

**NC STATE UNIVERSITY**

**A Pest Management (IPM) Survey of Maintenance Directors of North  
Carolina Public Schools**

A report compiled by

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## Executive summary

This report presents results of a survey that was conducted to assess the level of IPM implementation in North Carolina public schools and to determine the effect of the school children's health act and effectiveness of the School IPM educational program in changing the pest management practices, and adoption of IPM practices by school districts in North Carolina. The respondents were school maintenance directors or their designees and the response rate to the survey was 99.9%.

The serious indoor pests included nuisance ants, rodents and cockroaches; whereas the serious outdoor pests included fire ants, weeds, birds and rodents. To control the pests, both chemical and non-chemical methods are used in schools. In most school districts, pesticides are applied *as needed* both indoors (except in food service areas where 84% of school districts still rely on monthly and bi-monthly pesticide applications) and outdoors; Pesticide use decisions for indoor areas are predominantly made by pest control contractors (78.9%) and by landscaping companies for outdoor areas (69.3%). The maintenance directors and IPM coordinators also contribute pesticide use decisions in some school districts. Eighty-two percent of the school districts incorporate non-chemical pest control methods and procedures in their pest control program.

To minimize the risk of pesticide exposure to school children and staff, pesticides are applied "as needed" on weekends (60%). On school days, pesticides are applied after school hours. Furthermore, risk of pesticide exposure is minimized by selecting least toxic pesticide formulations and methods (e.g. crack & crevice applications and spot treatments) and by notifying interested parents, guardians and staff about pesticide use in schools.

Tremendous progress has been made in implementing IPM programs in schools across the state of North Carolina. Overall, 61% of the school districts have implemented IPM programs compared to 6% at the inception of the School IPM program of North Carolina State university. About 88% of the school districts with programs adopted IPM programs between 2001 and 2007, of which 71% adopted between 2006/2007. This indicates that the educational program and the legislation (school children's health act) were effective in helping school districts adopt IPM programs. In conclusion, there is need to continue with the education program to increase IPM implementation especially in regions of the state where IPM program implementation is poor.

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## **Introduction**

Research indicates that children are especially at risk to pests and pesticides. Children's bodies, behaviors, and size make them both different from and more vulnerable than adults to pesticides (NRC 1993). From conception through adolescence, they are in a dynamic, often sensitive state of growth as their immature nervous, respiratory, reproductive, and immune systems develop. In North Carolina, the State Legislature passed "The School Children's Health Act" in 2006 to safeguard the health of school children and occupants. This bill requires school districts to notify parents, guardians, and school staff about pesticide use on school property (Starting 11/1/ 2006), and to implement Integrated Pest Management (IPM) programs by 11/1/2011.

Integrated Pest Management (IPM) is a proven approach that can effectively control pests while minimizing the risk of pesticide exposure to school occupants. IPM is a comprehensive pest management approach that combines multiple control methods, e.g., biological, physical, mechanical, cultural, and chemical tactics that are effective, economical, environmentally sound, and socially acceptable in a comprehensive plan to prevent and solve pest problems. IPM emphasizes the use of non-chemical control methods, but reduced-risk pesticides and/or formulations can be applied when necessary. Other components of IPM include routine inspections, regular monitoring, and pest identification, identifying conditions that contribute to pest problems, record-keeping (to track problems and prevent recurrence) and evaluation of pest management actions.

The School IPM program at North Carolina State University has promoted the adoption of IPM in public schools even before the School Children's Health Act was passed. The primary effort focused on an educational program consisting of training workshops to inform pest management professionals (PMPs), school personnel, and regulatory groups on the concepts of IPM and how to implement IPM in the school environment. Practical information delivered through demonstrations and facility walk-throughs were also included in these workshops. A training manual, brochures, and a web-site were developed and made available to maintenance directors, facilities supervisors and other members of the school community. This educational effort expanded in 2005 and 2006 with additional training opportunities focusing on implementation of IPM in schools. A total of 12 workshops (six each year) were conducted statewide in 2005 and 2006 in which a total of 129 maintenance personnel from 36 school districts were trained. In addition literature on School IPM was also mailed to all school district maintenance departments across the state.

The status of school IPM implementation has not been assessed since the training program was started. Therefore the main goal of this survey was to assess the level of IPM implementation in North Carolina public schools, and to determine the effectiveness of the educational program in changing the pest management practices, and adoption of IPM practices by school districts in North Carolina. Specific objectives of the survey were:

1. (a.) To identify important pests in schools and the current pest control practices from the perspective of school maintenance directors/facilities supervisors.  
(b.) To identify who makes pest control and pesticide use decisions.  
(c.) To determine the decision making process for the use of pesticides in schools
2. (a.) To discover how school maintenance directors and facilities supervisors define IPM to and assess their attitudes toward IPM.  
(b.) To investigate the extent to which public schools have adopted IPM practices  
(c.) To measure the awareness of school maintenance directors and facilities supervisors concerning the School Children's Health Act, the School IPM Program of North Carolina, and the availability of resources related to IPM in schools.  
(d.) To discover the health and economic impacts of pests in schools.

## **Methodology**

Maintenance directors/facilities supervisors of North Carolina Public Schools or designees were contacted by phone and requested to participate in the survey. To make comparisons with available data, some questions in the survey are similar to questions in two previous surveys to maintenance directors (Lilley 1999; ARC/PestEd 2003) and to pest management professionals (PMPs) that service schools (Nalyanya & Linker 2006). We included questions on outdoor pests and their control in order to get a comprehensive assessment of the pest control programs. Telephone interviews were conducted during regular work hours (8:00 a.m. to 5:00 p.m.) in June and July 2007 by the Center for Urban Studies at North Carolina State University. Out of a total of 115 school districts in North Carolina, 114 participated in this survey.

## Results

### Demography

Maintenance directors or designees with various levels of education responded to the survey. Thirty-two percent had a high school or some college education; 51.76% had either a 2-year or 4-year college education; 13.16% held MS and 2.63% PhD. level education. The response rate was 99% (n =115). The responses to survey questions are presented as percentages where the list of possible responses was read to the respondents and as number of school districts where the choice of probable responses was not read (Appendix I).

*Total number of schools per school district:* The number of schools ranged from 1 to 120. Ninety-five percent of the school districts have less than 50 schools; of these, 39% have between 1-10 schools; 31% have between 11-20 schools; 15% have 31-40 schools; and 4% have 41-50 schools.

*Total number of non-school sites:* The number of non-school sites (e.g. central office buildings, maintenance shops, warehouses etc) that require pest control ranges from 1 to 94. Eighty three percent of the school districts had 5 or fewer non-school sites, 14% had 6 to10 non-school sites while only 3% had 11 to 94 non-school sites.

*Total outdoor acreage requiring pest control:* The number of outdoor acres (acreage of school campus, including athletics fields), that require pest control ranged from 1 to 12,000 acres. Eighty-four percent of the school districts have less than 1,000 acres of outdoor land. The rest have between 1,000-12,000 acres of outdoor land.

### Pests and pest control practices

**Indoor pests and pest control practices:** Cockroaches were considered a serious pest problem by 10.53% of respondents, followed by nuisance ants (4.39%), rodents (3.51%), bats & fire ants (2.63%) and birds & pantry pests (1.75%). In order of importance, the pests that were considered somewhat a problem by more than 40% of the respondents were cockroaches (71.93%), nuisance ants (60.53%), rodents (59.65%), and spiders (42.98%).

Most school districts contract professional pest control companies for indoor pest control (63.2%); 11.4% use in-house technicians to control indoor pests, while 25.4% combine in-house and contactors to control indoor pests, respectively.

For the pests considered to be a serious problem (cockroaches, nuisance ants and fire ants, rodents), pesticides were the tools of choice for 100% of the respondents.

**Outdoor pests and pest control practices:** Fire ants were reportedly the most serious outdoor pest (23.68%), followed by weeds (15.79%), birds (4.39%), rodents (3.51%), and snakes (0.88%), diseases of landscape plants (0.88%), turf grass insect pests (0.88%). In order of importance, the somewhat important pests were bees & wasps (64%), weeds (70.5%), Fire ants/rodents (35.1%), birds/landscape insect pests (33.3%), snakes (31.5%) and spiders (27.2%).

Most school districts use in-house staff to control landscape pests (48.25%) and weeds (64%); only 21.05 % and 16.67% contract for landscape pest control and weed control respectively while 30.7% and 19.3% combine in-house and contact services for landscape pest and weed control.

For the pests considered to be a serious problem (fire ants, bees and wasps, birds, diseases of landscape plants, turf grass insect pests, weeds and other pests), pesticides were the tools of choice for 100% of the respondents.

**Table 1: Who deals with indoor, landscape pests and weeds in North Carolina Schools**

Pest type		Contract	In-house	Combination
a.	Indoor pests	63.16%	11.40%	25.44%
b.	Landscape pests	21.05	48.25	30.70
c.	Weeds	16.67	64.04	19.30

**Weed control:** When asked specifically about their 3 primary weed control methods, the first most selected methods were mowing (71.29%; n=101) selected, followed by herbicides (33.33%), hand weeding (11.76%) and mulching (4.65%). The second most selected methods were mulching (58.14%), herbicides (36.46%), hand-weeding (33.33%) and mowing (27.72%). Finally, the third most selected methods were hand weeding (54.9%), followed by mulching (37.21 %), herbicides (30.21%) and mowing (0.88%). Sanitation, maintaining plant health and plastic sheeting were the other methods used to control weeds in schools.

## **Pesticide formulations, application methods and frequency:**

### ***Indoor pesticide applications:***

*Classrooms:* Most school districts (59%) use baits, for both insect and rodent control in classrooms. Insecticides are also applied in cracks & crevices (49%), as spot applications (31%) and to various unspecified surfaces (7.89%). Forty three percent of the school districts use baseboard sprays. Foggers (1.67%) and dusts/powders (0.88%) are least used.

*Cafeteria/food storage areas:* Just as in classrooms, most school districts primarily use baits (62.4%), to control both insects and rodent control in food service areas. They also apply insecticides in cracks & crevices (52.6%), as spot treatments (23.7%) and to various unspecified surfaces (6.8%). Baseboard sprays are used by 37.7% of the school districts. Again foggers and dusts/powders are least used.

*Hallways/other areas:* Unlike classrooms, food service and storage area, hallways are predominantly treated with baseboard sprays (40.4%), crack-&-crevice applications (38.6%), baits (37.7%), and spot treatments (35.7%). Dusts and powders and various sprays are used by 0.88% and 1.7% school districts respectively.

### ***Outdoor pesticide applications:***

*Landscapes and grounds:* Most school districts spray (69.3%), apply granular formulations (38.6%), and baits/pellet formulations (25.4%) of pesticides on landscapes and grounds. Dusts and powders are used by only 6.1% of the school districts.

*Athletics fields:* Similar to landscapes and grounds, most school districts spray (69.3%), apply granular formulations (30.7%), and baits/pellet formulations (17.5%) of pesticides on athletics fields. Dusts and powders are used by only 3.5% school districts.

### **Frequency of pesticide use:**

*Indoor pest control:* In most school districts, pesticides are applied *as needed* (based on the severity of infestation, recommendations of the maintenance director, contract requirements and other reasons (see pg. 9), in classrooms (71.93%), hallways (73.68%) and cafeteria/food storage (2.68%). A few school districts (16.67%) apply pesticides in classrooms monthly, quarterly (7.02%) and semi-annually and annually (3.50%). In cafeterias and food storage areas, pesticides

are predominantly applied on a bi-monthly basis (50.88%), followed by monthly (33.33%), quarterly (7.89%), and weekly (2.63%) service.

*Outdoor pest control:* Pesticides are predominantly applied “as needed” to the landscape & grounds (83.33%) and to athletics fields (85.96%) school districts respectively. Overall, school employees cannot bring and apply their own pesticides in 97.37% of the school districts.

**Timing of pesticide applications:**

Sixty percent of the school districts apply pesticides on school property on weekends and holidays, while 40% apply pesticides on school days. But whenever pesticides are applied on schools days, 89% of the school districts apply the pesticides after school hours. Only, 6.5% of the respondents apply pesticides on school property anytime during the school day and 4.35 % apply them before school hours.

**Decision-making for pesticide applications**

*Criteria for pesticide use:* The most important criteria for using a pesticide is severity of pest infestation (68.4%) as determined by the pest control contractor or IPM coordinator, followed by recommendation by maintenance or facilities director (59.6%). Contract requirements (34%) and school principal request (28%) are of moderate importance. Request to apply a pesticide by teachers was the least significant criterion.

*Pesticide use decision-making:* In a majority of the school districts, decisions about which pesticide to apply are made by the pest control contractor (78.9%); others who contribute towards this decision are the maintenance director (31.6%), the in-house pest control technician (21.9%) and then the IPM coordinator (28%). Pest control contractors (69.3%) also are also the primary decision maker when it comes to determining where and when to apply pesticides. Others individuals who make such decisions include the maintenance director (43%), the in-house pest control technician (25.4%) and then the IPM coordinator (18%).

*Pesticide applicator:* After deciding which pesticide to apply, and where and when to apply it, it is important to know who applies the pesticides:

*a). School buildings:* The pest control contractor (84%) applies pesticides in most school buildings. In other school districts, the maintenance director (43%), the in-house pest control

technician (17.5%) and then the IPM coordinator (8.8%), maintenance director (6.1%) and custodial staff (5.2%).

*b). Landscapes and grounds:* In this case, landscaping or pest control contractors (45.6%) apply pesticides in a majority of the school districts. Other applicators include the in-house pest control technician (36%), the grounds keeper (22.8%), the maintenance director (13%), the IPM coordinator (10.5%), and custodial staff (4.4%).

*c). Athletics fields:* Landscaping contractors (39.5%) again are the primary pesticide applicators on athletics fields of many schools followed by in-house pest control technicians (32.45%), athletics coaches (21.05%) and grounds keepers (18.2%). Fewer school districts use the IPM coordinator (3.5%), maintenance director (3.5%) or custodial staff (1.75%) to apply pesticides on athletics fields.

#### **Integrated Pest Management (IPM) definition and use**

Seventy-two percent of the maintenance directors defined IPM as the use of action levels and a combination of pest control tactics. Sixteen percent defined IPM as the application of pesticides and pest exclusion measures; 7% defined IPM as absolutely no pesticide use while 4% said IPM is rotation of pesticide classes and formulations.

When asked to rate the effectiveness of IPM in solving pest problems, 48% considered IPM to be very effective, 51% considered IPM somewhat effective while 1% considered it not effective.

#### **Non-chemical pest control methods used and recommended by contractors:**

Eighty-two percent of the school districts incorporate non-chemical pest control methods and procedures in their pest control program. In order of importance: they incorporate glue boards (56.1%), caulking (52.6%), cleaning up clutter (50.87%), and sticky traps (43%); light traps (5.2%). Others incorporate food storage in plastic containers or pest proof containers (29.8%).

Fifty-four percent of the maintenance directors said that pest control contractors recommend to their departments measures to support the pest control effort. For 57% the recommendations involved structural repairs; 61% involved placing screens on doors, windows etc.; 69% were for improving cleanliness, and 65% for improved food storage. Others included placing vending machines on wheels.

With regard to the level of cooperation of the school districts in responding to pest management recommendations, 59.68% of the respondents claimed to be very cooperative 38.71% were somewhat cooperative, while 1.61% were not cooperative.

**Notification and record keeping:**

Ninety-one percent of the school districts maintain records of pest control related activities. Their records include pesticide application records (71.9%), pest control work orders (79.8%), repair and maintenance (46.5%), pest sighting (42.98%), inspection and monitoring (35.96%) and recommendations for building repair and modifications (35%).

Eighty percent of the school districts notify their school communities about pesticide use on school property. They notify the principals (78%), parents & guardians (29.8%), teachers, staff, and cafeteria managers (28.9%). Notification is written (58.8%), by telephone (38.6%) or/and posted near treated areas (14.9%).

**Awareness of School Children’s Health Act and of School IPM program of North Carolina:**

Ninety-eight percent (98%) of the schools districts are aware of the School Children’s Health Act and 95% were aware of the existence of the School IPM program of North Carolina State University. Of the maintenance directors who are aware of the existence of the School IPM Program of North Carolina State University, 85% are aware of the publications, while 86% and 91% respectively are aware of the web-site (<http://schoolipm.ncsu.edu>) and educational and awareness workshops. Seventy-seven percent are aware of the availability of trouble-shooting and technical support, and 83% are aware of the annual recognition and awards program.

**Health related and structural impacts of pests and pesticide use**

Thirty-three percent of the responding school districts reported pest related damage to structures, stored products or materials in the 2006-07 fiscal year. Seventy-one percent (71%) estimated the value of damage to range from \$ 0-\$1,500; 13% reported damage in the range of \$1500 to \$3500 and 16% reported damage above \$ 4500. About 5% of the responding school districts reported that students, parents, teachers, or staff complained about pesticide use in their schools in the previous 2 years. Forty-nine percent of the school districts have an established system for addressing concerns of students, parents, and teachers about pesticide use in schools.

**Cost of pest control in the 2006-2007 fiscal year:**

a. *Indoor pest control:* For indoor pest control 95% of the school districts spend less than \$ 40, 000. Of these 84% spend up to \$20, 000, 12% spend between \$20,001 and \$40,000; and 4% spend between \$40, 000 and \$60,000 on indoor pest control.

b. *Out-door pest control:* For outdoor pest control, 97% of the school districts spend less than \$ 40, 000. Of these 91% spend up to \$20, 000, 7% spend between \$ 20,001 and \$ 40,000. Four percent spend between \$40,000 and \$60,000 on outdoor pest control.

c. *Termite control:* To control termites, 96% of the school districts spend up to \$ 20, 000. Four percent of the school districts spend between \$20,000 and \$30,000 to control termites.

**Status of IPM adoption and implementation:**

More than half of the school districts had instituted some changes in their pest control program between the years 2005-2007. The changes ranged from adapting IPM language in bid specifications (43%), educating employees about IPM (25%), training pest control technicians and personnel about IPM (19%), installing IPM logs in schools and passing IPM policies (18%). Overall, sixty-one percent of all the responding school districts have adopted an IPM program. About 12% of the school districts adopted IPM between 1987 and 2000. Eighty-eight percent of the school districts adopted IPM programs between 2001 and 2007, of which 71% adopted between 2006/2007.

**Discussion**

The survey data show that school districts are adopting and implementing IPM programs across the state of North Carolina. Currently, up to 70 school districts (61%) have implemented an IPM program. In addition, this is the first survey to present information on outdoor pests and pest control practices of schools in North Carolina. Fire ants and weeds are the serious outdoor pests, and they are controlled mainly using insecticides and herbicides. Unlike indoor pest control which is predominantly done by contractors, insect and weed control in landscaped areas is handled primarily by in-house technicians and groundskeepers, or a combination of in-house staff and contractors. Mowing and herbicides are the most preferred weed control methods.

This survey data clearly show that North Carolina schools have made tremendous progress in implementing integrated pest management now as compared to when the program was initiated (Lilley et al. 1999; PestEd 2003). For example, when the data in this survey are compared with information from the 2003 survey (ARC/PestEd):

- 47% of the school districts reported having a board approved pest management policy compared to 17% in the 2003 survey
- 80% of the school districts now notify parents, guardians, and staff about pesticide applications as compared to only 50% of the schools districts in 2003.
- 19% of the school districts have constituted an IPM committee compared to 2% in 1999(the 1999 and not the 2003 survey asked this question).

More than 71% of school districts apply pesticides “as needed” in classrooms, hallways, landscapes and athletics fields. Exceptions were the food service areas, where 85% of food service areas still apply pesticides routinely (on monthly or bimonthly to the baseboards, cracks & crevices), and as spot treatments. It is likely that they are not aware of the SCHA and its requirements and/or the availability and effectiveness of IPM. It is also probable that the child nutrition staff fear being cited for pest infestations by county environmental health inspectors. As such they encourage or require contractors and in-house technicians to apply pesticides routinely to prevent infestations.

When responses of maintenance directors (this survey) and PMPs (Nalyanya & Linker 2006) are compared:

- Cockroaches were perceived as the most serious indoor pest by maintenance directors while ants were the most serious pest according to PMPs.
- A higher percentage of maintenance directors (72%) than PMPs (67%) defined IPM as action levels and combination of pest control tactics.
- More maintenance directors (7%) than PMPs (2%) defined IPM as a system of pest control that does not require any pesticides.
- 48% of maintenance directors thought IPM was very effective while 81% of PMPs thought it very effective.
- Currently 61% of school districts have an IPM program, while 91% of PMPs reportedly use IPM in their school accounts.

Although the survey data show that PMPs are extremely important in the pesticide use aspects of school IPM programs, maintenance directors are pivotal to overall successful implementation of school IPM programs. They implement procedures and policies that direct IPM programs, and coordinate the implementation of the non-chemical components of IPM. They contribute towards the decision-making process for pesticide applications and apply pesticides in some school districts.

Maintenance directors are vital in the decision making and implementation of IPM programs of public schools in North Carolina and across the country; and as such there is continued need to provide them with current IPM information and training so they can effectively coordinate IPM programs in school districts. Because schools are faced with pest problems indoors and outdoors training should provide comprehensive information on IPM for indoor and outdoor pests.

There is significant progress in reducing pesticide use and in changing the patterns of pesticide use. A majority of school districts apply pesticides only as needed rather than on a routine basis except the cafeteria. They are reducing pesticide exposure by applying pesticides after school hours whenever necessary. School districts are also minimizing exposure by increasing the use of bait formulations than liquid applications. When liquid insecticides are used, they are applied in a targeted manner to cracks and crevices or as spot treatments. Very few schools use foggers or other surface pesticide applications. However, even school districts that are trying to minimize pesticide exposure still use baseboard applications especially in hallways and food service areas. There is need to investigate why these base-board applications are still deemed necessary.

The impact of pests and pesticide use was very low. Most schools incurred less than \$1500 in damage and about 5% received complaints about pesticide use. With an IPM program, fewer schools will receive complaints about pesticide use and incur less damage to school structures and property (anecdotal evidence available). According to The School children's Health Act, school districts were required to implement the pesticide use notification by 11/1/2006, yet some school districts have not implemented the notification system). They should be encouraged to comply.

It is clear that the School Children's Health Act gave many school districts the impetus to implement IPM programs as seen by the significant increase in the number of school districts that adopted IPM in 2006 and 2007. Training workshops and educational material available from NCSU's School IPM program have provided the necessary information and technical support that enable school districts to adopt IPM programs more easily.

## **Recommendations**

1. Continue IPM training and education to pest management professionals (PMPs), maintenance directors and their employees. Greater emphasis should be given to understanding why some critical areas such as food service still rely heavily on routine monthly or bi-monthly treatments. Educational programs can then focus on changing the pesticide use patterns in cafeterias and food storage areas from “routine” to “as-needed”. In addition, training programs should be targeted to those regions that have implemented only a few IPM programs, especially Western Carolina.
  
2. The survey indicates that schools manage weeds on large tracts of out-door land and still rely significantly on herbicides for weed control. Therefore, we need to expand our training efforts to IPM for outdoor pests and weeds.
  
3. Encourage more school districts to formalize their IPM programs and to incorporate the missing components. They should also be encouraged to adhere to the School Children’s Health Act by passing IPM policies and changing their pest control contract specifications to require IPM and by designating IPM coordinators to help individual schools to a better job at reducing pests and the conditions that often create pest problems.

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## Appendix 1

### A survey of maintenance and facilities directors of North Carolina public schools

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#### 1. A. Total number of schools

Total number of schools	Frequency	%
1-10	44	
11-20	35	
21-30	17	
31-40	8	
41-50	4	
51-60	1	
61-70	0	
71-80	1	
81-90	1	
91-100	0	
101-120	3	

#### 1. b. Total number is non school sites (including central office, maintenance shops, & warehouses)

Total # of non-school sites	Frequency	%
1	7	6.14
2	27	23.68
3	33	28.95
4	24	21.05
5	3	2.63
6	8	7.02
7	4	3.51
8	2	1.75
10	2	1.75
12	1	0.88
25	2	1.75
94	1	0.88

**1. C. Total number of outdoor acres requiring out-door pest control**

Total # outdoor acreage requiring pest control	Frequency	%
1-25	9	7.92
26-50	7	6.13
51-75	2	1.76
76-100	15	13.17
101-125	3	2.63
126-150	9	7.90
176-200	3	2.63
201-225	4	3.51
226-250	1	0.88
276-300	3	4.39
326-350	2	1.75
376-400	8	7.02
401-425	1	0.88
426-450	2	1.76
476-500	2	1.75
501-525	2	1.75
551-575	2	1.75
576-600	4	3.51
651-675	3	2.63
676-700	4	3.51
701-725	4	3.51
776-800	4	3.51
851-875	1	0.88
876-900	1	0.88
901-925	1	0.88
926-950	1	0.88
1000-1250	8	7.02
1251-1500	5	4.39
1751-2000	4	3.51
5000	1	0.88
12000	1	0.88

<b>Q 2</b>	<b>In your school district's pest management program have you</b>	<b>Yes</b>	<b>No</b>
a.	Created an advisory committee	22	92
b.	Passed a board approved IPM policy	53	61
c.	Designated an IPM coordinator	92	22
d.	Put in place a system of documenting Pest management Information	69	45
e.	Put in place a system for notifying parents and staff about pesticide use	73	41

**3. Which of the following indoor pest problems do you consider a serious problem, somewhat a problem or not a problem in your school district?**

<b>Item</b>	<b>Pest</b>	<b>Seriousness of pest (%)</b>		
		<b>Not a problem</b>	<b>Somewhat a problem</b>	<b>Serious problem</b>
a.	Cockroaches	17.54	71.93	10.53
b.	Nuisance ants	35.09	60.53	4.39
c.	Fire ants	85.09	12.28	2.63
d.	Flies	84.21	15.79	0
e.	Bees and wasp	75.44	24.46	0
f.	Head lice	65.79	34.21	0
g.	Pantry/stored products pests	71.93	26.32	1.75
h.	Spiders	57.02	42.98	0
i.	Rodents	36.84	59.65	3.51
j.	Snakes	66.67	32.46	0.88
k.	Birds	80.70	17.54	1.75
l.	Bats	69.3	28.07	2.63

**4. If a serious problem, what are the 3 primary methods of controlling the indoor pest problems?**

a. Cockroaches	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	9	88.89	11.11			
A2			77.78		22.28	
A3		12.5			62.50	25

b. Nuisance ants	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	4	100				
A2			75	25		
A3				50	25	25

- c. Fire ants      d. Flies      e. Bees and Wasps      f. Head lice      g. Pantry pests  
h. Spiders

i. Rodents	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	2		100			
A2				66.67	33.33	
A3					33.33	66.67

j. Snakes	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1						
A2	1		100			
A3					100	
A4 (other)		Sulfur/Moth balls				

k. Birds	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	2	50		50		
A2						
A3						

l. Bats	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	2	100				
A2			50	50		
A3						

m. Other pests (Termites, squirrels, grubs, crickets, silverfish, hard “round worms”, opossum).

**5. Which of the following outdoor pests do you consider a serious problem, somewhat a problem or not a problem, in your school district?**

Item	Pest	Seriousness of pest (%)		
		Not a problem	Somewhat a problem	Serious problem
a.	Fire ants	41.23	35.09	23.68
b.	Bees & wasps	33.33	64.04	2.63
c.	Spiders	72.81	27.19	0
d.	Rodents	61.4	35.09	3.51
e.	Birds	62.28	33.33	4.39
f.	Bats	82.46	14.91	2.63
g.	Snakes	67.54	31.58	0.88
h.	Diseases of landscape plants	85.96	13.16	0.88
i.	Diseases of turf grass	89.47	9.65	0.88
j.	Landscape insect pests	66.67	33.33	0
k.	Turf grass insect pests	85.96	13.16	0.88
l.	Weeds	23.68	60.53	15.79

m. Other pests (n=8)	%
Skunks	25.00
Raccoons	25.00
Moles	12.50
Groundhogs	25.00
Ticks	12.50

5 m. n=8	
Not a problem	0%
Somewhat a problem	57.14%
Serious problem	42.86%

**6. If a Serious problem, what are the 3 primary methods of controlling the outdoor pest problems?**

a. Fire ants	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	23	95.65%		4.35		
A2	6	16.67	16.67	16.67	33.33	
A3	8	50	12.5		25	12.5

b. Bees & wasps	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	1	100				
A2	2	16.50	50.00	33.33	33.33	
A3	3					

c. Spiders

d. Rodents	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	2		100			
A2	4	25	25	25	25	
A3	3			25	25	50

e. Birds	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	4		50.00	25	25	
A2	3	33.33		66.67		
A3	2			50.00	50	

f. bats	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1						
A2	3		33.33	66.67		
A3	3			33.33	33.33	33.33

g. Snakes	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1						
A2	1		100			
A3	1				100	

h. diseases of landscape plants	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	1	100				
A2						
A3						

i. Diseases of turf grass	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	1	100				
A2						
A3						

j. Landscape insect pests

k. Turf grass insect pests	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	1	100				
A2						
A3						

l. Weeds	n	Pesticides	Sanitation	Exclusion	Trapping	Education
A1	5	100				
A2						
A3	2	100				
A4	14	66.67	6.67 hand pulling; 26.667 mowing			

7. What are the top three primary methods of controlling weed problems?

Weed control method	n	1 <sup>st</sup> Method	2 <sup>nd</sup> Method	3 <sup>rd</sup> Method
Herbicides	96	33.33	36.46	30.21
Mowing	101	71.29	27.72	0.99
Hand weeding	51	11.76	33.33	54.90
Mulching	43	4.65	58.14	37.21
Sanitation	1	0	0	100
Flooding and irrigation		0	0	0
Maintaining plan health	1	100		
Other methods				
Plastic Sheeting	2	100		

**8. How does your school district deal with (a) indoor pests (b) Landscape pests (c) weeds?**

Area	Contract	In-house	Combination
a. Indoor pests	63.16%	11.40%	25.44%
b. Landscape pests	21.05	48.25	30.70
c. Weeds in landscapes, grounds and athletics fields	16.67	64.04	19.30

**9. Criteria for pesticide application**

A. The severity of pest infestation	78
B. The principal request	32
C. The teacher request	15
D. If contract requires this as standard procedure	39
E. The recommendation of Maintenance director or facilities director	68
F. Other Criteria	
Pest Control contractor evaluates and recommends	1

**10. Who decides which pesticides to apply? & 11. Who decides where and when to apply pesticides?**

Who decides	10. Which pesticides to apply (n=)?	11. Where and when to apply pesticides (n=)?
School Superintendent	0	1
Maintenance director/Facilities supervisor	36	49
Principal or Assistant	1	4
IPM Coordinator	23	21
Pest Control Contractor	90	79
Custodial Staff	1	3
In- House Pest control technician	25	29
Child Nutrition Director	0	0
Cafeteria manager	0	0
Designated Teacher	0	0
Grounds keeper	7	5
Athletics Coach/staff	2	5
Other: County extension agent	1	1

**12. Who applies pesticides (a) in school buildings (b) on landscapes & grounds; (c) on athletics fields?**

<b>Who applies pesticides</b>	<b>a. In school buildings</b>	<b>b. on landscapes and grounds</b>	<b>c. on Athletics fields</b>
Superintendent	0	1	1
Maintenance director /Facilities supervisor	7	15	7
Principal or Assistant	0	0	0
IPM Coordinator	10	12	4
Pest Control Contractor	96	52	45
Custodial Staff	6	5	2
In-House Pest control technician	20	41	37
Child Nutrition Director	0	0	0
Cafeteria manager	0	0	0
Designated Teacher	0	0	0
Grounds keeper	0	26	21
Athletics Coach/staff	0	1	24
Other: a. County extension agent b. County parks & rec. staff	1 1	1	

**13. How frequently are pesticides applied in classrooms, cafeteria/storage areas, or on landscapes and ground, athletics fields?**

	<b>weekly</b>	<b>monthly</b>	<b>quarterly</b>	<b>Semi-annually</b>	<b>annually</b>	<b>As needed</b>	<b>Every 2 months</b>
a. Classrooms	0	16.67	7.02	1.75	1.75	71.93	0.88
b. Cafeteria/ food storage	2.63	33.33	7.89	3.51	2.63	2.63	50.88
c. Hallways	14.91	5.26	3.51	2.63	2.63	73.68	0
d. Landscapes and grounds	0	7.02	2.63	4.39	2.63	83.33	0
e. Athletics fields	0	5.26	1.75	2.63	4.39	85.96	0

**14. When pesticides are applied in classrooms, cafeteria/food storage and hallways/other areas, are they applied as (n= )**

<b>Pesticide formulation or application method</b>	<b>Classrooms (n= )</b>	<b>Cafeteria/food storage (n= )</b>	<b>Hallways/other (n= )</b>
a. Baits (for rodents and insects)	67	73	43
b. Spot treatments	35	27	41
c. Crack & Crevice treatments	56	60	44
d. Baseboard Sprays	49	43	46
e. Various surface sprays	8	9	2
f. Foggers	2	1	0
g. Dusts and powders	1	3	1
f. Other (sticky traps, gels)			

f. Other (sticky traps, gels) Yes (n= )

Classrooms	5, 3
Cafeteria/food storage	4
Hallways/Other	7

**15. When pesticides are applied on landscapes and grounds, and athletics fields, are they applied as (n),**

<b>Pesticide formulation or application method</b>	<b>Landscapes &amp; grounds</b>	<b>Athletics fields</b>
a. Baits & Pellets	29	20
b. Granules	44	35
c. Spray treatments	79	79
d. Dusts and powders	7	4
e. Fumigants	0	0
f. Other	0	0

**16. Typically, are pesticides applied in schools on school days OR on weekends and/holidays?**

On school days	40.35%
Weekends/holidays	59.65%

**17. When pesticides are applied on a school day are they applied before school hours, after school hours or anytime during the school day, or some other time?**

Before school hours	4.35%
After school hours	89.13%
Anytime during the school day	6.52%

**18. What are 3 primary sources of pesticides? (1 most common, 3 least common source)**

Source of pesticide	First	Second	Third
a. Local hardware stores	21.95	68.29	9.76
b. Pest Control companies	80.58	15.53	3.88
c. Pesticide distributor	43.48	45.65	10.87
d. Other	0	0	0

**19. Are principals, teachers and staff permitted to bring and use their own pesticides?**

Yes	2.63%
No	97.37%

**20. Does your school district provide notification about pesticide use on school property?**

Yes	79.82%
No	20.18%

**21. Who is notified about pesticide use on school property (n)?**

Parents and guardians	34
Teachers and staff	33
Principals	83
Cafeteria mgrs	33
Other	
Athletics director	1
Superintendent	1
Central office	5
Maintenance department	1

**22. In what format is notification provided (n)?**

Written notification (letter, mail, flyer etc)	67
Telephone or oral	44
Post notification near treated areas	17
Other	0

**23. Does your school district maintain any records of pest control activities?**

Yes	91.04%
No	8.77%

**24. Do you maintain the following records?**

	<b>Yes (n)</b>
Pest sightings	49
Inspection and monitoring	41
Pesticide applications	82
Pest control work orders	91
Recommendations for structural repair/modifications	40
Repair and maintenance	53

**25. Has any school in your school system reported pest related damage to the structures, stored product or materials in the last fiscal school year (2006-2007)?**

Yes	33.33%
No	66.67%

**26. What sort of damage did the pests cause (n)?**

a. Boxes of stored supplies punctured by pests	5
b. Contaminated stored food	2
c. Damaged stored wood	4
d. Damaged drop ceilings	1
e. Damaged plants	.
f. Damaged lawns or turf grass	.
h. Structural damage	30

**27. What would you estimate as the value of the damage (n=38)?**

a. \$ 0-\$ 1, 500	71.05
b. \$ 1, 501-2, 500	10.53
c. \$ 2, 501- 3, 500	2.63
d. \$ > 4, 500	15.79

**28. Have students, parents, teachers or staff complained in the last 2 years about the use of pesticides in any school?**

Yes	5.26%
No	94.74%

**29. Have they complained of:**

	<b>Yes</b>	<b>No</b>
a. Burning eyes, nose, throat	0	6
b. Dizziness	0	6
c. Shortness of breath	1	5
d. Rashes on skin	0	6
e. Nausea	0	6
f. Sneezing and wheezing	0	6

g. Symptoms due to assumed exposure	2	4
h. Other complaint – Smell	3	0

**30. Do you have an established program for addressing concerns of students, parents or teachers about your school pest control program?**

Yes	49.12%
No	50.88%

**31. Do you incorporate any non-chemical methods in your pest control program?**

Yes	82.46%
No	17.54%

**32. What non-chemical methods do you use?**

	<b>Non-Chemical method</b>	<b># of school districts</b>
a.	Clean up clutter	58
b.	In section of incoming merchandise	16
c.	Regular building inspections	37
d.	Light traps	6
e.	Glue boards/sticky traps	64
f.	Food Storage(in plastic containers, zip lock bags)	34
g.	Pressure washing kitchen floors	
h.	Caulking	60
i.	Plastic liners in garbage cans	28
j.	Vacuuuming pests	7
k.	Sticky traps	49
l.	Other methods	.

**33. Have you made any changes to your pest control program within the last 2 years?**

Yes	53.51%
No	46.49%

**34. What changes have you made?**

	<b>Changes</b>	<b>Yes (n)</b>	<b>No (n)</b>
a.	Changed contract specs to reflect IPM requirements	42	
b.	Educated and informed school employees, teachers, students and administrators about IPM	29	
c.	Trained technicians  personnel in IPM techniques	22	
d.	Installed Pest sighting logs	23	
e.	Passed an IPM Policy	21	

**35. Are you aware of the school children’s health act of 2006?**

Yes 98.25%  
No 1.75%

**36. Are you familiar with the School IPM program at North Carolina State University?**

Yes 94.74%  
No 5.26%

**37.**

<b>Awareness</b>		Yes %	No %
a.	Are you aware of the print materials like manuals, brochures, and fact-sheets they produce?	85.09	14.91
b.	Are you aware of the website that has these materials?	85.96	14.04
c.	Are you aware of the educational and awareness workshops?	91.23	8.77
d.	Are you aware of the recognition and awards program which recognizes school districts that adopt IPM?	83.33	16.67
e.	Are you aware of the troubleshooting and technical support on IPM available through this program?	77.19	22.81

**38. How do you describe IPM?**

Pesticide + Pest exclusion 16.67%  
Mix or Rotate pesticide formulations and classes 4.39%  
Absolutely no pesticides 7.02%  
Action levels and combination of pest control tactics 71.93%

**39. How effective is IPM in solving pest problems?**

Not effective 0.88 %  
Somewhat effective 50.88 %  
Very effective 48.25 %

**40. Does your school district have an IPM program? (n=114)**

Yes 61%  
No 39%

**41. When did your school district adopt an IPM program? (n=70)**

1987	1.64%	2000	4.92%	2005	6.56%
1990	1.64%	2001	1.64%	2006	34.43%
1997	1.64%	2003	1.64%	2007	36.07%
1998	1.64%	2004	8.20%		

Approximately how much money did your school district spend in 2006-2007 on **42. Indoor pest control** **43. Outdoor pest control** and **44. Termite control**?

Amount spend (\$)	42. Indoor pest control	43. Outdoor pest control	44. Termite control
Less than 5000	30.70%	57.02%	73.682%
5000-10000	34.21%	22.81%	18.42%
10,001-20000	18.42%	9.65%	3.51%
20001-30000	7.02%	5.26%	4.39%
30001-40000	5.26%	1.75%	.
40001 -50000	1.75%	0.88%	.
50,001- 60,000	0%	0.88%	.
Over 60,000	2.63%	1.75%	.

**45. Do pest control contractors make recommendations to your department about how the school community can support pest management efforts? (n=114)**

Yes	54.39
No	45.61

**46. What recommendations have they made (n=114)?**

Recommendation	n	Yes	No
a. Structural repairs	56	57.14	45.86
b. Screening	61	60.66	30.34
c. Sanitation	62	69.35	30.65
d. Proper food storage	60	65	35
e. Other : Vending machines on wheels	1	100	
IPM	1	100	

**47. How would you rate the level of cooperation of the school district in responding to these recommendations? (n=62)**

Not cooperative	1.61%
Somewhat cooperative	38.71
Very cooperative	59.68

**48. Highest level of education**

High School	21.05%
Some College	11.40%
2-year College	25.44%
4-Year College	26.32%
MS Degree	13.16%
PhD. or higher	2.63%