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ABSTRACT

In 2001, the Environmental Studies Senior Capstone Seminar class at Denison University helped the state of Ohio work to prevent harmful pesticide use in schools. In cooperation with Ohio State University's Integrated Pest Management (IPM) in Schools Program, Denison conducted a statewide survey of school districts to determine current pest management strategies. The 42-item survey asked about school location, fiscal data, and demographics; general practices regarding pest management; pests encountered; and specific practices. The survey was mailed to 595 of Ohio's 607 public school districts, and 213 useable surveys were returned. Results indicated that the per pupil expenditure on pest management ranged from $0.08-$22.73. Most districts spent less than $3 per student per year. Most schools sprayed pesticides at least monthly, relied on the advice of professionals, and provided few warnings when pesticides were applied. Schools were relatively careless about the times they applied pesticides. Few schools used preventive measures for pest control. Some very toxic chemicals were used for nuisance pests. Only about half of the respondents felt their pest management efforts were effective, despite intense use of pesticides and involvement of professionals. Satisfaction with pest control methods was higher among schools utilizing elements of IPM. The survey and survey responses are appended. (Contains 15 references.) (SM)

The Ohio Schools Pest Management Survey: A Final Report

Denison University
Environmental Studies Capstone Seminar
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Introduction

Today when we think about dangers children may face in their schools, our attention tends to be directed by headlines reporting a seeming epidemic of school violence. While this threat to children is undeniably real, our focus here is on a different risk children face in schools, one perhaps less sensational but no less real. Indeed this risk may be more pervasive and pose harm to greater numbers of children: the use of pesticides in schools. While pesticides can serve an important function of reducing or eliminating harmful pests, there should be no mistake that pesticides are poisons intended to harm living things. Many pesticides are applied routinely and even overapplied (Owens and Feldman 2000). Without doubt, children are exposed to them in the school environment, creating reason for concern..

In recent years it has become standard for humans to adopt the ritual of excess. This is no less true with conventional methods of pest management. Often homes, businesses, schools, and public venues are treated for pests too frequently and too heavily. Fortunately, there are alternatives to current pest management practices, which, when applied in places such as schools, will greatly benefit those who spend time there.

Integrated Pest Management (IPM) is a decision-making process where the selection, integration, and implementation of pest control (biological, chemical or cultural) relies on predicted economic, ecological and sociological consequences. IPM programs use information on the life cycles of pests and their interactions with the environment. The information is used to manage pests with the least possible hazard to people, property, and the environment. The basis of IPM methodology is removing some of the basic elements pests need to survive (air, moisture, food and shelter). IPM creates an environment that is unattractive to pests through regular

maintenance, sanitation, and inspection, to find and correct conditions that encourage pests before pests become a problem. IPM also strives to limit the use of pesticides.

The introduction of integrated pest management practices in schools is important for a number of reasons. First, because it reduces the environmental degradation that humans are inflicting upon the earth. Second, IPM techniques are practical in that they are often simply more effective than the conventional methods of pest control. Third, when pesticides are used, it is possible for pests treated to build up a resistance to the chemicals applied. Fourth, integrated pest management practices are also often the most economically feasible option to choose. But the most important reason for adopting the alternative is because of the health risks involved for humans.

The use of pesticides and other chemicals in our schools has remained a largely unnoticed issue until recently, as people now understand just how hazardous the use of these chemicals can be. Although the effects of pesticides on the human body are still not completely understood, one thing that is known is that the dangerous effects of pesticides may not even be completely visible to those who have been exposed. Although single incidents of exposure can be serious enough to lead to poisoning, it is frequent exposure to unnoticeable amounts of chemicals with which we should be concerned. Symptoms of exposure to toxic chemicals may not become apparent until many years after initial exposure (Carson 1962:188). "The biological effects of chemicals are cumulative over long periods of time, and...the hazard to the individual may depend on the sum of the exposures received throughout [one's] lifetime" (Carson 1962:188).

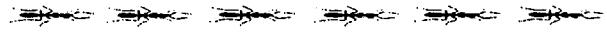
When pests begin to build a resistance to the chemicals used, more pesticides must be used in order to continue to be effective. "Insect, weed and disease pests have the ability to 'learn' and pass their 'schooling' down to their offspring. The learning takes place as a change in

the inherited genetic material within the pest population" (IPM Almanac 2001). In the 1970s, it was realized that the number and diversity of pests showing resistance was increasing worldwide, along with the number of chemicals to which resistance developed (National Academy Press 1986). In order to control pest resistance and avoid the application of higher levels of chemicals, it is necessary to consider adopting IPM strategies.

We should give special consideration to the issue of children and their exposure to pesticides. As explained in Rachel Carson's *Silent Spring*, children are more susceptible to pesticide poisoning than adults (Carson 1962:23). The health risks from pesticides are much greater with children compared to adults because, pound for pound, children ingest more and breathe more potential toxins than adults, especially playing on the ground or floor where chemicals are often applied. Children also have a more rapid metabolism than adults. And because young children's brains and bodies are still developing, they are particularly susceptible to lung damage, and damage to the nervous, endocrine, reproductive, and immune systems (U.S.EPA 2001a).

Although humans tend to pay attention only to short-term effects while ignoring future consequences, this is the most dangerous mentality we can have when dealing with issues such pesticides and harmful chemicals. Pesticides and other chemicals often operate in such a covert manner that humans allow themselves to give chemical exposure no notice until it is too late. This is largely why children are at such high risk – because of the uncertainty and the subtle symptoms of chemical exposure beginning at such an early age. It is imperative that we take as proactive a stance as possible on this issue and combat the problem from the ground up. Families must play their part in improving their pest management practices at home, just as their schools, where children spend a substantial part of their young lives, must act to do the same.

With necessary precautions such as these, we will not only ensure the longevity of our physical environment, but we can, more importantly, ensure the health and safety of our children and future generations.



This spring, our Environmental Studies Senior Capstone Seminar class was presented with the unique opportunity to assist in the efforts of the State of Ohio to prevent harmful pesticide use in schools. In cooperation with the IPM in Schools Program of Ohio State University Extension, we were asked to conduct a statewide survey of school districts to ascertain current pest management strategies. We hoped to gather important information about trends of pesticide use in schools across the state and that would provide direction for the future development of the IPM in Schools Program. The following pages present our detailed findings and utilize them to make a series of recommendations to move the important work of reducing pesticide use in schools forward.

Methods

The survey was designed by several members of the Capstone class to be as thorough yet as concise as possible in order to insure a high response rate from the school districts of Ohio. We used previous surveys from different states and programs (provided by Dr. Margaret Huelsman, Director of the IPM in Schools Program at Ohio State University Extension) as models to draft questions. An initial draft survey was presented to our full class of thirteen who provided additional ideas on what questions to include and how best to phrase them. The final survey instrument included 42 questions regarding information on the schools (location, fiscal data, demographics) general practices regarding pest management, pests encountered and specific practices taken when dealing with these.

Dr. Huelsman prepared an address database for public school districts in Ohio and provided printed address labels for each. She also signed a cover letter that accompanied each questionnaire. Students worked to stuff, stamp, and label envelopes for distribution. Surveys were mailed out to 595 of the 607 public school districts in the state of Ohio on March 5th, 2001. Following the Dillman method (Dillman 2000), about 10 days later, schools also received a postcard reminder asking them to return their questionnaires had they not yet done so. Replacement surveys were sent out to those failing to return theirs from the initial mailing on roughly April 1st.

A total of 213 useable questionnaires were returned. Six students, working in pairs, completed data entry. Spreadsheets were prepared in Microsoft Excel for the organization of numerical data and a Microsoft Word document was created for data entry of open-ended questions on the survey (Questions #18l, 20d, 21, 24, 26, 27e, 28d, 30e, 31h, 34g, 35g, 36d, 37d,

38d, 39c, 40c, 41d, 42). The Demographic information (Questions #1-18) was entered in a separate Excel spreadsheet. After all survey information had been entered in the spreadsheets, the numerical information from questions 18-42 was then transferred to SPSS 9.0, a statistical analysis program for Windows. Descriptive statistics were calculated in SPSS statistical package for all frequency questions. The results of those calculations are presented in the next section.

The next section of the report contains the findings from the survey. Based on these findings, we then make recommendations for implementing IPM in the final part of this paper.

Findings

We provide descriptive statistics to summarize the survey findings. Much of the information presented here is in the form of frequency distributions. Frequencies report the percentage of respondents that selected each option within a given question. In the text here we highlight findings; the full questionnaire with quantitative results is presented in the Appendix.

The first two parts of the questionnaire (Parts A and B) asked for contact and background information on the respondent. The questions in Part A (questions 1-6) were solely used to compile a list of contact information: school, school address, phone, fax and email. Part B asked for demographic information in order to better understand and characterize the survey respondents as a group.

Question 7 in Part B asked the informant's job title/position in the school district. Table 1 shows that the majority of the respondents for this survey were maintenance supervisors; superintendents were also frequent respondents.

TABLE 1: JOB TITLE OF RESPONDENTS

(N = 213)	N	%
Principal	1	0.5%
Superintendent	29	13.6%
Director of Operations; Operations Supervisor	11	5.2%
Director of Business; Business Manager	16	7.5%
Maintenance Supervisor; Facilities Manager;	116	54.5%
Buildings & Grounds Supervisor	9	4.2%
Custodian; Groundskeeper		
Other	31	14.6%

Regardless of position or title, the average length of time that informants had been in their position was 8.43 years. Many of the respondents had job responsibilities that included supervising transportation needs for the school systems as well as overseeing all maintenance and groundskeeping.

The school systems represented by the survey respondents vary widely in size, from those with but one school to the largest school system in the sample, with 122 schools. On average, the districts have just under six schools (5.95). Multiple schools suggest a number of individual buildings, in addition to administration buildings, garages, physical plants, and the like. On average, school districts include 8.53 buildings.

Districts vary dramatically in the number of students they serve. The average number of students per school system in the sample was 3276. The smallest district had 10 students; the largest had 77,000. The per pupil expenditure reported by these school systems is $6025.22, $1000 under the 1999-2000 state average of $7057 (Ohio Department of Education). Respondents report that the average amount spent on pest management per year is $3655.30 (Table 2).

TABLE 2: EXPENDITURES

Per pupil expenditure per year (N = 119)	Average = $6025.22
Amount spent per year on pest management (N = 144)	Average: $3,655.30 (range = $100 - $100,000)

The great majority (66.7%) of schools represented by the survey data classify themselves exclusively as rural, while 5.3% are urban, 16.7% are suburban, and 11.3% are a combination of

two or more of these (Table 3). All schools receiving the questionnaires were public school districts.

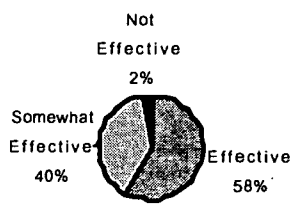
TABLE 3: SCHOOL DISTRICT TYPE

(N = 150)	N	%
Urban	8	5.3%
Suburban	25	16.7%
Rural	100	66.7%
Combination	17	11.3%

In total, the survey respondents represent 213 school districts that in the aggregate serve 655,201 students. Based on an estimate of 1,751,760 enrolled in Ohio public schools, this sample represents 36.4% of Ohio's K-12 students. If the average annual expense for pest management ($3655.30) reported by survey respondents is extrapolated to all 607 Ohio public school systems, we estimate that over 2 million dollars is spent annually on pest control in Ohio schools. In this era of school funding crisis, these are precious dollars. We must act responsibly to spend them in ways that manage pests effectively while protecting the environment and safeguarding the health of children.

When asked to rate the effectiveness of their current pest management practices (Question 19), 2.4% of the respondents said they find their current practices ineffective and 57.5% said their current practices are effective. In between, 40.1% deemed their current pest management strategies "somewhat effective" (Figure 1).

Figure 1: Effectiveness of Current Practices



Question 18 asks for information regarding what pest management strategies are used and how frequently they are employed. These data are reported in Table 4 and Figures 2 and 3.

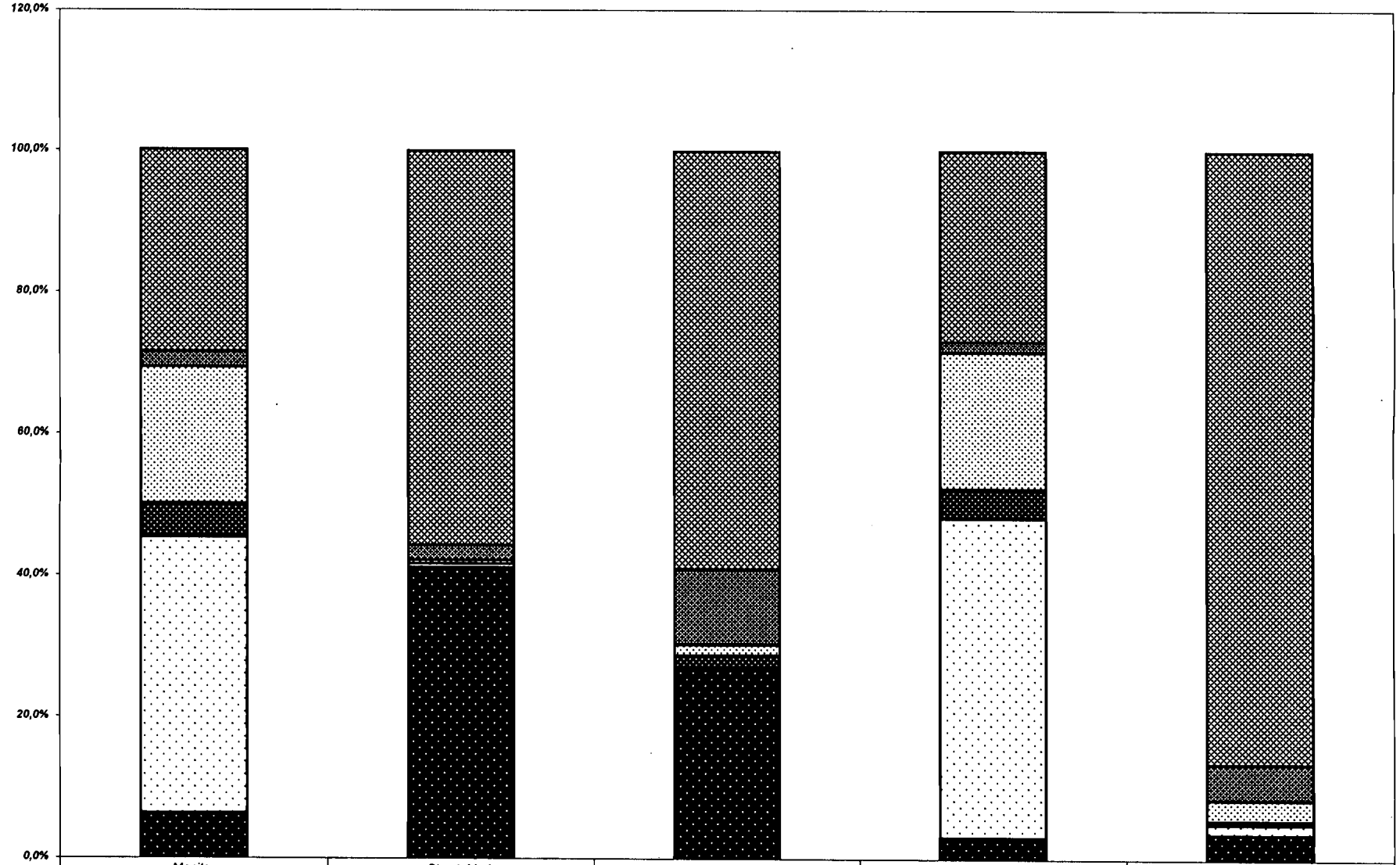
TABLE 4: How often does your district use the following methods to manage pests?

	N	Never	Daily	Weekly	Monthly	Yearly	As Needed
a. Spraying pesticides	198	9.1%	0.0%	0.0%	43.4%	6.1%	41.4%
b. Traps and baits	201	3.5%	5.5%	2.5%	22.4%	2.5%	63.7%
c. Fogging	192	60.4%	0.0%	0.0%	0%	2.1%	37.5%
d. Physical removal (vacuuming)	188	21.8%	29.3%	2.7%	0.5%	0.5%	45.2%
e. Monitoring	192	6.3%	39.1%	4.7%	19.3%	2.1%	28.6%
f. Structural Modifications	185	41.1%	0.5%	0.0%	0.5%	2.2%	55.7%
g. Education of students, teachers & staff	188	27.1%	0.0%	1.6%	1.6%	10.6%	59.0%
h. Sanitation/ food storage	197	3.0%	45.2%	4.1%	19.3%	1.5%	26.9%
i. Institute school rule/policy	176	26.1%	7.4%	0.0%	0.6%	8.5%	57.4%
j. Fencing	181	42.0%	1.7%	0.6%	1.1%	2.2%	52.5%
k. Limiting pest access	199	3.5%	1.5%	0.5%	3.0%	5.0%	86.4%
l. Other methods	63	33.3%	7.9%	1.6%	3.2%	0.0%	54.0%

We can distinguish between strategies which are aimed at *preventing* pests and those which are a *response to their presence*. Monitoring, structural modifications, education, sanitation, and limiting access are all preventive measures. As shown in Figure 2, attention to sanitation and limiting access are frequent preventive practices, and monitoring is also viewed as an ongoing preventive step. Education, while seen by some as part of a pest management strategy, is clearly not universally viewed in this way: More than one-fourth of respondents report that they "never" use education of students, teachers, and staff as a pest management method.

Once pests are believed to be present, or as part of routine treatment for them, schools may rely on spraying, trapping or baiting, fogging, physical removal, or fencing to eliminate

Figure 2: Frequency of Use of Various Pest Prevention Practices



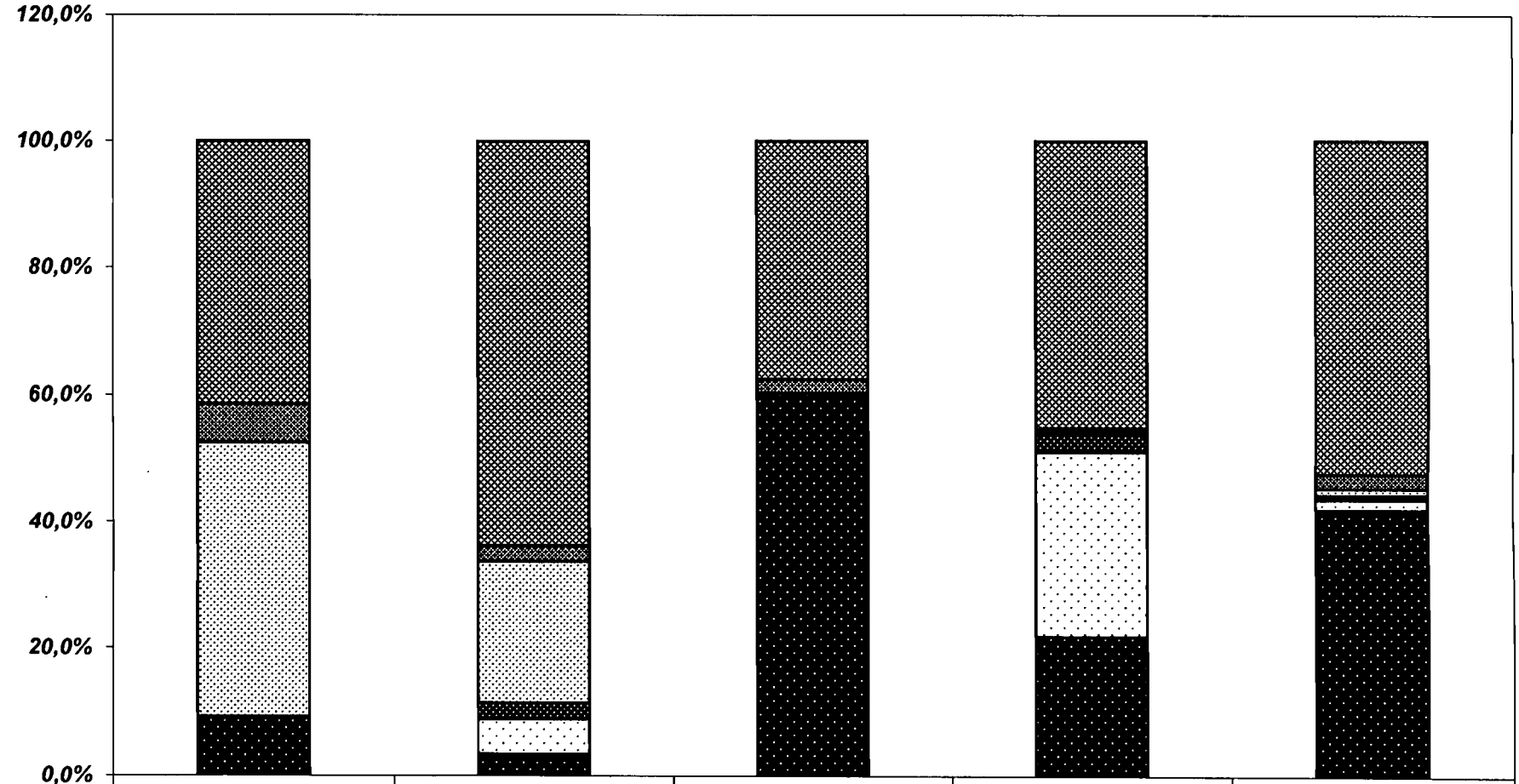
	Monitor	Struct. Mod.	Educate	Sanitation	Limit Access
As Needed	28,6%	55,7%	59,0%	26,9%	86,4%
Yearly	2,1%	2,2%	10,6%	1,5%	5,0%
Monthly	19,3%	0,5%	1,6%	19,3%	3,0%
Weekly	4,7%	0,0%	1,6%	4,1%	0,5%
Daily	39,1%	0,5%	0,0%	45,2%	1,5%
Never	6,3%	41,1%	27,1%	3,0%	3,5%

them. All of these are commonly used at least on an "as needed" basis. Spraying is routinely done monthly by numerous school districts: of 198 schools responding to this question, 43.4% report that they spray monthly, and an additional 41.4% spray as needed (Table 4 and Figure 3). Less than 10% report that they "never" spray. Traps and baits are also frequently used to manage pests: 63.7% of respondents (out of N = 201) use these "as needed" and 22.4% do so monthly. Pests may also be removed "as needed" (45.2% out of 188 responding) and often daily (29.3%). Over half the school systems (52.5% out of 181 responses) rely on fencing. The least popular method of pest management among those mentioned on the questionnaire is fogging: over 60% (from N = 192) report that they "never" fog, although a significant proportion (37.5%) do so "as needed."

Thus, respondents spray, monitor pests, and attend to sanitation and food storage in order to manage pests on a regular basis (most respondents answered to daily, weekly, monthly or yearly). Traps and baits, physical removal, structural modifications, education of students and staff, school rules/policies, fencing and limiting pest access to food, water, and shelter as well as other methods are mostly used on an as-needed basis. All methods of pest control used by some (even many) schools on as "as needed" basis. Unfortunately, it is impossible to interpret precisely the frequency implied by "as needed."

When pesticides are used, they are "usually" applied by contracted pest control operators (Question 20). School maintenance staff are also involved in applying pesticides at least occasionally (though not "usually") (Table 5). Teachers and other staff almost never apply pesticides.

Figure 3: Frequency of Use of Various Pest Management Practices



	Spray	Traps/Baits	Fog	Removal	Fencing
As Needed	41,4%	63,7%	37,5%	45,2%	52,5%
Yearly	6,1%	2,5%	2,1%	0,5%	2,2%
Monthly	43,4%	22,4%	0,0%	0,5%	1,1%
Weekly	0,0%	2,5%	0,0%	2,7%	0,6%
Daily	0,0%	5,5%	0,0%	29,3%	1,7%
Never	9,1%	3,3%	60,4%	21,8%	42,0%

TABLE 5: When pesticides are applied, who typically applies them?

		Never				Usually
	(N)	1	2	3	4	5
School maintenance/custodial staff	167	21.6%	35.3%	19.2%	6.6%	17.4%
Contracted pest control operator	194	6.7%	1.0%	6.2%	4.6%	81.4%
Teacher and/or other staff	129	87.6%	8.5%	1.6%	0.8%	1.6%
Other: (see appendix)	16	87.5%	12.5%	0.0%	0.0%	0.0%

Respondents were asked to indicate the level of training required for individuals who apply pesticides in the school district (Question 21). A total of 94 respondents replied to this open-ended question (see appendix). Just over 11% of the people applying pesticides are certified/licensed, and an equal proportion are explicitly not trained. Compliance with OSHA standards was mentioned in only about 2% of responses, while following requirements of the Material Safety Data Sheet (MSDS) was mentioned in 9.6% of responses. Also in 9.6% of responses was reading label directions explained as the "required training." 18% mentioned some other form of training (e.g., "in service from manufacturing company," "follow instructions of PCO"), while 8.5% said that they only use over the counter products.

The survey instrument also gathered information about pest management policies. From 187 respondents to Question 22, only 8% (15) indicated that they have a written pest management policy. This small number provided additional information about their policy.

Respondents were asked to indicate who among a list of possibilities is aware of the policy (Table 6). It would appear that maintenance staff and pest control operators are the primary audience for the policies, with two-thirds of responding schools indicated awareness on the part of the PCOs and nearly three-fourths report that their maintenance staff is aware of the

policy. Less than half of teachers are aware, one-fifth of parents are, and even fewer students have knowledge of pest management policies in their schools.

TABLE 6: For those with a written policy, who is aware of the policy? *(Please check all that apply)* (N = 15)	
Maintenance/Custodial staff	73.3%
Parents	20.0%
Students	13.3%
Teachers	40.0%
Pest control operator	66.7%

For those schools with written policies, they have been in place an average of 4.3 years (with a range from 0.75 years to 20 years).

Schools were also asked whether or not they keep written pest management records. We found that the responding 194 schools systems are nearly evenly split: 49.5% do not maintain such records while 50.5% do.

Thus it appears that in only a few instances, at most, might a school have a written policy to guide them in deciding either when to apply pesticides or what kind of pesticide to use. The questionnaire asked explicit questions regarding these decisions (Tables 7 and 8).

TABLE 7: How does your school district decide *when* a pesticide should be applied in or around a school? (N = 210)	
Advice of a contracted pest control operator	67.6%
Based on criteria established by school district	11.4%
School maintenance/custodial staff decision	58.1%
Other: (see appendix)	10.0%

The decision of when to apply pesticides on schools grounds is mainly based on the advice of a professional pest control operator (67.6%) or on the advice of building maintenance staff (58.1%). Likewise, when schools need to determine which pesticide to use, they rely on the recommendations of contracted pest control operators in nearly every instance (91.0%). Less common "other" sources for this decision include recommendations from salespeople, and safety considerations (see appendix).

TABLE 8: How does your district decide *what* pesticide product to use? (N = 211)

Recommendations of contracted pest control operator	91.0%
Select from a list approved for use by the district	9.0%
Product price	3.3%
Based on toxicity/signal word	14.7%
Other: (see appendix)	11.4%

Once a school has decided to use a pesticide, personnel must also determine when to conduct the application (Table 9).

TABLE 9: Which of the following are true for your school district?

		Never true				Always true
	N	1	2	3	4	5
Pesticides are used in the evenings.	178	9.0%	5.6%	20.2%	28.1%	37.1%
Pesticides are applied in the mornings before school.	147	60.5%	12.2%	12.9%	6.1%	8.2%
Pesticides are used on weekends or during vacations.	175	9.7%	8.0%	20.0%	28.6%	33.7%
After the application of pesticides, people are kept out treated areas	119	9.2%	5.0%	21.8%	22.7%	41.2%

Many respondents use pesticides in the evening (65.4% indicated a "3," "4," or "5"), but an even larger percentage apply pesticides during weekends and school vacations (82.3% answered with a "3," "4," or "5"). A small percentage (14.3%) use pesticides almost always or always in the mornings before school. A large number of respondents indicate that they usually keep people out of treated areas after pesticides are applied; when this is done, the average length of time that people are kept out of the area is a little less than a day (22 hours). While the range is from a half hour to a week, only three school systems restrict access for more than 48 hours.

Survey respondents were asked if their school provides warnings before pesticide applications. 71.7% of respondents said they do not, while 28.3% said they do provide warnings (Table 10). Those that responded that they do provide warnings were asked to elaborate and indicate who is provided notification (Table 11). 87.0% said that they notify teachers and staff, and 35.2% notify students. The "general public" is notified more commonly than is notice targeted specifically to parents.

TABLE 10: Does your school district provide warnings (written or other) before pesticide application? (N = 191)

No	71.7%
Yes	28.3%

TABLE 11: If yes, who is notified? ***(Please check all that apply)*** (N = 54)

Teachers & Staff	87.0%
Parents	11.1%
Students	35.2%
General public	18.5%

Those who indicated they provide warnings were also asked how such warnings are communicated (question 31). The most common methods mentioned were posting signs in treated areas and placing notes in staff mailboxes (Table 12). Posting signs as school entrances and blocking off treated areas are also occasionally used. More schools send notes to *all* parents than to parents who have made special requests for this information. When giving warnings about pesticide application, respondents usually announce these warnings verbally.

TABLE 12: If yes, how are notices or warnings given? *(Please check all that apply)*
(N = 54)

Signs posted at school entrance	18.5%
Signs posted in treated areas	35.2%
Notes in staff mailboxes	37.0%
Treated areas blocked off	13.0%
Notes sent to all parents	9.3%
Notes sent to parents that request them	1.9%
Verbal announcements	59.3%
Other (see appendix)	11.1%

Additionally, respondents were asked about their familiarity with integrated pest management (IPM). Of 204 respondents to this question 72.1% (147 of them) said they were not familiar with this way of managing pests while 27.9% (57) said they are familiar with it (Table 13).

TABLE 13: Are you familiar with integrated pest management (IPM)?
(N = 204)

No	72.1%
Yes	27.9%

When asked if these practices are part of the school district's pests management strategy, 127 respondents answered. That more respondents would assess whether or not IPM is part of the school's pest management strategy than claimed familiarity with it (127 versus 57) suggests that respondents in general had only a vague understanding of IPM and may not have been able to respond reliably to the second question.

To get a better handle on this issue, we separated out those who responded to the question of whether or not their schools used IPM practices: 47.2% (60) responded that they did not and 53.3% (67) responded that these practices were part of the district's strategy. Looking only at those who claimed to be familiar with IPM (54 out of these 57 responded to Question 33), we find that 86.8% of those who are familiar with IPM claim that IPM is also part of the school district's pest management strategy. Thus, those who know about IPM seem to use it.

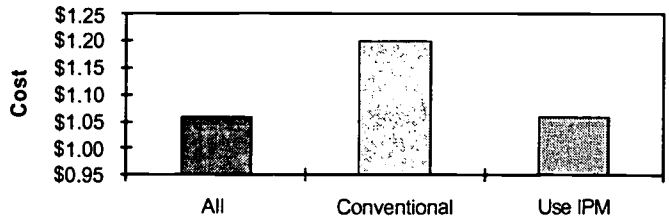
TABLE 14: Are these practices part of your school district's pest management strategy?

(N = 127 – all responding to question)	
No	47.2%
Yes	52.8%
(N = 53 – those answering "yes" to familiarity with IPM and responding to this question)	
No	13.2%
Yes	86.8%

This question also allows us to explore possible financial implications of the use of IPM. We calculated the annual cost of pest mana gement per student for all schools that reported both a total expenditure on pest management (question 15) and number of students in district (question 13). 114 out of 213 respondents provided information that allowed us to make this calculation.

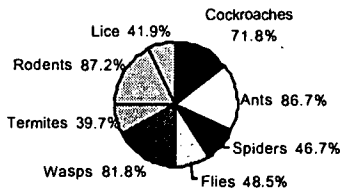
We found that between \$0.08 and \$22.73 is spent per student per year on pest management[1], with an average figure of \$1.06 (Figure 4). The vast majority (96%) of schools spend under \$3.00 per student per year for pest management (87% spend less than \$2.00). However, if we look only at those districts that claim to use IPM as part of their pest management practices (N = 49), the average cost per pupil is an identical \$1.06 per year, while those who do not use IPM (N = 38) spend an average of \$1.20 per year per student on pest management. A difference of means test shows that this difference is not statistically significant. Therefore, there does not appear to me a meaningful cost difference associated with the use of either conventional or IPM means of pest control.

Figure 4: Cost (per pupil) of Pest Management



The last section of the questionnaire asked school district informants to report whether or not they had a problem with eight commonly encountered pests. The eight pests were cockroaches, ants, spiders, flies, mice, termites, rodents, and lice. The pest problem most frequently

Figure 5: Pests Encountered by Schools



[1] The maximum figure of \$22.73, while correct, is an outlier in the dataset and is excluded from the following analyses. The district reporting that figure has few students but puts significant monetary resources into pest management. Thus, spread among a small student population, the cost per student is extremely high.

encountered by respondents is rodents (87.2% find them to be a problem), but ants (86.7%) and wasps (81.8%) are nearly as problematic (Figure 5). Cockroaches are a common concern – 71.8% of respondents encounter them, while spiders, flies, termites, and lice are considered to be pest problems in fewer than half of schools responding.

We also asked informants to indicate what type of treatment is used and how frequently (daily, weekly, monthly, annually, as needed) it is used. Respondents were provided a list of commonly used chemicals (and brand names) and were asked the frequency with which they are used, indicating as many of these as appropriate. Unfortunately we found that respondents seemed to have trouble in responding to this query, which presented challenges for us as well in coding the data. Many of the responses they provided fell under the "other" category and thus could not be coded under the existing quantitative format. Thus we adopted a very conservative approach in analyzing this portion of the dataset, and consider the results reported here on chemical use to be preliminary and tentative. We have simply recorded the use of each chemical for each specific pest on a "use/do not use" basis, with no attempt to detail the frequency of use (Table 15).

TABLE 15: CHEMICALS USED TO TREAT PESTS

Cockroaches	**N = 103**	**Number Schools That Use**
Tralomethrin (No Pest Indoor Fogger)		8
Cyfluthrin (Bayer Home Pest Control)		5
Tetramethrin (Hot Shot)		6
Tralomethrin (Spectracide Bug Stop)		7
Sulfluramid (Max Attax)		8
Other (see appendix)		61

Ants	**N = 124**	**Number Schools That Use**
N-ethyl Perfluorooctanesulfonamide (Max Attax)		12
Tetramethrin (Hot Shot)		14
Tralomethrin (Spectricide Bug Stop)		8
Cyfluthrin (Bayer Home Pest Control)		12
Diazinon (No Pest)		16
Other (see appendix)		68

Spiders	**N = 64**	**Number Schools That Use**
Tetramethrin (Hot Shot)		15
Tralomethrin (Spectricide Bug Stop)		11
Other (see appendix)		40

Flies	**N = 63**	**Number Schools That Use**
Tralomethrin (Spectricide Bug Stop)		19
Other (see appendix)		37

Wasps	**N = 117**	**Number Schools That Use**
Diazinon (Ortho Hornet and Wasp Killer)		58
Tralomethrin (Spectracide Wasp Killer)		28
Other (see appendix)		35

Termites	**N = 56**	**Number Schools That Use**
Sulfluramid (Spectracide Terminate)		17
Other (see appendix)		30

Rodents	**N = 123**	**Number Schools That Use**
Brodifacoum (D-Con, Mouse Kill)		61
Other (see appendix)		60

Lice	**N = 52**	**Number Schools That Use**
Lidane		14
Pyrethroids		13
Other (see appendix)		23

Discussion of Major Findings

> The public's concerns about health and environmental risks associated with chemicals are increasing, particularly when children are involved. As the public becomes more aware of the health and environmental risks pesticides may pose, its interest in seeking the use of equally effective alternative pest control methods increases. School administrators and other persons who have pest control decision-making responsibilities for school buildings and grounds should become aware of the pest control options available to them. It is in everyone's best interest to reduce exposure to potentially harmful chemicals.
>
> U.S.Environmental Protection Agency, an excerpt from "Pest Control in the School Environment: Adopting Integrated Pest Management"

The responses from 213 public schools in Ohio yielded telling, and in some cases alarming, information about pesticide management in our state. The per pupil expenditure on pesticide management varied considerably across districts, ranging from $0.08 to $22.73, while the vast majority spent less than $3.00 per student per year. The average amount of money spent on pesticide management per student was $1.06. The demographics of schools responding to the survey were varied, and wide ranges on items such as per student expenditure, number of students in district, and number of schools in district suggest that there is not a "one-size-fits-all" solution to pesticide management in Ohio schools.

Our findings indicate that most Ohio Schools spray pesticides on at least a monthly basis, rely on the advice of professionals, and few provide warnings when pesticides are applied. It is uncommon for schools to use preventive measures, such as structural modifications, educating students and staff, and implementing school rules or policies, as a means of pest control. Surprisingly, despite the intense use of pesticides and the involvement of professionals, only slightly more than half of the survey respondents felt that their pest management efforts were effective. Notably, satisfaction with pest control methods (question 19) seems higher among those schools that utilize elements of IPM than those that do not (question 33). Among those

school systems that do not use IPM, only 36% rated those methods as "effective," versus 68% among those school system that do use IPM (Table 16).

TABLE 16: ASSESSMENT OF EFFECTIVENESS OF PEST CONTROL METHODS FOR THOSE THAT DO AND DO NOT USE IPM

Effectiveness	Do not use IPM	Do Use IPM
Effective	21 (36%)	45 (68%)
Somewhat Effective	35 (59%)	20 (30%)
Ineffective	3 (5%)	1 (1.5%)

This suggests that more effective means of pest management are needed because those utilizing conventional methods are not satisfied with the results. And, as noted earlier, they are paying more for pest management than those who incorporate IPM into their practices. For unsatisfied schools wishing to do something different, there are educators and experts who provide opportunities for schools to implement safer means of pest control. Resources for schools wishing to change their current practices are discussed in the next section.

Trends in pesticide use in Ohio schools indicate that some very toxic chemicals are used for nuisance pests. Recognizably, some insects are vectors for disease, such as cockroaches, and their presence in schools can lead to health problems. But, nuisance pests, such as sugar ants, are not a health hazard. The chemicals used to eliminate such pests pose much more serious health risk. Although we are unable to provide detailed analysis of chemical use, our preliminary results suggest that 62 out of 213 schools (29% of responding school systems) use diazinon to control ants. If this figure is representative of all Ohio school systems – and we have no reason to think that it is not -- that means that over one half million of Ohio children may be exposed to

diazinon, a known carcinogen, while at school. Due to the danger of this chemical, beginning in December of last year it is being phased out over a four-year period. The National Coalition Against the Misuse of Pesticides asserts that there are less toxic and non-toxic alternatives available to diazinon users, and it is therefore "wrong and unnecessary to allow its use to be continued" (Beyond Pesticides/NCAMP 2000:1). The effects of diazinon include long term health problems, especially reproductive, and it has adverse effects on the nervous system (Beyond Pesticides/NCAMP 2000:1). Furthermore, children who have been exposed to household insecticides and professional extermination methods within the home are three to seven times more likely to develop non-Hodgkin lymphoma (NHL) compared with children who have not been exposed to pesticides (American Cancer Society 2000). These statistics, and many others published every year, stress the need to reduce pesticide use in schools, *especially* when pests are mere nuisances and do not threaten the health of children.

Our findings also indicate that schools are being relatively careless about the time that pesticides are applied in schools. Many seem to think that applying pesticides in the evening, and keeping children and others out of the area for an hour to 24 hours is sufficient to protect health. Research on the pesticides indicates their persistence in carpets, rugs, furniture, and other materials. In addition, there are many pesticides that should not even be used in the presence of children, such as carcinogens, endocrine disrupters, reproductive toxins, developmental toxins, neurotoxins, and pesticides listed by the EPA as a toxicity category I or II pesticide (Owens and Feldman: 1998).). Of the 48 most commonly used pesticides in schools: 22 can cause cancer, 26 can adversely affect reproduction, 31 are nervous system poisons, 31 can cause liver/kidney damage, and 16 can cause birth defects (Owens and Feldman: 1998). There is certainly no "good time" to apply pesticides, but when everyone is away (ie: summer vacation), is preferable.

Schools cannot always wait to apply pesticides (ie: infestations). This demonstrates how important it is to have a coherent, practice that emphasizes prevention so that schools can minimize the occurrence of "crises" that force the use of pesticides at inappropriate times.

Also, most schools do not provide warnings when pesticides are applied (Table 10). This is a small, but very important step to protecting the health of children and others who come into contact with pesticides. Studies show that parents are often unaware of health hazards in schools. Parents, teachers, and others have a right to know about the health and safety risks to children in schools, and it is the responsibility of pest management decision-makers to provide notification. Currently, laws do not mandate that schools give advanced notification of pesticide use (Child Proofing 2001), the results of which can be severe. Research indicates over 2,300 reported pesticide poisonings in schools between 1993 and 1996 (Owens and Feldman 1998). Parents have a right to know information about the types of pesticides applied in their children's schools, the times that pesticides are applied, and the severity of their health implications.

This discussion highlights some of the biggest pest management problems in schools today. Responses to a statewide survey indicate the need to take proactive measures to ensure the safety of school-aged children. Some of the steps that must be taken require significant changes, such as modifying current policies to incorporate least toxic pest management strategies. But others are very simple to implement, for example, providing advanced notification of pesticide use and applying pesticides during times of the year when students are not present. The next section points out some steps that schools can take to move in the direction of using integrated pest management

Recommendations

This section includes both specific recommendations based on survey results, and more general advice on pest management strategies from the literature on this topic. The purpose of this section is to show that, based on the recommendations of established IPM programs, and quantitative survey results, schools in Ohio should convert to least toxic pest management policies. This section of the report discusses initial steps that schools might take in order to implement this philosophy and these practices, including the advice of professionals.

Rural Action is a group organized to promote economic, social, and environmental justice in Appalachian Ohio. Rural Action Safe Pest Control Program itemizes the essential components of a good school policy, including:

(a) assigning specific roles to decision-makers
(b) clear communication
(c) on-going education and training
(d) pest-specific tolerance levels
(e) regular inspections and record-keeping
(f) monitoring
(g) guidelines and procedures for pesticide use and application
(h) multi-tactic pest management based on a knowledge of pest biology
(i) follow-up and assessment procedures
(j) site specific objectives and plans
(k) long-term pest prevention goals
(l) consistent record-keeping
(m) on-going assessment
(n) establishment of an IPM committee
(o) development of a policy statement
(p) putting everything in writing, and
(q) creating a resource library (Ohio Rural Action 2000).

While all of Rural Action Safe Pest Control Program's recommendations are necessary for an extensive and holistic school policy, the recommendations in this report emphasize aspects of this list that the statewide survey results suggests are the top priorities for schools in Ohio with

regard to pest management (Ohio Rural Action 2000). Analysis survey responses indicates that schools in Ohio need to focus their efforts on three main areas: (1) policy development, (2) education about integrated pest management, and (3) improved communication through notification and information dissemination.

Policy Development

A written pest management policy is the foundation for implementation at the county or school district level. The establishment of such a policy allows for greater control over decision-making concerning pesticides in the case that they must be used, monitoring efforts within schools, and integration in the curriculum. Ninety-two percent of the respondents reported that their districts did not have a written policy. This confirms the need for the development of such policies throughout the state. The Environmental Protection Agency recommends that schools developing official policy statements for pest management should state the intent of the administration implementing the IPM program, provide guidance on specific expectations for the IPM program, and decide how an IPM program will be incorporated into the existing pest management strategy (U.S. EPA 1993). Educational programs for the students, staff, and pest manager are crucial for the integration of the IPM.

In order to assure the development of a policy and the follow-through necessary to implement integrated pest management practices, districts should name coordinators and form advisory committees. Coordinators would provide the administrative support necessary and an advisory committee might develop their school's pest strategy. It is important that a pest management policy includes a commitment to the implementation of least toxic methods of pest

control, specifies the overall objectives, and serves as a guide to pest management decision-making in the district.

Education about Integrated Pest Management

Over seventy-two percent of the districts surveyed reported that they are not familiar with integrated pest management practices (Table 13). However, nearly 87% of the respondents who are familiar with the concept integrated these practices into the district's management strategy. This statistic suggests that integrated pest management works – those who understand it also use it. Moreover, those that use it are generally pleased with its results (Table 15), and spend less than those who do not incorporate IPM strategies. Integrated pest management results in the reduction of harmful chemical use, and the substitution of biological and cultural means of control when they apply. These findings suggest that Ohio Schools look favorably upon IPM when they understand the concept. However, most schools need to be educated before they can implement these policies because they are not familiar with this philosophy. The majority of survey respondents contracted with pest control operators for the application of pesticides. A next step for the IPM in School Program might be to target pest control operators because they are responsible for pest management in most schools. Education explaining the effectiveness of IPM is essential to the integration of these practices in school districts. Pest control operators and school districts are in a position to work with one another to find the most safe and cost-effective means of pest management. Effective integrated pest management requires that school officials, parents, students, administrators, and staff understand methods of pest management.

Improved Communication

Over 70% of the surveys respondents said that they do not provide warning before pesticides are applied (Table 10). Respondents admitted that parents are rarely notified when pesticides are applied at schools. In fact, of those who *do* provide warnings, 11% of the schools surveyed notified parents, but for *all* respondent school systems, this proportion falls to but 2.8% of schools . The general public and students are also less frequently notified. When such notices are given, verbal announcements were the most common means of notification.

In the event that pesticides have to be used, schools must provide warnings about the application. Education and information dissemination is central to pest management. It allows us to rethink the way that we view pest problems in our schools to implement safer, more environmentally conscious alternatives. Perhaps one of the most severe problems with pesticide use in schools is that public is rarely notified when pesticides are used. Pesticide use in schools is hazardous not only to students and others who come in direct contact with chemicals, but to the public at-large. As previously stated, parents are seldom to never told about pesticide application in their children's schools. Parents are not able to make informed decisions regarding their children's attendance and participation in activities that may take place in or near the vicinity where pesticides have been applied, thereby exposing their children to harmful chemicals (Small 1997:3).

Conclusion

As our work concludes, a possible new chapter in school pesticide use begins. The School Environment Protection Act (SEPA) has been included in legislation passed by the U.S.

Senate and now goes on to the House of Representatives. If this bill becomes law, it will promote safer pest management in schools. Key previsions of the bill call for notification to parents prior to the use of pesticides, adoption of pest management strategies which emphasize alternative (non-chemical) methods, and establishment of a 24-hour re-entry period following spraying. As we have shown here, there are all areas in which Ohio schools can make large changes at small or no cost, changes which will improve the health and well-being of students.

IPM is endorsed by U.S. Environmental Protection Agency, National Education Association, American Public Health Association, National PTA, and many statewide groups. Some states, including Pennsylvania, West Virginia, Texas, Maryland, Michigan, and New Jersey mandate IPM programs in public school (US EPA 2001b). Yet, when making efforts to start IPM programs intended to reduce pesticide use in a school system the ease of implementation must be considered.

Maintenance workers, supervisors of buildings and grounds, and teachers already have substantial workloads. Proponents of integrated pest management need to focus on turning theory into practice. Diffusion of this philosophy will occur most rapidly if least toxic methods of pest control are easily substituted for conventional methods of pest control. There are resources available to schools interested in IPM that will facilitate the integration of these ideas and make less work for personnel. The U.S. Environmental Protection Agency is showing their support for integrated pest management by offering a grant to Purdue University and Texas A & M. Purdue is serving as the regional IPM support network for the Midwestern states (U.S. EPA 2001b). Florida University has also conducted a considerable amount of research on IMP, and their resources include educational presentations, technical information, vital information for

administrators, curricular resources, information for parents and faculty, and a comprehensive list of resources organized by location and subject (University of Florida n.d.).

There are also resources right here in Ohio to help ease the transition to least toxic methods of pest control. As mentioned in the introduction, Margaret Huelsman can be contacted at Ohio State as the director of the School IPM Program. The following are pest control operators that use integrated pest management practices. Specializing in school IPM and servicing Ohio, EnviroSafe, Inc. covers all pests, including head lice. EnviroSafe, Inc., can be contacted at 800/226-0418, or via email at Envirosafe@aol.com. Naturalawn of America is on outdoor pest control contractor that provides IPM services to schools, and they can be contacted at 330/644-5991.

Appendix A:
Summary Survey Results

Ohio State University Pest Management Survey

The purpose of this questionnaire is to collect information from school districts in Ohio on pest management practices. This study is part of an effort to assess the situation in the state, and to help us understand current practices and future possibilities for pest management.

Thank you in advance for your participation.

A. Contact Information

1. Name:_____ 2. School:_____

3. Address:_____

4. Phone #:_____ 5. Fax #:_____

6. Email:_____

B. Background Information

7. Job title (N = 213)

Principal	**0.5%**
Superintendent	**13.6%**
Director of Operations; Operations Supervisor	**5.2%**
Director of Business; Business Manager	**7.5%**
Maintenance Supervisor; Facilities Manager; Buildings & Grounds Supervisor	**54.5%**
Custodian; Groundskeeper	**4.2%**
Other	**14.6%**

8. Number of years in current position (N = 209) — **average = 8.43 (range = 0.4 – 30.0)**

9. Job responsibilities

10. Number of schools in district (N = 210) — **Average = 5.95 (range = 1 – 122)**

11. Number of buildings in district (N = 209) — **Average = 8.53**

12. Number of maintenance/custodial staff in district — **n/a**

13. Number of students in district (N = 200) — **Average = 3276 (range = 10 – 77,000)**

14. Per pupil expenditure per year (N = 119) — **Average = $6025.22**

15. Amount spent per year on pest management (N = 144) — **Average: $3,655.30 (range = $100 - $100,000)**

16. Age range of buildings in district (N = 195) — **171 years old-just built**

17. School district type (N = 150) — **Urban : 5.3%, Suburban: 16.7%, Rural: 66.7%, Combination: 11.3%**

All schools in survey population are public

C. Pest Management Practices

18. **How often does your district use the following methods to manage pests?**

	N	Never	Daily	Weekly	Monthly	Yearly	As Needed
a. Spraying pesticides	198	9.1%	0.0%	0.0%	43.4%	6.1%	41.4%
b. Traps and baits	201	3.5%	5.5%	2.5%	22.4%	2.5%	63.7%
c. Fogging	192	60.4%	0.0%	0.0%	0%	2.1%	37.5%
d. Physical removal (vacuuming)	188	21.8%	29.3%	2.7%	0.5%	0.5%	45.2%
e. Monitoring	192	6.3%	39.1%	4.7%	19.3%	2.1%	28.6%
f. Structural Modifications	185	41.1%	0.5%	0.0%	0.5%	2.2%	55.7%
g. Education of students, teachers & staff	188	27.1%	0.0%	1.6%	1.6%	10.6%	59.0%
h. Sanitation/ food storage	197	3.0%	45.2%	4.1%	19.3%	1.5%	26.9%
i. Institute school rule/policy	176	26.1%	7.4%	0.0%	0.6%	8.5%	57.4%
j. Fencing	181	42.0%	1.7%	0.6%	1.1%	2.2%	52.5%
k. Limiting pest access	199	3.5%	1.5%	0.5%	3.0%	5.0%	86.4%
l. Other methods	63	33.3%	7.9%	1.6%	3.2%	0.0%	54.0%

Please specify other methods used: *(see Appendix B)*

19. **How effective would you rate the current pest management practices of your district?** (N = 207)

Effective	57.5%
Somewhat effective	40.1%
Ineffective	2.4%

20. **When pesticides are applied, who typically applies them?**

	(N)	Never 1	2	3	4	Usually 5
a. School maintenance/custodial staff	167	21.6%	35.3%	19.2%	6.6%	17.4%
b. Contracted pest control operator	194	6.7%	1.0%	6.2%	4.6%	81.4%
c. Teacher and/or other staff	129	87.6%	8.5%	1.6%	0.8%	1.6%
d. Other: *(see Appendix B)*	16	87.5%	12.5%	0.0%	0.0%	0.0%

21. **If district employees apply pesticides in your school, what level of training is required?**
See Appendix B

22. **Does your school have a written pest management policy?** (N = 187)

No	92.0%	*(If no, skip to question 25)*
Yes	8.0%	

23. **If yes, who is aware of the policy?** ***(Please check all that apply)*** (N = 15)

a. Maintenance/Custodial staff	73.3%
b. Parents	20.0%
c. Students	13.3%
d. Teachers	40.0%
e. Pest control operator	66.7%

24. **If yes, how long has the policy been in place?** Average = 4.3 years (range = 0.75 – 20 years)

25. **Does your school district maintain written pest management records?** (N = 194)

No	49.5%
Yes	50.5%

26. **How does your school district decide *when* a pesticide should be applied in or around a school?** (N = 210)

Advice of a contracted pest control operator	67.6%
Based on criteria established by school district	11.4%
School maintenance/custodial staff decision	58.1%
Other: (*see Appendix B*)	10.0%

27. **How does your district decide *what* pesticide product to use?** (N = 211)

Recommendations of contracted pest control operator	91.0%
Select from a list approved for use by the district	9.0%
Product price	3.3%
Based on toxicity/signal word	14.7%
Other: (*see Appendix B*)	11.4%

28. **Which of the following are true for your school district?**

		Never true				Always true
	N	**1**	**2**	**3**	**4**	**5**
Pesticides are used in the evenings.	178	9.0%	5.6%	20.2%	28.1%	37.1%
Pesticides are applied in the mornings before school.	147	60.5%	12.2%	12.9%	6.1%	8.2%
Pesticides are used on weekends or during vacations.	175	9.7%	8.0%	20.0%	28.6%	33.7%
After the application of pesticides, people are kept out of treated areas.	119	9.2%	5.0%	21.8%	22.7%	41.2%

If people are kept out of treated areas, for how long? (N = 93) Average = 22 hours
(*See also Appendix B*) (range = 0.5 – 168 hours)

29. **Does your school district provide warnings (written or other) before pesticide application?** (N = 191)

No	71.7%
Yes	28.3%

30. **If yes, who is notified?** ***(Please check all that apply)*** (N = 54)

Teachers & Staff	87.0%
Parents	11.1%
Students	35.2%
General public	18.5%
Other (*see Appendix B*)	13.0%

31. **If yes, how are notices or warnings given?** ***(Please check all that apply)*** (N = 54)

Signs posted at school entrance	18.5%
Signs posted in treated areas	35.2%
Notes in staff mailboxes	37.0%
Treated areas blocked off	13.0%
Notes sent to all parents	9.3%
Notes sent to parents that request them	1.9%
Verbal announcements	59.3%
Other (*see Appendix B*)	11.1%

32. **Are you familiar with integrated pest management (IPM)?** (N = 204)

No	72.1%
Yes	27.9%

33. **Are these practices part of your school district's pest management strategy?** (N = 127)

No	47.2%
Yes	52.8%

Note: results from Question 34 are reported in two separate tables on this and the following page.

34. **Pests encountered at schools:**

Cockroaches (N = 142)	
No	28.2%
Yes	71.8%
Ants (N = 143)	
No	13.3%
Yes	86.7%
Spiders (N = 137)	
No	53.3%
Yes	46.7%
Flies (N = 130)	
No	51.5%
Yes	48.5%
Wasps (N = 143)	
No	18.2%
Yes	81.8%
Termites (N = 141)	
No	60.3%
Yes	39.7%
Rodents (N = 141)	
No	12.8%
Yes	87.2%
Lice (N = 124)	
No	58.1%
Yes	41.9%

The following chart lists commonly encountered pests, products, and treatments used for pest control. Respondents indicated if they encountered these pests and, if so, what treatment they used for them, if any. We have used the most conservative count possible in tallying these numbers. Percents are calculated only for those schools responding to the specific question. Since more than one response was possible, and since not every respondent reported what treatment is used, percentages may not sum to 100%.

CHEMICALS USED TO TREAT PESTS

Cockroaches N = 103	**Number (%) Schools That Use**
Tralomethrin (No Pest Indoor Fogger)	8 (7.7%)
Cyfluthrin (Bayer Home Pest Control)	5 (4.8%)
Tetramethrin (Hot Shot)	6 (5.8%)
Tralomethrin (Spectracide Bug Stop)	7 (6.8%)
Sulfluramid (Max Attax)	8 (7.7%)
Other (*see Appendix B*)	61 (59.2%)

Ants N = 124	**Number (%) Schools That Use**
N-ethyl Perfluorooctanesulfonamide (Max Attax)	12 (9.7%)
Tetramethrin (Hot Shot)	14 (11.3%)
Tralomethrin (Spectricide Bug Stop)	8 (6.4%)
Cyfluthrin (Bayer Home Pest Control)	12 (9.7%)
Diazinon (No Pest)	16 (12.9%)
Other (*see Appendix B*)	68 (54.8%)

Spiders N = 64	**Number (%) Schools That Use**
Tetramethrin (Hot Shot)	15 (23.4%)
Tralomethrin (Spectricide Bug Stop)	11 (17.2%)
Other (*see Appendix B*)	40 (62.5%)

Flies N = 63	**Number (%) Schools That Use**
Tralomethrin (Spectricide Bug Stop)	19 (30.2%)
Other (*see Appendix B*)	37 (58.7%)

Wasps N = 117	**Number (%) Schools That Use**
Diazinon (Ortho Hornet and Wasp Killer)	58 (49.6%)
Tralomethrin (Spectracide Wasp Killer)	28 (23.9%)
Other (*see Appendix B*)	35 (29.9%)

Termites N = 56	**Number (%) Schools That Use**
Sulfluramid (Spectracide Terminate)	17 (30.4%)
Other (*see Appendix B*)	30 (53.6%)

Rodents N = 123	**Number (%) Schools That Use**
Brodifacoum (D-Con, Mouse Kill)	61 (49.6%)
Other (*see Appendix B*)	60 (48.8%)

Lice N = 52	**Number (%) Schools That Use**
Lidane	14 (26.9%)
Pyrethroids	13 (25.0%)
Other (*see Appendix B*)	23 (44.2%)

Appendix B:
Responses to Open-Ended Questions

Additional Survey Responses to open-ended ("other") questions

18 l. What are the OTHER methods used to manage pests in your district?

Survey 20: Extra cleaning
23: Every month have a visit or as needed
53: Enzymes, common sense controls
55: Contact exterminating
57: Mole Control
64: Spraying for ants
67: Glue boards
69: We employ Torco out of Zanesville by the month
83: If we see 'em – we step on 'em (sorry)
92: Monitor all aspects prior to using pesticides
115: frankly, we have a crow problem
155: Mouse or rat traps; cages
157: large live traps for skunks
158: 1 PM

20.d. When pesticides are applied, who typically applies them?

Survey 106: contracted pest control operator applies treatment only as needed
151: Exterminators always apply.
153: Contractor
156: All pest control completed professionally by American Pest Control
171: school, work, party groups

21. If district employees apply pesticides in your school, what time of training is required?

Survey 4.: Vo. Ag Instructor has all the licenses
5: Reading of MSDA and label on product
7: none
8: pesticide license
10: Read can directions to kill bees and ants
11: Under supervision of pesticide applicators, license
12: OSHA standards and safety, hazardous material handling
13: Hazardous chemical training
15: None, Traps only
16: Only using household type
18: never
19: Some training-only custodial/maintenance staff
22: Must be licensed
23: Minimal

24: They don't
29: We only use products like D-con
30: None, use outside contractors
34: Awareness training, to OSHA standard
40: He is trained by the maintain ace super. and told to read directions
41: None
43: Certified/Licensed through OSU
45: Pesticide applicator's license
47: Never apply
50: Certified/Licensed
53: Must have ODA/pesticide applicator's license
55: None
57: Safety, in house
60: Basic
61: Instructed of dangers/advised of PPE/ advised on caution every time of use
62: Have just aerosol cans
63: General uses/MSDS
64: None
69: Staff usually only put out bait for mice or spray for bees
71: None
75: Read can
83: None – limited to approved chemicals in outside areas
86: school personnel only apply sprays in cans ie: bug spray
87: Farmer has been to school for weeds.
89: In service from manufacturing company.
90: Instructions/recommendations of MSDS information
92: Someone must be ODA licensed to supervise; others need trained service man training
93: Label/MSDS info
105: proper application techniques, MSDS, child contact warnings
106: NA
107: district employees spray for hornets and wasp when they re located. They are trained personal protective equipment
108: landscape staff applicators have ornamental/turf applicators license; interior applications are only used after sanitation, baits and traps by other preventitive measures have failed. Am unaware of chemicals used when necessary.
109: in house training by director
110: setting traps
111: NA
113: very little
114: none
115: MSDS, application, sometimes it is just the label
116: our staff spray over the counter grade ant control
119: in-service
124: May use wasp or pest sprays, sometimes put out baits and traps
127: Canned spray with no training

129: Legal requirements
134: State pesticide license
135: Safety training guide for trained servicemen
136: The only pesticide they would be using would be "store bought" spray i.e: wasp spray, bug spray etc…
139: District staff have been instructed not to apply pesticides in last year
145: None – normally outside due to bees
148: Only the knowledge of MSDS requirements and warnings
150: They use aerosol cans for small --?-- pest control contractor
151: Public operators license (state of OH)
152: Trained service man
155: Read the labels.
156: Directions for use – limited to outside applications
157: basic
158: NA
162: DNA
164: minimal
165: public application – former golf course supervisor – OSU landscape horticulture/turf mgmt
166: usually traps and spray cans
171: MSDA Labels, instruction of use or reviewed, protective clothing if needed
172: Directions are strictly followed, all precautions are followed
173: (Wasp and Hornet Spray) – Read Label
176: No training
177: OSHA Approved
179: None – using over counter.
182: They only spray for ants never with student or staff on premises.
183: Wear protective equipment.
185: minimal
187: public operator licensed, or directly supervised associate
192: none formal; instructions by suppliers
194: public operators lice nse
196: follow instructions of pest control operator / maintenance supervisor
198: follow label instructions
201: chemical co. reps – msds training
182: (re q 20: granulated around students; no spray)
202: none. use wasp spray occasionally
204: none
208: none, just bee killer and sprays
211: instructions on can highly emphasized

26. How does your district decide when a pesticide should be applied in or around a school?

Survey 3: directory/supervisor decision after applying other IPM methods
- 50: Pesticide applied on a monthly basis
- 51: Building administration staff
- 53: Supervisor
- 58: When an observation is reported
- 86: joint decision
- 113: my decision
- 118: superintendent decision
- 139: When staff complain
- 146: When problem exists
- 150: Yearly and in summer b/f school starts
- 151: Exterminators' decision
- 154: Monthly maintenance by contractor.
- 158: pesticides are not used
- 160: all above
- 165: personal experience
- 171: Collaborative Decision
- 187: OSHA, EPA, Fed. reg's, HWRP . . . .
- 191: do not use pesticides
- 196: maintenance supervisor
- 196: maint. supervisor
- 209: administration input
- 209: administration input
- 211: custodial/administration consensus
- 211: custodial/administration concensus

27 e. How does your district decide what pesticide product to use?

Survey 8: Info. From product supplier
- 23: Based on type of pest
- 40: Ask the salesperson for most effective product with the least harm to people
- 43: Pesticide applier's knowledge
- 53: Organic and safe
- 57: Safety around food/people
- 61: Salesman
- 86: need, potential for harm
- 93: products available from buyers group -- METPA
- 119: custodial/maintenance
- 120: As needed for bees and wasps
- 139: Contractor/custodial supervisor discuss and try to find most effective, least toxic to humans
- 150: Aerosol supplied by chemical contractor.
- 151: Exterminators' decision
- 158: NA

165: depending on severity, safety, and exposure
171: Recommendation from Pest Control Specialist
182: granulated around students no spray.
192: effectiveness; student safety
196: maintenance supervisor
211: product chosen at retailer

28 d. How long are people kept out of treated areas?

Survey 8: depends on product
9:overnight
12: baits are used whenever possible by contractor and custodians
17: depends on what was used
30: As contractor recommends
104: overnight
105: depends on toxicity
106: weekend
107: 12 hours
108: according to label specification
112: until next day
113: at least overnight
115: can't determine
114: 1 hr – 1 day
116: 8 hours
117: 2 hours
119: 12 hrs
135: Based on review with maintenance staff
156: Go home – overnight
159: all evening
184: 12-24 hours
176: Approx. 2 hours. Spray after school hours.
183: 8-12 hours
180: As specified by contractor
109: 24 – 48 hrs
181: 1 hr.
182: granulated around students, no spray.
189: 2 days
198: 2-8 hours
194: as recommended
196: per recommendations of PCO
200: over night
201: week
203: over night
160: 48 hrs
204: 4 hours
211: if necessary
207: 16 hours

206: 24 hours
210: 24 hours

30 e. Who is notified about pesticide applications?

Survey 4: Signs are posted
9: custodian
38 done by contractor
43: Building administration
57: Signs are posted
86: posting in area
129: Principal

31 h. How are the notices or warnings given?

Survey 38 Done by contractor
43: Telephone call to principle
108: application area is marked with yard sign
134: Email to principal/secretary
139: Done during special application not regularly scheduled application

34g. OTHER products used to manage Cockroaches

Survey 5: Avert bait active ingredient. ABEMECTIN
6: Deltamethrin suspend EPA 432-763
9: Fipronil
11: Contracted
12: Pyrethrins
17: Rose products
18: Tonko Pest Control
39: Whatever the exterminator uses
40: Ortho Boric Acid Powder
42: Combat Roach Control
46: Cloropyroifos "Strike Force"
55: Enforcer Roach Rid
61: Bendiocarb and Synergized Pyrethrins
69: Max Fourth, Exciter, Demand CS, Temple 20 WP, Bay Bone Bait
87: Able pest – lunch room
89: Special by vendor (overt gel)
93: Esfenvalerate 0.027%Survey 107: hydamethlanon
112: baits only avermectin
113: prelude
114: kitchen and café contracted pest control

125: Whatever company uses
126: Propetamphos
128: Fipronil 0.01%
130: Baiting only
131: Baits
135: Fibrenil (Maxforce bait) and Abametile
138: Triples double action residual insecticide
148: Central exterminating company – IPM program
152: Avert-bait
156: Hydromethylnon 2%
166: DEK
179: Traps
181: Suspend SC by Aventis Corp.
182: Orkins brand granular base.
187: Max Force Bait
191: vacuum
203: contracted
206: glue traps, max force paste
207: safrotin; gencor
208: Fiprimil

35g. OTHER products used to manage Ants

Survey 3:Ant hotels, glue boards
4: Max Force
5: Duel Choice Bait Stations
6: Deltamethrin suspend EPA 432-763
12: Drax AntGel, advance dual choice
15: Ant traps
17: Rose Products
18: Tonko Pest Control
40: Ortho Boric Acid Powder
42: Ant traps, Pyrethrine Spray
55: Claire-Fast Kill
56: Borax
61: Pyrethrins
86: Drax, Demon, Dual Choice
69: Max Fourth, Exciter, Demand CS, Temple 20 WP, Bay Bone Bait
89: bait: Max force
93: Esfenvalerate 0.027%
107: boric acid gel
112: baits
113: prelude
114: kitchen and café contracted
117: black flag
121: Dry ant kill gel (Orkin)

128: Esfenvalbrate 0.027%
130: Baiting only
131: Baits-N-Ethyl Perfluorooctanes sulfanamide
135: Drax (esthebocle acid) and abametile and hydramethylmar
138: Triples double action residual insecticide
148: Claire fast ant kill and Central Exterminating Company
150: SSS Residual from Damon Chemical
152: Drax-gel
156: N-ethyl perfluorooctanesulfonamide advance dual choice
166: DEK
179: Traps
180: Ant traps and sprays
181: Asabore
187: Drax Bait
191: equal
194: ant traps
203: an traps
206: ant gel
208: Fiprimil
210: Granular abanectin (?)

36d. OTHER products used to manage Spiders

Survey 5: Microencapsulate, Demand CS
6: Deltamethrin suspend EPA 432-763
9: hydra methglnon
12: Delta Methrin
18: Tonko Pest Control
61: Diazinon-pyrethrins, Bendiocarb
87: Able – lunch room
112: synthetic pyrethroid
117: black flag
132: Cypermethrin
138: Triples double action residual insecticide
141: Cyfluthrin, Bayer
150: SSS Residual from Damon Chemical
166: DEK
191: vacuum

37d. OTHER products used to manage Flies
Survey 18: Tonko Pest Control
40: Dry mist insect killer
61: Pyrethrines, Piperonyl, Butoxide
86: Pyrethrins, Piperonyl Butoxide, Propoxur
141: Cyfluthrin

148: Claire fly jinx insect spray
166: DEK
179: Traps
180: Use fly spray (arasol).
187: Drain Cleaner
191: traps

38d. OTHER products used to manage Wasps

Survey 12: Sevin Dust
55: Black Flag
61:Tetramethin, Hysan wasp and hornet killer
86: Methyl chloroform, Isopropanol
90: Methyl carbomate
113: prelude
117: Jet Force II
118: dursban, sevin
131: Delta Dust
135: Dribun (solver gel)
141: Cyfluthrin, Bayer
148: Claire golden jet
150: SSS Wasp and Hornet Spray; jet spray Damon Chemical
166: DEK
179: Traps
180: Wasp spray from hardware
182: Fly swatter
191: vacuum
196: spray cans – outside buildings only
206: outside only

39 c. OTHER products used to manage Termites
Survey 12: Sentricon
17: Contractor
40: Ortho Boric Acid Powder
84: hexa flumaron
87: Able pest control Survey
113: dursban tc
114: contracted pest control
118: pest control operator
141: Imidactoprid, Bayer
152: Sentracon
168: Per contract with pest control
180: by Plumer Diehl – yearly
182: Orkin

191: borax, preditory mites
203: contracted

40c. OTHER products used to manage Rodents

Survey 3: glue boards
4: baited boxes
5: Bromadilone, contracts and bait,
6: Glueboards, Catch Master
12: Contrac-Blox
15: mice traps
17:Traps
41: Glue traps
42: pads
44: traps
50: glue traps
55: D Con rat traps
61: trap-sticky pad
63: Trap
83: traps
84: glue boards
86: traps
89: mechanical traps
90: snap trap
109: traps only
110: sticky traps
112: glueboards
113: contrac
114: traps with peanut butter
118: traps
121: trap
126: glue boards and snap traps
130: Spring trap
132: Glue trap, Pi/Blox
135: glueboards
139: Snaps/glue traps
141: Bromadioione
148: Central Exterminating Company
150: American Pest Control Systems
154: Traps
156: talon-G .005%
159: traps
166: Traps
174: traps
179: Traps
180: Mice traps

182: glue traps
184: Traps
187: Control Bait, glue boards
191: traps
196: baits, traps
206: glue board and traps

41d. OTHER products used to manage Lice

Survey 53: Offer free shampoo to students and parents
109: controlled by nurse
118: home treatment of students hair
135: We dry the temperature of the building on the weekend
141: Isopropyl alcohol, Cyclopropane, Chrooxylate
148: Claire lice killer
150: Nothing recommended by contractor; would like more info on lice control
180: school nurse takes care of this.
191: not nice to lice
206: pyrethoids 0.40%

42. Additional Comments:

Survey ?91: Using IPM – It works great!!
3: Dust for wood-boring wasps, as needed
4: We use "Mauger Exterminating chemlawn" puts the chemicals on our football and sports fields
5: Problems handled as needed, professional chemicals handled by licensed tech only. MSDS available upon request
7: We generally use a contractor to handle pest problems as they arise.
23: weeds-Round Up as needed
30: I use outside contractors for pest control because I do not have personnel to train and license for pest control
33: All buildings and kitchens are sprayed monthly in problem areas
35: This is left to the discretion of the pest control service
36: Yellow jackets in late summer/fall as needed
38: Have pest control contractor
46: Most all chemicals are provided by contractor.
57: Yellow jackets-sweet water jugs, stick traps, all outside
58: In 1999 the school district spent $7,997 on BAT control
60: Fertilizers
63: Products that contractor uses, Contractor= Extermintal Extermination Service
64: Do not have info, Buckeye Exterminator is contracted
65: All of the above handled by Miami Valley Pest Control
66: Done by pest control company, don't know answers
89: no spray tank in our schools

91: Our exterminators use IPM methods – baits, gels, monitors, and non-airborne chemical prevention
105: ladybugs
110: demon ec .005% mixed with water
83: After Q 33: We use only approved professionals in within our facilities.
117: contracted to Campnell and C
123: Our current pest-control contractor uses the IPM program in our school buildings
124: Services are contracted-unfamiliar with what they use
129: As needed under direction of pest control professionals
131: As needed per label specifications on frequency of use
133: Use professional exterminator for all applications
134: I do not know what specific pesticide is used on your chart
135: insect monitors are used to monitor insect type and infestations, monthly
136: Pyrethrins, monthly and as needed Hydramethylanon (bait) as needed Adamectin (bait) as needed Boric ortho acid (bait) as needed
139: CB40 (Aerosol) as needed. Demand CS as needed; Knox Out as needed; Max force Gel as needed; Tempo SC Ultra as needed
149: All chemicals are provided by Terminex Inc.
150: We are under contract with American Pest Control – buildings are treated; annually then as needed
158: 1PM only – no chemicals or pesticides are used
165: turf grass, horticultural plantings
175: All that are not marked are handled by Hahn Exterminator Service, 161 North Trimble Road, Mansfield OH 44906 419 529-3051.
12: We use Zep Zep Instecticide / spray in can / for light any and fly spraying sometimes.
197: I pay a company to use an effective safe product.
205: I have checked with our pest controller and he looked at the list of products and said he does not use these products.
210: Lice handled through school nursing staff
122: Tempo Ulta SC, Lot #965 2906 %.06, diluted ½ gal raw quality, 8 hrs

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