides, 25 pesticide degradates (*compounds that result from the deterioration of pesticides in the environment*), and nitrates. Statistically, the survey represents approximately 94,600 drinking water wells at 38,300 CWS and over 10.5 million rural domestic wells throughout the United States. The survey focused on the quality of drinking water in wells, rather than on the quality of ground water, surface water, or drinking water at the tap. It was designed to obtain valuable information on both the frequency and levels of pesticide, pesticide degradates, and nitrate present in rural domestic (*private*) wells and community (*public*) drinking water wells on a nationwide basis. However, the survey was not designed to provide an assessment of pesticide contamination in drinking water wells at the local, county, or state levels.

EPA analyzed well water samples for the combined presence of nitrate and nitrite measured as nitrogen, which are reported as a single concentration of nitrate. Based on the results, EPA estimated that nitrate is present, at or above the analytical minimum reporting limit of 0.15 mg/L used in the Survey, in about 49,300 (52.1%) CWS wells (range=45,300-53,300 @ 95% confidence level) and 5,990,000 (57.0%) rural domestic wells (range=5,280,000-6,700,000) nationwide. A major source of nitrate in cultivated soils is from inorganic fertilizers. Nitrate fertilizers are applied to enhance plant growth and nitrogen is necessary in the synthesis of plant proteins. Other sources of nitrate in soil and water include animal wastes, septic systems, plant residues, and fixation from the atmosphere.

The Survey detected pesticides and pesticide degradates in drinking water wells much less frequently than nitrates. Twelve of the 126 pesticides and pesticide degradates included in the Survey were found in the sampled wells at levels above various minimum reporting limits used in the Survey. EPA estimated that 9,850 (10.4%) CWS wells (range=6,330-13,400) and 446,000 (4.2%) rural domestic wells (range=246,000-647,000) in the United States contain at least one pesticide or pesticide degradate at or above the minimum reporting limits used in the Survey. The two pesticide analytes most frequently detected were DCPA acid metabolites (a degradate of DCPA - a pesticide used on home lawns, golf courses and farms to control annual grasses and broadleaf weeds) and atrazine (a commonly used herbicide on farms and for some industrial weed control).

For analytes with established or proposed EPA Lifetime Health Advisory Levels (*HALs*) or Maximum Contaminant Levels (*MCLs*), most observed detectables of nitrate, pesticides, and pesticide degradates were at levels well below these standards. Well water containing an analyte at levels exceeding EPA's MCL's or HAL's may not be safe to consume. Based on the results of the Survey, EPA estimates that 1,130 (1.2%) CWS wells (range=370-2,600) and 254,000 (2.4%) rural domestic wells (range=122,000-464,000) nationwide contain nitrate exceeding EPA's HAL and MCL of 10 milligrams per liter (*mg/L*). EPA estimates that at most 750 (0.8%) CWS wells nationally have at least one pesticide detection above the respective HAL's/MCL's and 60,900 (0.6%) rural domestic wells (range=9,430-199,000) nationally contain at least one pesticide detection above the MCL's/HAL's.

Fact sheets on the Drinking Water Survey Project are available through EPA's Public Information Center, 401 M Street SW, Washington, D.C. 20460; (202) 382-2080. Complete copies of the report can be obtained by contacting the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, (703) 487-4650.

The history and current level of knowledge indicates that the problem of pesticides and fertilizers used in and around the home is certainly real, but probably not at the magnitude perceived by the public. As is indicated by the background, there is a very important need to educate the public (both applicator and consumer) on the need to protect human health, the environment, and the quality of life through intelligent decisions dealing with pest control. For the consumer, it is important to be aware of the problems associated with home pest control and chemical use. For the applicator it is important to use the best and safest controls as necessary to control a pest, including the choice of using no pesticides or even not controlling a pest in favor of letting nature take its course if economically possible.

For Virginians, this study is being conducted to establish a basis for the Commonwealth to promote some of these needs. The study must first establish a situation for the specific charge made by the General Assembly and the Governor. The sections to follow will establish this base.

## STUDIES CONDUCTED IN RESPONSE TO HOUSE JOINT RESOLUTION 62

A series of surveys were conducted to assist with this study. These were conducted in areas where the committee needed information to answer certain questions or where public opinion was needed for input into the report. Surveys were conducted of selected Extension Agents throughout the Commonwealth, homeowners in Fairfax County, professional lawn care companies, and professional pest control companies. The surveys covered home pest control, home lawn care, professional lawn care and professional pest control. The Fairfax County survey studied lawn care by homeowners and professionals. A survey was not conducted of homeowners using in-home pest control services due to an inadequate mailing list. However, this information was pooled from the Extension Agent survey, EPA data, and the knowledge of the committee who have dealt directly with homeowners with indoor and outdoor pest control problems for over 20 years and is reflected in the recommendations section to follow.

### Statewide Extension Agent Survey

A select number of Virginia Cooperative Extension Service units were surveyed on their knowledge of household usage of lawn, garden, and household chemical pesticide usage. Reportable data was obtained from 65 of the 107 county/city units. This data set represents Extension Units in communities with 1,134,089 households. Agents estimated that 50% of the households in their areas use lawn care chemicals, 54% use garden and ornamental pesticides, and 73% use household pesticides. Responses of the Extension Agents to specific questions regarding usage provided these results:

1. The agents estimated that a majority of households (54%) dispose of leftover chemicals by throwing them in the garbage; only an estimated 19% use them up or give them to a friend.
2. Lawn and garden chemicals are usually stored in an unheated garage or shed (54%) and household chemicals are stored in a closet or pantry in the house (55%).
3. Less than half (42%) of the households use a combination of shoes and protective clothing when applying pesticides. An estimated 44% do not wear protective clothing when using pesticides.
4. An estimated 21% of the households clean their spray equipment after applying chemicals. Overall, 50% do not clean their equipment, and 60% using household chemicals do not clean equipment; most likely due to the fact that many of these chemicals are ready-to-use formulations requiring no equipment.
5. For all chemicals used, an estimated 53% of the households use ready-to-use formulations to control pests; 72% use ready-to-use household chemicals. About 14% use non-synthetic, organic methods.
6. The largest source for purchases of lawn and garden chemicals is feed/seed stores (30%). Household pesticides are purchased primarily at grocery/drug stores (39%) and discount outlets (25%).
7. Individuals do hire commercial applicators for lawn (17%) and household (21%) pesticide management.
8. The primary source of chemical and pesticide information is point-of-sale with retail dealers (24%) and labels (23%) contributing to this total. The Cooperative Extension Service is the next highest ranking source (22%). Newspapers (5%) and books (3%) rank lowest.
9. Approximately 33% of the households follow correct procedures for applying chemicals and can identify pests correctly.
10. An estimated 43% know about calibration of spreaders or sprayers. However, only about 21% actually calibrate them.

A sample survey can be viewed upon request in the Consumer Horticulture Office, Department of Horticulture, Virginia Tech, Blacksburg, VA 24061, (703) 231-6254.

### **Pest Control Company Survey**

A survey of 50 professional pest control companies in Virginia was conducted by the Virginia Tech Urban Pest Control Center, Department of Entomology in August, 1990. The background of the companies indicated that they served an audience or customer base made up of 41% commercial and 59% residential. The average number of years in the pest control business was 26 years. The average number of technicians (applicators) per firm was six. The following points were assessed as part of the survey:

1. The average amount of unused pesticide (not termiticide) returned at the end of the day for each company (not each technician) was 13 oz. (range from 1-2 qts).
2. A majority (87%) of the companies responding to the survey questionnaire reported no pesticides were returned at the end of the day (the technician used them on the job).
3. A majority (98%) of the companies responding to the questionnaire reported that their company has a policy of informing their clients about exposure to surfaces treated with residual insecticides.
4. A majority (98%) of the companies responding to the questionnaire reported that unused pesticides were saved for use the following day or added to termiticide tanks for use the following day.

A sample survey can be viewed by contacting the Urban Pest Control Center, Department of Entomology, Blacksburg, VA 24061, (703) 231-6341.

### **Fairfax Homeowner Study**

To develop an intense study of all homeowners or even a representative sample of all homeowners statewide was not an option for this study. Problems included the availability of a statewide mailing list, limitations of time and resources to develop, mail and compile such a study, and a uniform sampling area (localities vary according to pest control practices, pests, and attitude). To develop a sample which would provide a reasonable picture of the residential chemical and application practices we selected the County of Fairfax. Reasons for the selection included: the willingness of the Fairfax County Extension Office to conduct a survey in the county, the possible large sampling area, a cosmopolitan population sample, availability of a diverse number of services and products, and a well organized governmental structure. In addition, the potential for a concerned public associated with the use of pesticides and fertilizers and the concern for the environment is probably greater here than in any other part of Virginia. This assumption is based on the socio-economic make-up of the community, the education and awareness of government and social problems, and the richness of government services and educational opportunities in the area. This is not to assume that there are not other areas of Virginia which would meet these same criteria. In addition, the House Joint Resolution Number 62 was initiated by Delegate Byrne who represents Fairfax County. Delegate Byrne's request was based on the needs of her constituency and thus makes it apparent that there is concern about this issue in Fairfax County. Hence, the logic for conducting the survey in Fairfax County.

Two types of surveys were mailed to 422 residents of Fairfax County. Each resident received two surveys, one for those using lawn care services and the other for those conducting their own lawn maintenance (*do-it-yourselfers*). The do-it-yourself survey (D-I-Y) consisted of questions about application practices, safety, disposal, storage, and sources of information. The survey asking for information about lawn care services, asked similar questions except about the services hired by the homeowners. The respondents had the option to return one or both surveys. A total of 133 responses were received; 101 conducting their own lawn care and 32 with lawns being treated by lawn care companies. This represented roughly a 32% return of surveys. Only one person returned responses for both maintaining their own lawn and also using a lawn care service. The surveys represented a total of 1,618,707 square feet of turf or 37.2 acres.

Highlights of this study include the following:

1. Homeowners tend to follow poor practices in handling pesticides including the use of unprotected water sources for use in diluting and applying pesticides and fertilizers.
2. Less than half (44.7%) of the homeowners rinse their pesticide containers prior to disposal and most (87.4%) reported throwing these containers in the public garbage system.
3. More than half (60.3%) of homeowners who apply pesticides reported that they do not wear protective clothing or equipment in order to protect themselves from exposure during use.
4. The average number of applications of fertilizers and pesticides by homeowners was 5.80/year; most of these were granular fertilizers and liquid pesticides.
5. Only 23.8% of homeowners reported that they know the amount of nitrogen they apply per 1000 square feet of lawn per year; amounts provided by others often indicated that they didn't know either.
6. Most homeowners (85.4%) would be willing to give up a greener lawn and tolerate pests in favor of a pesticide free environment.
7. Only 56.3% of homeowners reported that they remove such items as children's toys, pet dishes, and yard furniture from their lawn areas prior to pesticide application.
8. Although most homeowners (88.6%) read the pesticide label for safety precautions, less than half (45.5%) reported that they followed label directions on when to re-enter a sprayed area. Hardly any (4.6%) reported that they notified neighbors prior to application and none posted treated areas.
9. Most homeowners (74.3%) obtained their gardening and pesticide information from newspaper garden articles. Next highest was magazines (59.4%) and sales personnel (49.5%).

Details of this survey are reported below as part of the Results section, and sample surveys can be viewed in the Chemical, Drug and Pesticide Unit, Virginia Tech, Blacksburg, VA 24061-0409, (703) 231-6543.

### Lawn Care Company Survey

A survey of 108 lawn care companies in Virginia was conducted by the Virginia Tech Department of Crop and Soil Environmental Sciences and the Chemical, Drug and Pesticide Unit. The survey consisted of a series of questions directed at collecting data on water quality, public health, worker protection, and determining application methods used during operation. Of the total companies surveyed, responses were received from 27 companies. Although not a large response (25%), it is typical of most mail-out surveys of this type due to a concern by the recipients as to their liability in providing such sensitive and sometimes controversial information. Many are afraid that a wrong response could incriminate them in some way. The respondents were responsible for 5,295 acres of residential turf all over the Commonwealth; an average of 252.25 acres per company. Surveys were received from locations widely distributed throughout the Commonwealth. The total number of customers serviced by these companies was 25,755 and the average number of customers per company was 1288. One respondent reported treating 4,500 acres of commercial turf -- this figure and other data provided by this respondent were not used in the report because the survey asked for residential turf businesses only.

Highlights of this study include the following:

1. Some lawn care companies (23.8%) reported that they use their clients' water supply to fill their spray tanks.
2. Most lawn care companies (81.0%) have a company policy not to apply chemicals during periods of potentially heavy rainfall.

3. Most (95.2%) rinse chemical containers after use and most dispose of these containers in the public garbage system (71.4%).
4. All lawn care companies reported that they require their employees to wear protective clothing and equipment during chemical handling and use, and 47.6% reported that they conduct employee health monitoring.
5. The average number of applications reported by lawn care companies was 4.75/year. Most (80.9%) use liquid formulations of pesticides and granular fertilizers (81.0%).
6. Most (90.5%) reported that they use spot treatments and use pesticides as needed, and 60.0% offer customers lawn care programs using alternative pest controls or no pesticides.
7. More than half (57.1%) notify customers prior to treatment and very few (14.3%) post treated areas.
8. Only 52.4% reported that they notified customers of the safety hazards associated with the chemicals used on a client's lawn and 71.4% informed customers of the label re-entry requirements after treatment. Some 66.7% of the lawn care companies reported that they requested homeowners to remove yard items prior to treatment, or provided clients information about the pests controlled by the treatments.
9. The Virginia Cooperative Extension Service was reported as the most valuable (61.9%) and most used (95.2%) of the pesticide and agronomic information sources available to the lawn care companies. Textbooks and research articles were the next most used at 91.5% each.

The detailed findings of this survey are reported below as part of the Results section. A sample survey can be viewed in the Chemical, Drug and Pesticide Unit, Virginia Tech, Blacksburg, VA 24061-0409, (703) 231-6543.



## SURVEY RESULTS AND DISCUSSION

The raw survey data was used to answer specific questions relating to the use of pesticides and fertilizers around the home and community. The lawn care data was most important since commercial and home lawn care are the most visible and result in the most chemicals used in a typical single family residential area. Also, the impact of these chemicals is continually in question in the community. The other use assessed in the study was indoor and peripheral treatment of premises for wood destroying, structural pests, health-related pest infestations, and general pest control.

The results have been divided into issues that are important to public health, the environment, worker safety, water quality, hazardous waste disposal, and public education. The topics will be divided into several areas which correlate with the questions asked of lawn care services, pest control operators, extension agents, and private citizens. These include the following.

### Water Quality

Prevention of contamination of water systems is mandatory to reduce the potential for chemicals reaching water sources such as groundwater(aquifers), lakes, streams and rivers. In addition, contamination of plumbing within the home is a very real threat of improper handling of pesticides and fertilizers due to backsiphoning and well contamination. A series of questions were asked the recipients of the surveys to determine if they understood the need for prevention of contamination of water from the use of pesticides and fertilizers. In addition, these questions ask if the recipients have or know of the existing methods of prevention and proper usage methods to prevent contamination.

A question was asked of lawn care companies and homeowners to determine if they used home water supplies to fill spray tanks and if so, if the supplies were protected with a backflow preventer. Other questions asked if the applicators (specifically homeowners) used hose end proportioners to apply chemicals. A hose end proportioner is a device which is designed to siphon chemicals from a container attached to a water hose. Another question dealt with use of pesticides prior to heavy rainfall due to potential runoff. The following are answers to survey questions relevant to water quality.

	Lawn Care Companies	Homeowners D-I-Y	Homeowners w/lawn care co.
Use home water supplies to fill spray tanks?	23.8%	100.0%	7.1%
Use backflow preventers to protect water source?	71.4%	18.6%	21.4%
Use hose end proportioners to apply pesticides and fertilizers	0.0%	40.0%	n/a
Lawn care companies with a policy not to apply chemicals during periods of potentially heavy rainfall?	81.0%	n/a	n/a
Apply chemicals during periods of potentially heavy rainfall	n/a	14.0%	48.2%

The answers to these questions indicate that the potential threat to home water supplies from homeowners using pesticides and fertilizers is great. The reason is that most homeowners use their own water supplies to fill their sprayers or use them with hose end proportioners. If the flow in the hose is reversed, the chemical can move with the water back to its source if the hose is in direct contact with the chemical or the proportioner is not built to prevent this problem. Most hose end proportioners are equipped with a built-in anti-siphon device to prevent this problem from occurring, but if the proportioner is old or faulty, a backflow can contaminate the water supply if the flow is interrupted in any way. Fortunately, several conditions must exist for a backsiphon to occur and thus reduce the likelihood for an accident from this phenomenon. If the homeowner allows an air gap between the tank water level and the hose end or if their proportioners have an anti-siphon device built-in, the problem is eliminated. In addition, this threat also depends upon the possibility of a backsiphon occurring in the water line at the time of use for pesticide application. For the commercial applicator (23.8%), the use of home water supplies to fill a commercial sprayer probably presents a greater potential for contamination due to the size of the tank and height of the tank above the water source; commercial tanks tend to be larger. Again a backflow must occur at the same time as the applicator is filling the tank and the fill hose must be below the water level in the tank. It seems that these factors would reduce

this threat significantly for the commercial applicator as well. However, because past experiences indicate that backsiphoning does occur, that applicators are following poor practices, and that water supplies are unprotected, it would be important to address these inadequacies in the recommendations of this report.

Another area of concern was the possible application of pesticides and fertilizers prior to or during periods of potentially heavy rainfall. The data indicate that this practice is taking place. Therefore, it would also be prudent to address this in the recommendations.

## Disposal

One of the major issues associated with pesticide use is the disposal problem associated with left-over containers, concentrate and diluted chemical mixtures. For the homeowner, this problem is often resolved by disposal in the trash which is collected and transported to the municipal landfill, proper use, or dumping the chemicals into the sanitary sewer system. For the professional pesticide applicator, this dilemma is usually solved by proper product selection, prudent application practices, and disposal by hazardous waste firms. Without these practices, the professional is often greatly vulnerable to prosecution from a number of regulatory agencies for pesticide and hazardous waste violations; these laws often exempt the homeowner. In the surveys, homeowners and professionals were both asked a series of questions in order to determine their practices for disposal of concentrate and mixed chemical, and empty chemical containers. These are listed as follows:

	Lawn Care Companies	Homeowners D-I-Y	Homeowners w/lawn care co.
Dispose of excess spray chemicals by using in future tank mixes	36.8%	10.5%	n/a
Dispose of excess spray chemicals by spraying at label rates on unsprayed areas	68.4%	66.7%	n/a
Dispose of excess spray chemicals in garbage	0.0%	8.8%	n/a
Dispose of fertilizer/pesticide containers by burning or burying on own property	4.8%	2.3%	n/a
Dispose of fertilizer/pesticide containers in public garbage system	71.4%	87.4%	n/a
Dispose of fertilizer/pesticide containers by delivering to public landfill	28.6%	n/a	n/a
Dispose of pesticide containers at application site	0.0%	n/a	6.3%
Dispose of pesticide containers by other means (unidentified)	19.0%	19.3%	n/a
Rinse liquid containers prior to disposal	95.2%	44.7%	n/a

The results indicate that most applicators use their left-over chemicals by applying them to unsprayed areas at label rates or by using in future tank mixes. This was contrary to the Extension Agents' estimate that 54% of homeowners dispose of their left-over pesticides in the garbage. The agents also estimated that only 19% of homeowners used up left-over chemicals or gave them to a friend; again contrary to the 66.7% reflected in the Fairfax survey. This difference is hard to explain, except that the agent data was statewide and an estimate of public behavior, while the Fairfax data was just one local area and direct public feedback. Most left-over containers are disposed of in the public trash system. Disposal of pesticide containers into the local landfills has been a concern to many landfill managers over the years. However, it is a practice which is recommended by EPA if the containers are rinsed and crushed according to label directions. Homeowners are even permitted to dispose of most pesticides, whether they are concentrates, mixtures or containers in the same manner as other household wastes. The survey data indicated that 95.2% of commercial applicators rinse their containers prior to disposal, while only 44.7% of the homeowners rinse their containers. The concerns that lawn care companies dispose of pesticide containers at the application site was unfounded, although 6.3% (2) of the Fairfax County respondents indicated that their services had disposed of containers on their property. The low number is probably the result of most lawn care companies not mixing their chemicals at the application site.

## Applicator Safety

The greatest risk associated with the use of pesticides is that of applicator exposure. Although not often viewed as a community problem, applicator exposure can result in the loss of millions of dollars annually in lost income to businesses and costs to government and local community services due to illness, lost work time, emergency services, medical treatment, and possible exposure to others through carelessness. The need for applicators to protect themselves has always been a concern and has been addressed through the use of protective clothing, education and training, health monitoring, and reading the product label. Survey questions were asked of lawn care companies and homeowners as to what types of protective clothing they used while handling pesticides. Although it is expected that homeowners would be at less risk than the professional applicator, they too should wear some types of protective clothing such as rubber gloves. It was assumed that all applicators wore long-sleeved shirts, long pants, socks and shoes while handling pesticides; although this is not always the case with many homeowners. The survey data are as follows:

	Lawn Care Companies	Homeowners D-I-Y	Homeowners w/lawn co.
Applicators wear plastic/cloth spray suits	47.6%	0.0%	5.9%
Applicators wear goggles	71.4%	15.1%	11.8%
Applicators wear rubber gloves	100%	31.5%	58.8%
Applicators wear rubber boots	90.5%	8.2%	76.5%
Applicators wear respirators	66.7%	6.8%	11.8%
Wear no protective clothing and equipment	0.0%	60.3%	0.0%
Conduct health monitoring for spray technicians (blood cholinesterase tests)	47.6%	n/a	n/a

The survey indicated that in general, lawn care services equipped their personnel with adequate protective clothing for most application practices. The type of protective gear depends upon the label directions and type of chemical used. Those applying fertilizers, some herbicides, and fungicides would not ordinarily need a respirator or plastic spray suit unless the chemicals were distributed in such a fashion that applicators could breathe them or be soaked by a mist or other drift. All applicators should wear rubber gloves and 100% of the lawn care companies indicated that they provided rubber gloves to their applicators. However, the homeowners who hired applicators in Fairfax County did not observe the applicators wearing gloves all the time (58.8%). More applicators were reported to have been observed wearing rubber boots (76.5%) than gloves. Of even more concern was that only 31.5% of the homeowner applicators reported using rubber gloves and only 8.2% wore rubber boots; a statistic that is not surprising. The majority (60.3%) of the homeowners reported that they didn't wear any protective clothing or equipment. The data for the professional applicators indicated that they did, as a group, protect themselves from exposure and 47.6% of their employers reported that they conducted health monitoring. Although the type of protective clothing and equipment worn will vary with the type work conducted by the lawn care companies, the statistics indicate that there is still room for improvement in this area.

## Application Methods

The types of application methods used by pest control operators, lawn care companies and homeowners differ according to type of pesticide used and where the application will take place. In addition, volume of chemicals used and the cost of equipment affect the types of application methods.

Most homeowners use ready-to-use solutions applied in the form of liquids, dusts or aerosols for pest control in and around the home. For the home gardener, most chemicals are applied as liquids and dusts either by ready-to-use applicators or in compressed air sprayers. For the homeowner, the most common type of application equipment used for fertilizers and most other lawn chemicals is the granular spreader. Homeowners were asked what methods (liquid or dry applicator) they used to apply pesticides and fertilizers to their lawns and what types of chemicals (fertilizer, insecticide, herbicide, or fungicide) they used on their home lawns in the Fairfax Survey. Herbicides were listed in two groups as either pre-emergent weed killers or broadleaf weed killers. The pre-emergents are herbicides used to prevent weeds from germinating and include such chemicals as DCPA (Dacthal), benefin (Balan), bensulide (Betasan), pendimethalin (Turf Builder Plus Halts), oxadiazon (Ronstar), or siduron (Tupersan); the most commonly used members of this

group are benefin and pendimethalin. The broadleaf weed killers include 2,4-D, 2,4-DP, dicamba (Banvel), and mecoprop and are usually sold as a triple mixture under a variety of product names. Both groups of chemicals are available in liquid mixtures and in granular formulations. Another chemical used by homeowners is glyphosate (Roundup, Kleenup), although unlike the other chemicals, it kills all weeds. These same chemicals and groups are used by the professional lawn care company. The survey asked these groups a series of questions dealing with chemical types, amount of usage, and methods of application listed as follows:

	Lawn Care Companies	Homeowners D-I-Y	Homeowners w/lawn care co.
Average number of times per year lawn treated	4.75	5.80	4.77
Average number of times per year lawn treated with fertilizers	n/a	5.80	n/a
Average number of times per year lawn treated with insecticides	n/a	1.61	n/a
Average number of times per year lawn treated with fungicides	n/a	0.17	n/a
Average number of times per year lawn treated with herbicides	n/a	3.48	n/a
Average number of times per year lawn treated with lime	n/a	1.84	n/a
Use liquid formulations	80.9%	54.5%	59.4%
Use hose end proportioner to apply liquids	0.0%	46.5%	n/a
User pressurized backpack sprayer to apply liquids	n/a	45.4%	n/a
Use high pressure sprayer to apply liquids	76.2%	n/a	n/a
Average gallons of liquid per 1000 sq. ft. of lawn	2.28	n/a	n/a
Average pounds pressure on liquid delivery hose	54.75	n/a	n/a
Using dry (granular) pre-emergent weed killers	52.4%	33.3%	n/a
Using liquid pre-emergent weed killers	57.1%	13.3%	n/a
Using dry (granular) broadleaf weed killers	4.8%	28.9%	n/a
Using liquid broadleaf weed killers	95.2%	31.1%	n/a
Use dry formulations of insecticide (granulars)	57.1%	15.6%	n/a
Use liquid formulations of insecticides (sprays)	95.2%	31.1%	n/a
Use dry formulations of fungicides (granulars)	9.5%	3.3%	n/a
Use liquid formulations of fungicides (sprays)	90.5%	5.6%	n/a
Use dry formulations of fertilizers (granulars)	81.0%	82.2%	n/a
Use liquid formulations of fertilizers (sprays)	38.1%	16.7%	n/a
Average % of treated area w/ liquid pre-emergent herbicides	50.5%	n/a	n/a
Average % of treated area w/ dry pre-emergent herbicides	38.2%	n/a	n/a
Average % of treated area w/ liquid broadleaf herbicides	84.4%	n/a	n/a
Average % of treated area w/ dry broadleaf herbicides	4.8%	n/a	n/a
Average % of treated area w/ liquid insecticides	42.9%	n/a	n/a
Average % of treated area w/ dry insecticides	37.1%	n/a	n/a
Average % of treated area w/ liquid fungicides	64.5%	n/a	n/a
Average % of treated area w/ dry fungicides	4.9%	n/a	n/a
Average % of treated area w/ liquid fertilizers	27.9%	n/a	n/a
Average % of treated area w/ dry fertilizers	70.9%	n/a	n/a
Know how many pounds nitrogen/year/1,000 sq. ft. you apply to your home lawn	n/a	23.3%	n/a
Average number of pounds of nitrogen per 1,000 sq. ft. lawn	3.60	13.29	n/a
Percent of nitrogen used insoluble in water or slow release	38.9%	50%	n/a

These data are complex but can be used to make a number of important points. The number of applications affect the pesticide and fertilizer loading put in the environment. The data indicate that the homeowner places more applications (5.80/year) into their lawns than the average lawn care company (4.75-4.77). This is the opposite of most conclusions being made today relating to the use of chemicals on residential turf. However, one should not read into these data too far, since most lawn care companies are known to apply their chemicals in tank mixtures containing several different pesticide types (i.e. - combinations of insecticides, fungicides, or herbicides). Further investigation of the data do indicate that few homeowners (23.3%) are aware of the amount of nitrogen they apply to their lawns. As was indicated in the EPA Water Well Survey, the nitrates were found more often than any other chemical tested in the study. Yet homeowners tend to apply more pounds of nitrogen/1,000 sq. ft. of lawn (13.29 lbs./1,000 sq.ft./year) and at more frequency than professional applicators. This figure was so far out of line of the normally recommended amount, it became suspicious that most homeowners do not understand the meaning of the fertilizer ratings on most product labels or did not understand the meaning of the question. If the figure is correct, the amount of nitrogen being applied is extremely high and presents a runoff problem. Otherwise, the data indicate that the homeowner needs to be educated on fertilizer product labeling and the recommended amount of fertilizer to apply to a lawn per 1000 sq. ft. per year. Homeowners also indicated that they tend to

apply more water insoluble or slow release chemicals than lawn care companies. The data indicate that homeowners use nitrogen with an average 50% water insoluble vs. 38.9% average for lawn care companies. Another area of concern is the data which indicate that both groups use pre-emergent herbicides which include the chemical DCPA (Dacthal); a chemical found in higher amounts in the EPA water well survey. The statistics indicate that lawn care companies use more pre-emergents (52.4% use dry formulations, 57.1% use liquid formulations) than homeowners (33.3% dry, 13.3% liquid). Although DCPA is readily available to both groups, homeowners and lawn care companies use very little; they usually use benefin or pendimethalin.

## Product Selection and Selection of Alternative Pest Controls

The selection of pest controls is governed by personal knowledge and the advice of experts available to the applicator. Unfortunately, the decision to use or not to use a pesticide is often made when the homeowner reaches the retail store or reads an advertisement about a service or product. This usually results in unnecessary use, overuse, or excess chemical and subsequent waste of money and storage/or disposal of pesticides and fertilizers which can threaten the health of a family, pets or neighbors. In addition, this action can place heavy chemical loadings into the environment, water systems, and food sources. In the three surveys for lawn care data, participants were asked if they either used or offered any choices to pesticides in treating residential turf. They were also asked if they used a low input type strategy when using pesticides. Homeowners were asked if they would be willing to give up a greener lawn and tolerate weeds and pests for a pesticide-free environment. In addition, homeowners were asked if their lawn care companies were making an effort to use the minimum amount of chemicals on their lawns, if the homeowners asked these services to use a program of reduced chemicals or chemical-free lawn care, and if the companies were open to their requests. Lawn care companies were asked similar questions. The following are specific response data dealing with these issues.

	Lawn Care Companies	Homeowners D-I-Y	Homeowners w/lawn co.
Apply pesticides as needed or as spot treatment	90.5%	67.6%	61.5%
Maintain lawn using, or offer customers, a "no pesticide" or biological control program	60.0%	42.3%	23.8%
Willing to give up greener lawn and tolerate pests for a pesticide-free environment	n/a	85.4%	n/a
Lawn care company makes an effort to minimize chemical use on the home lawn	n/a	n/a	61.5%
Homeowners who have requested a reduced chemical or chemical-free lawn care from services	n/a	n/a	10.0%
Lawn care companies asked reported to be receptive of request	n/a	n/a	83.3%

From these results, it is evident that the lawn care companies participating in the survey are interested in the use of alternative chemical controls and many (90.5%) had implemented some form of reduced application methods. This number varied in Fairfax County with only 61.5% of the homeowners reporting that their services offered such a program. However, very few (10%) of these homeowners ever requested reduced chemical usage by their services. Of those services asked to reduce chemical use in Fairfax, 83.3% were reported by the homeowners as receptive to the request. Some homeowners (42.3%) and a larger number of lawn care companies implemented or offered their customers a "no pesticide" or biological control program as an alternative to some lawn care activities. For the homeowner, most (85.4%) were willing to give up a greener lawn and put up with weeds and other pests for a pesticide-free environment. A possible recommendation relating to these data would be to develop more alternative controls through research and to educate the public about these controls through Extension and formal education.

## Notification and Posting of Sprayed Areas

Lawn care companies were asked if they notified their customers about the application of pesticides and fertilizers in regard to safety and precautions. Homeowners were also asked if the lawn care companies they hired provided this information to them. In addition, pest control operators were asked if they had a policy of notifying their customers about sprayed areas regarding safety. The posting of sprayed areas is another very controversial issue particularly associated with lawn care. Professional and amateur applicators were both asked a series of questions dealing with this subject.

	Lawn Care Companies	Homeowners D-I-Y	Homeowners w/lawn care co.
Provide pre-treatment notification to customers or neighbors	57.1%	4.6%	47.4%
Lawn companies who inform customers about, or D-I-Y homeowners who determine, label re-entry precautions	71.4%	45.5%	47.4%
Lawn companies who request customers to, or D-I-Y homeowners who, remove yard items such as toys, pet dishes, etc. prior to application	66.7%	56.3%	26.3%
Lawn care companies who inform customers, or D-I-Y homeowners who read the label, about pests controlled with chemicals applied	66.7%	72.7%	31.6%
Lawn care companies who inform customers, or D-I-Y homeowners who read label, about safety hazards of chemicals applied on their lawns	52.4%	88.6%	36.8%
Lawn care companies who inform customers, or D-I-Y homeowners who read label, about irrigation and watering requirements of a treated area	81.0%	88.6%	75.0%
Lawn care companies or D-I-Y homeowners who post signs after treatment	14.3%	0.0%	73.7%

These data indicate a need for more education and possible regulation to encourage some of these points relating to public notification and information. There is a general problem of a lack of information being made available to the lawn care and pest control customer relating to all safety aspects of pest control and use of fertilizers. This concern was reflected in the findings of the recent GAO study on lawn care pesticides mentioned above in the situation and background section of this report. The industry needs to provide the consumer more information on what will done on their property prior to a service being conducted, whether this service is pest control or fertilization. This action would clear up many of the misunderstandings which fuel many homeowner complaints today. For the homeowner, the data indicate that they are not paying as much attention to the product label directions as is necessary to safely and effectively use the products. Many misuse cases by homeowner "do-it-yourselfers" result directly from a lack of label comprehension. A concerted effort needs to be made to educate the consumer and applicator in order to benefit each other in this process.

### Information Services and Education

The need to inform and educate the public is the responsibility of both the public and private sectors. The applicator and homeowner seek information from a number of sources. The services and sources are plentiful, but it is often up to the individual to determine what sources to use. Often these are the most convenient sources, such as the morning newspaper. A series of questions were asked to both homeowners and lawn care companies to determine where and of what value these sources were to the groups. The following are the results:

Ranking of major sources of gardening and pesticide information by homeowners:	1	2	3	4	5
newspapers/garden articles	26.7%	17.8%	28.7%	1.0%	25.7%
magazines	8.9%	20.8%	27.7%	2.0%	40.6%
Virginia Dept. of Agriculture and Consumer Services	8.9%	3.0%	8.9%	1.0%	78.2%
Virginia Tech Cooperative Extension Service	7.9%	3.0%	5.9%	2.0%	82.2%
textbooks	5.0%	6.9%	12.9%	4.0%	71.3%
sales personnel	8.9%	9.9%	23.8%	5.9%	51.5%
other	7.9%	6.9%	10.9%	1.0%	73.3%

Ranking of major sources of agronomic and pesticide information by lawn care companies:	1	2	3	4	5
trade magazines	23.8%	33.3%	28.6%	0.0%	14.3%
Virginia Dept. of Agriculture and Consumer Services	19.1%	33.3%	33.3%	0.0%	14.3%
Virginia Tech Cooperative Extension Service	61.9%	19.1%	14.3%	0.0%	4.8%
textbooks	19.1%	47.6%	23.8%	0.0%	9.5%
research journal articles	23.8%	19.1%	42.9%	4.8%	9.5%
sales personnel	19.1%	23.8%	33.3%	4.8%	19.1%
other	42.9%	0.0%	0.0%	0.0%	57.1%

Ratings	
1	= extremely valuable
2	= moderately valuable
3	= valuable
4	= not valuable
5	= not used

The data indicate almost the opposite for the two groups. The homeowners do refer to the most available information as most rely on the newspapers for gardening and pesticide information. A large majority feel that newspapers and magazines are the most valuable source of this information. The services offered by Cooperative Extension were not heavily used or viewed as valuable by the homeowners; probably because they were not aware of them. Extension has never had the latitude to undertake more effective communications campaigns to make more homeowners aware of its services. This is mostly due to the fact that it is a non-profit government entity rather than a commercial venture like a newspaper, magazine or other private business.

This was the exact opposite for the lawn care industry who took great advantage of the services offered by Cooperative Extension. They also rated it the most valuable of all their sources of information and education. Textbooks and trade magazines are also heavily relied on for valuable pest control information. "Other" (unidentified) sources provided a significantly valuable source of information to turfgrass professionals.

These data suggest that the Cooperative Extension Service would be an excellent resource for training professionals turfgrass managers. In addition, homeowners would be most effectively informed through newspapers and perhaps other forms of mass communication. Another source of homeowner information and education is the Extension Master Gardener Program which has involved over 40,000 Virginians in 32 counties through formal classes, seminars and demonstrations.

## FINDINGS AND RECOMMENDATIONS

The recommendations from this report are those of the Extension HJR62 Committee which met to review the findings and to formally document recommendations for the Governor and the General Assembly. They include input from the results section and the background data.

Although the studies associated with HJR62 were not as sophisticated as past government studies and have their limitations, they did indicate trends and needs associated with the way Virginians deal with this issue. Many of these trends will need to be changed and others present no problems. In addition, there are a number of needs of a monetary and regulatory nature that must be implemented to bring about these changes. These needs are outlined in the following findings and recommendations of the study.

**Finding #1:** Most homeowners and professional applicators use granular fertilizers and liquid pesticides to treat lawns for various pest and nutritional problems.

**Recommendations:** The Commonwealth should expand HB279 (*House Bill 279 is a new tax law which establishes an income tax credit of 25 percent of the cost of purchasing improved equipment for more precise pesticide and fertilizer application*) to also include pesticide and fertilizer applicators that use new technology in the form of advanced chemistry, packaging, and handling equipment and facilities that reduce chemical exposure, waste, and provide environmental protection. Examples include: new low-rate chemicals; slow-release encapsulated formulations; returnable or refillable containers; water soluble packets; soil immobile and non-persistent chemicals; application equipment based on injection and closed system technology; advanced mixing, loading and calibration devices and systems; jet rinsers; new storage facilities; and, rinse and waste minimization stations.

The Commonwealth should greatly increase funding for research and Extension programs in the Virginia Tech College of Agriculture and Life Sciences to support the development and dissemination of alternative pest control programs.

The Commonwealth should provide tax incentives to promote the implementation of alternative pest controls by homeowners and professional applicators alike. A similar program is being conducted in Virginia for multiflora rose control.

**Finding #2:** Most homeowners and some professional applicators are using unprotected home water supplies to fill and apply pesticides and fertilizers, or apply chemicals in a manner that could jeopardize surrounding water sources due to runoff.

**Recommendations:** The Commonwealth should mandate that anti-siphon devices be installed on all accessible home water supply outlets in order to protect municipal water supplies and local aquifers from contamination by chemicals, wastes and microorganisms entering water systems through backsiphoning.

The Commonwealth should mandate that professional pest control companies and lawn care services not be permitted: to use unprotected water supplies to dilute chemical tank mixes; to clean equipment at a customer's site; or, to leave chemical or chemical containers behind at a job site, whether the site is a residence or commercial site.

The Commonwealth should continue to take measures to reduce the amount of nitrates and pesticides in areas where water supplies are vulnerable to leaching and run-off from lawn and garden chemicals. Currently, much of this work is being done through the



Chesapeake Bay Initiative, however, benefits need to be extended to other parts of the state. Education plays an important part in this effort. All homeowners and applicators should be informed of making proper selection of pest controls in order to reduce the risk of contamination from improperly used pesticides and fertilizers. Both groups should also be encouraged not to apply pesticides and fertilizers prior to or during periods of heavy rainfall or watering.

**Finding #3:** Most homeowners are not fully aware of the amount of nitrogen they apply to their lawns annually, do not read pesticide labels adequately, and are unaware, or do not have an opportunity to obtain further information and education on these subjects either from their local chemical supplier, through the Extension Service, or from other sources. Most obtain some information through newspaper articles.

**Recommendations:** The Commonwealth should fund four (4) integrated pest management Extension agent positions to be placed in four metropolitan areas (Northern Virginia, Richmond/Petersburg, Tidewater, and Roanoke/Lynchburg) to educate the public and professional applicators in new pest controls and pesticide safety.

The Commonwealth should significantly increase funding for the Extension Service to develop environmental and chemical safety educational programs and materials for delivery to the public at the point-of-sale of home and garden chemicals, supplies, and plant materials. The Extension Service should work closely with the industry to develop and deliver this program.

The Commonwealth should significantly increase funding for the Extension Service to expand its existing program to provide the mass media with more information to promote the safe and proper use of pesticides and to encourage the use of alternative pest controls.

The Commonwealth should require that each retail agricultural, home, lawn and garden chemical outlet have sales personnel certified as pesticide applicators in a special retail dealer category. There should be at least one person certified and available to the customers during regular business hours. This would provide customers with a source of consistently reliable information about the products they are buying; something that is not often available at many outlets of home and garden chemicals.

**Finding #4:** Most professional pesticide and fertilizer applicators do not provide the customer enough information about the chemicals they will apply in and around a potential customer's home.

**Recommendation:** The Commonwealth should mandate that the professional applicator be required to: provide detailed information to the client about chemical safety, identity, and characteristics; see that the client removes or protects vulnerable materials, animals and persons from areas prior to treatment; notify the client when the treatment will take place and when it will be safe to enter treated areas; advise the client of any restrictions or limitations regarding watering procedures, clean-up, or re-use of treated areas; and provide a phone number and the name of a contact to call if they have any questions about the treatment. These requirements and an explanation of how they will be met should be provided in printed form to prospective clients prior to their commitment to any initial services and annually for continued services.

**Finding #5:** All pesticide applicators, professional and amateur, need more information and educational opportunities to reach a certain competency level in the necessary use of all pest controls and fertilizers in the residential environment.

**Recommendations:** The Commonwealth should significantly increase funding for the Virginia Tech Extension Pesticide Applicator Training Program to deliver programs to all applicators who seek training and information. The existing program is inadequately funded to support the needs of the public. Part of this funding should be used to expand the current efforts to deliver a statewide continuing education program for pesticide applicator training by satellite directly to business, community colleges, and other facilities to educate applicators on proper use and handling of pesticides and alternative pest controls. The satellite training program is the only one of its kind in the country and over the past several years has been received by over 25 states on eight occasions and has trained over 5,600 pesticide applicators. The expanded program should involve multiple contact hours and professional accreditation.

The Commonwealth should fund one (1) additional faculty position in the College of Agriculture and Life Sciences at Virginia Tech to provide pesticide applicator training directed at clientele in the urban environment - both homeowner and professional pesticide applicator. This position should also include an adequate operating budget to allow for the development of educational materials and programs to support this effort.

The Commonwealth should provide funding to expand the current research being conducted at Virginia Tech to develop computer-based, prescription-form pest control recommendations. The current efforts involve the use of CD-ROM and expert system technology to manipulate large pesticide label databases in order to deliver accurate pest control recommendations to the public. The ultimate goal is to deliver pest control and fertilizer recommendations in a prescription form directly to the user or local Extension office by computer. This research is part of a USDA-Extension funded National Pesticide Information Communication Project (NPICP), a multi-year effort to enhance pesticide information delivery through use of advanced communications technology. NPICP is part of the Virginia Tech Pesticide Information Program.

The Commonwealth should provide a tax incentive to businesses to build or renovate space for on-site classroom instruction, or who install satellite receiving equipment, videotape recorders, monitors, computers, and other audio-visual equipment for the sole purpose of use for employee continuing education. These facilities would allow for direct instruction to pest control technicians and supervisors to encourage best management practices and safety in handling pesticides and fertilizers.

The findings and recommendations of this Committee indicate a number of needs which cannot all be adequately served under the constraints of the current system. If the Commonwealth is to take action to change public behavior when dealing with pesticides and fertilizers and to adequately protect the public and the environment, then a number of steps need to be taken to address this issue. It isn't the purpose of this report to provide a shopping list of needs at Virginia Tech, however, the Virginia Tech College of Agriculture and Life Sciences is the primary source of pesticide and pest control expertise and research in Virginia; its programs in pesticide and pest management are recognized nationally. The overall opinion of the Committee is that the situation within Virginia is caused by misinformation and miscommunication of the issue by the public, pesticide applicators, government officials, and the news media. There are many areas where improvements can be made which could make a significant impact on the situation in order to improve the quality of life in Virginia. These changes have been the focal point of this report.

**APPENDIX A - HOUSE JOINT RESOLUTION NUMBER 62**

The following is a copy of the House Joint Resolution Number 62 as agreed to by the Senate and the House of Delegates of the Virginia General Assembly.

**GENERAL ASSEMBLY OF VIRGINIA -- 1990 SESSION  
HOUSE JOINT RESOLUTION NO. 62**

*Requesting the Virginia Polytechnic Institute and State University Extension Service to study the application practices of lawn chemicals and household and garden pesticides in residential properties and to develop a plan to reduce potential impacts of household and garden pesticides and lawn chemicals in the urban environment.*

Agreed to by the House of Delegates, March 9, 1990

Agreed to by the Senate, March 7, 1990

WHEREAS, the Commonwealth of Virginia is committed to the protection of its natural resources and the safeguarding of the health and welfare of its citizens; and

WHEREAS, a study by the Natural Resources Defense Council states that nonpoint source pollution from applications of lawn chemicals and pesticides threatens 4,000 miles of Virginia's rivers and streams; and

WHEREAS, nitrogen and phosphorous runoff from fertilizers enters storm sewers and finally flows into rivers and streams, resulting in an algae bloom; and

WHEREAS, the threat to human health and welfare from lawn chemicals and pesticides has not been determined; now therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Virginia Polytechnic Institute and State University Extension Service is requested to study the application practices of lawn chemicals and household and garden pesticides in residential properties and to develop a plan to reduce the potential impacts of household and garden pesticides and lawn chemicals in the urban environment.

The Extension Service shall complete its work in time to submit its findings and recommendations to the Governor and the 1991 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.