Stinging Insect IPM for Schools and Similar Areas

Project Leaders: Lynn Braband, Carolyn Klass, Joyce Rodler, Jody Gangloff-Kaufmann

Cooperators: School districts in New York State, Suffolk County Farm and Education Center, selected Suffolk County (high risk) facilities, Pat Cozzarin Pest Management

Type of grant: Cultural methods; sanitation; physical controls

Project locations: Albany Co., Livingston Co., Ontario Co. (yellowjacket trap trials only), Rensselaer Co., Suffolk Co., Tompkins Co.

Abstract: Stinging insects are considered to be high-priority pests in the urban environment. There are many risks associated with stinging insects, including the chance of having a severe allergic reaction to a sting, and the potential to become exposed to pesticides. A proactive stinging insect management program tailored for schools and similar settings is proposed. This project focuses on demonstration of techniques and education of the school buildings and grounds staff in non-toxic stinging insect management.

Background and justification: Issues surrounding the use of pesticides in schools have become increasingly significant in the past few years. While the reduction of pesticide use and potential exposure is often the most important goal, exposure to pests should not be dismissed as a serious risk in schools. Stinging insects are considered to be among the most serious of pests in the school environment. Wasp stings can cause mild reactions in those who are not allergic, however, approximately 40 deaths occur every year in the U.S. due to severe reactions to yellowjacket stings. A recent publication by the Maine Department of Agriculture, Food and Rural Resources (October 2000) cited stinging insects as the most important outdoor pest inducing the highest percent of reaction (treatment) from schools. It is more common for schools to treat stinging insect problems in a reactive rather than proactive manner. In other words, stinging insects are not usually controlled until a large nest or swarm is discovered or an individual is stung. Therefore, conventional management for stinging insects relies heavily on insecticides for quick results.

Recently, many local communities have agreed to limit or eliminate the use of pesticides on school property and all schools in New York State are encouraged to adopt "least-toxic" pest management strategies due to the recent School Pesticide Notification law. In addition, changes in pesticide applicator certification rules by the Department of Environmental Conservation make it more difficult for school personnel to become certified for pesticide use. Furthermore, county property pesticide phase-outs limit the ability to quickly control stinging insects in high-risk public areas. These developments offer an excellent opportunity for educational outreach to school facilities staff on low-risk and pesticide-free stinging insect management and for the demonstration of techniques that have been shown to work. Furthermore, investigation of new or unproven tools and practices can be carried out. Useful information can then be added to current management strategies for stinging insects on school and county property.

In 2000, preliminary efforts of this project were focused on the investigation of a proactive approach to stinging insect management. An emphasis was placed on non-toxic approaches with evaluation of reliability and practicality of the process in controlling stinging insects. The work was conducted in several areas of New York State in collaboration with five school districts and a county-owned educational farm and prison. All four collaborators were able to engage with facility personnel, locate suitable sites for trials, and gain the skills necessary for safely managing stinging insects. In 2001, the group continued and expanded the project to include more facilities and piloted a yellowjacket trapping experiment.

Objectives:

1. Demonstrate management of paper wasps, hornets, and yellowjackets using low-risk techniques.
2. Transfer information to school or facility managers.
3. Investigate new tools for problem areas not easily managed.
4. Evaluate results of the effort; verify that the evaluation methods are good.
5. Evaluate the relative cost of stinging insect IPM.

Procedures:

1. Demonstrate to school officials and staff that stinging insects can be managed without the use of synthetic insecticides. This will include early-season scouting and nest removal, exclusion and discouragement techniques, and alternatives to conventional insecticide use. These methods can be used by unlicensed facility staff for wasp prevention and avoidance of pesticide use.

2. During the course of the project, facilities staff will be kept informed and asked to participate. Information about the biology and ecology of different species of wasps will be available. They will experience hands-on training and will later benefit from workshop summaries of the project. Other school districts, not involved in the project, will be trained in workshops in stinging insect IPM. In the workshops, training will go into greater detail of specific information about the major species and their management.

3. The group will investigate new tools, such as baited traps and sticky traps, for problem areas that are more prone to wasp infestation. This includes garbage bins, dumpsters, wall voids and playgrounds. A variety of lures, both food and visual, will be tested for high efficacy. Vacuuming will also be tested as a means of eliminating wall or ground nesting colonies of yellowjackets. A new plant-oil dust will be used against wall-nesting yellowjackets and possibly ground nesting colonies, and the efficacy will be assessed.

4. In the evaluation phase, traps used in areas with high yellowjacket activity will be collected and the number of trapped wasps will be counted or estimated. This will give an indication of efficacy of the work. Finally, the evaluation phase will include such factors as the number of students and staff stung, the reduction of stinging insect activity, the level of satisfaction of facilities staff, and the ultimate cost.

5. A relative estimate of the cost of this program to a single school will be calculated based on labor, supplies, and reduction of pesticides used. In addition, the number of workshop participants will be documented.

6. In the future, to measure the impact of the educational effort, the level of school adoption will be assessed by surveying facilities staff about their scouting frequency, wasp nest sighting, and nest removals.

7. Pilot experiments seeking to assess the effectiveness of yellowjacket traps in reducing the risk of being stung were conducted at two sites. One site was the NYS Agricultural Experiment Station in Geneva, NY (Ontario Co.). The second site was at the Gabreski Airport, Westhampton, NY (Suffolk Co.). At both locations, two plots were established in open fields of grass or hay. Each plot was 100 ft. by 100 ft.. Eight-foot tall (above the ground) poles were installed at 20 ft. intervals along the periphery of the plots. Three poles were also placed in the center of each plot. Our objective was to test the assumption that trapping foraging yellowjackets at the periphery will reduce yellowjacket numbers in the center of the plots. Yellowjacket container traps were suspended from the center poles in all plots. At each location (Ontario Co. or Suffolk Co.), traps were installed on the peripheral poles of one plot but not the second plot. Traps were maintained and captures recorded for two weeks. The peripheral traps were then moved from the first plot to the second for the next two-week period. This pattern of alternating plots with the peripheral traps continued through the study period (late summer through October).

Results and discussion:

Diagnostics: Species identification was done largely by Carolyn Klass and Jody Gangloff-Kaufmann. The most common stinging insects encountered were *Polistes dominulus, Vespula germanica, Vespula maculifrons,* and *Dolichovespula maculata.* Other species identified were *Polistes fuscatus, Vespula vidua, Vespula aerania, Vespula flavipilosa,* and *Vespa crabro.*

Inspections: The purposes of the inspections were to find and remove stinging insect nests and to identify sites for exclusion or sanitation. The frquency of the inspections varied depending on the site. Inspections of most locations were done monthly.

At three of the school sites, comparisons were made based on the frequency of inspections : weekly (Livingston Co.), semi-monthly (Albany Co.), and monthly (Rensselaer Co.). These inspections began in May and were conducted through October. In terms of maintaining control of paper wasps and locating yellowjacket nests, the semi-monthly inspections performed as well as the weekly inspections and better than the monthly inspections. This was consistent with last year's results.

At these same three locations, "managed" schools were compared to "unmanaged" schools. As the season progressed, "managed" schools had fewer (if any) nests compared to "unmanaged" schools. This also was consistent with last year's project.

Nest removal (Paper wasps): Most paper wasp (largely *Polistes dominulus*) nests were successfully removed by physical means such as a water spray or knocking down with a pole. By mid-summer, the building of new nests on the managed sites had largely ceased. Thus, the managed sites usually lacked large late-season paper wasp nests especially when compared to unmanaged sites. Some hidden nests (as in the hollow supports of playground equipment) did escape notice until later in the season.

Larger paper wasp nests or nests in hard to reach places were sprayed with insecticides containing mint oil or eugenol. At one location, a dust formulation of the eugenol product was applied to possible nest sites. This application appeared to successfully function as a repellent to prevent nest building.

Nest removal (Yellowjackets): Included in this discussion are *Vespula spp.* and *Dolichovespula maculata.* Compared to paper wasp nests, yellowjacket nests tended to be more difficult to locate. This was especially true of nests in enclosed spaces such as wall voids and in the ground. Frequently, the nests were not noticed until the colonies were large with a regular stream of workers entering and leaving the nest.

Both the size and location of the nest impacted the ease of removal. Several techniques (including vacumming, digging, enclosing within a container, and mint oil or eugenol insecticides) were utilized. Often a combination of techniques was needed. Yellowjacket removal by these means tended to be labor intensive. More than one visit or treatment was often required.

Nest removal (other species): Occasionally the nests of other stinging insects were encountered. Mud dauber (Sphecidae) nests were removed by physically knocking them down or with water sprays. One bumble bee (Bombus sp.) nest was successfully treated with an eugenol dust formulation.

In 2000, ground bees were apparently discouraged at one location with the use of the mint oil insecticide.

Exclusion: Exclusion was extensively used to reduce the number of nest sites on the managed properties. The materials used were expanding insulating foam (applied with a "foam gun"), caulk, and insect screening. Exclusion sites included playground equipment, tennis courts, doorways, signs, and building cracks/gaps. Exclusion was particularly effective in reducing paper wasp activity around fences and other situations.

Sanitation: Dumpsters were particularly attractive to foraging yellowjackets. Food-baited traps were not sufficient to draw wasps away from the garbage. In Suffolk Co., we recommended that the dumpsters be kept covered and regularly cleaned. This would probably involve a significant time investment.

Last year, at one of the school sites, nearby milkweed plants harbored aphids. The exuded honeydew then attracted wasps. Milkweed (and aphid) numbers were reduced this year.

One of the project locations was a food pantry. They were already practicing good sanitation and no yellowjacket problems were reported.

Lids for open garbage receptacles were recommended at one site. At other locations, reminders to empty full trash containers were made.

Trapping (demonstrations of yellowjacket container traps): Most commercial yellowjacket traps consist of a container partially filled with a, usually, sweet liquid such as fruit juice. The wasps are attracted to, and subsequently drown in, the liquid.

We utilized container traps at eight locations: five schools, one restaurant, one fire training academy, and one county farm. Most traps were Victor's Yellow Jacket Traps. Safer Disposable Yellow Jacket Traps were also used at one site. The number of traps used per location ranged from two to 24.

Although a variety of stinging insects were captured in the traps, the majority were yellowjackets especially Vespula species. At two of the school sites (Albany Co. and Livingston Co.), we counted all stinging insects captured. A total of 9884 stinging insects were in the traps through the study. Yellowjackets comprised 98% of the catch. Paper wasps made up 1% of the total. Other species caught included bumblebees, carpenter bees (Xylocopa virginica), honey bees (Apis mellifera), and mud daubers. Last year, cicada killers (Sphecius speciosus) were commonly caught at the Livingston Co. site. None were captured this year.

Trap captures generally started to increase in August. Captures usually peaked in late August or September. One exception was the school site in Albany Co. which peaked during October.

Fruit juice and beer were the most attractive baits that we used. At the location where both the Victor and Safer traps were used, the Victor traps appeared to be more effective.

At the 3 Suffolk Co. school sites, exclusion reduced the need for yellowjacket traps except for near the dumpsters. However, the traps were apparently not as attractive as the garbage. A literature search revealed the potential use of crushed conspecific yellowjacket heads as an attractant. The stimulus is aggression (alarm pheromones) rather than food and may have utility for trapping around dumpsters.

Large numbers of yellowjackets can be captured with baited container traps. What is still unclear is the effectiveness of the traps in actually reducing the risk of being stung.

Trapping (demonstration of glueboard yellowjacket traps): At the Suffolk County Farm location, attempts were made to capture yellowjackets with glueboard traps. The traps were installed on the underside of garbage container lids, over doorways, and in a piece of playground equipment. Few wasps were captured. Most captures were flies, earwigs, and other insects.

Trapping (yellowjacket trap trials): We conducted a pilot experiment to see if trapping the perimeter of a plot would reduce the number of yellowjackets within the plot. Evaluation of the data is ongoing, but preliminary analysis points to fewer yellowjackets caught in the center of plots with peripheral trapping compared to plots without peripheral trapping.

However, we also had indications that the traps may actually serve as an attractant and not merely intercept yellowjackets as they fly by. If that is the case, trap use may be more appropriate in areas (such as concession stands) that would normally attract yellowjackets anyway. Trap use may not be appropriate in other circumstances (such as playgrounds) with no significant wasp food sources.

We hope to build upon this pilot project next year to get a better handle on these questions.

Biological control: We obtained an experimental use permit through PESP and the DEC to use BioBlast, a biological termiticide consisting of Metarhizium anisopliae, on yellowjacket nests. An application was made on one nest with minimal success due to application uncertainties and use at the end of the season. We believe the technique is worth further systematic investigation.

Surveys: Employees at three Suffolk Co. sites (Airport café, Fire Academy, and County Farm) were surveyed concerning their perceptions of the stinging insect project (see attached). The majority felt that the programs effectively reduced stinging insects at their facilities. More felt that nest removal and exclusion were effective than felt trapping was effective.

In the three school districts where "managed" schools were paired with "unmanaged" schools, we asked the nurses at each school to keep track of stinging insect incidents. The number of stings reported ranged from zero to 12. No trend was apparent in comparing the "managed" and "unmanaged" schools.

We also asked faculty and staff at the "managed" and unmanaged" schools to fill out a survey form (attached) concerning their perceptions of stinging insect problems and our demonstration project. To date, we have received surveys back from two of the "managed" schools. Of these respondents, 9 (36%) were aware of the demonstration while 16 (64%) were unaware. In general, of those aware of the demonstration, most felt it was effective in reducing the risk of being stung.

Educational outreach: On October 12, a half day workshop highlighting the stinging insect demonstration was held at the Livingston Co. school site. Twenty-six school (from 16 districts) and BOCES personnel attended. The workshop included a tour.

In Suffolk Co., Fire Academy occupants received training on non-toxic and low toxic pest management in preparation for the stinging insect project.

A poster paper on the project has been accepted for presentation at the Fourth International Conference of Urban Pests in Charleston, SC during July, 2002.

Presentations based on the project were given to the NYS Pest Management Association in October and the NYS Turfgrass Association in November. An article is being written for Turfgrass Trends.

We also made presentations on the project in several DEC-supported Non-Toxic Pest Management Workshops including NY Coalition for Alternatives to Pesticides workshops in Buffalo (March) and Albany (April) and three workshops sponsored by Cayuga Co.. Additional presentations were made to the NYS Wildlife Management Association, the Ithaca Kiwanis Club, and CCE Master Gardeners.

Summary and conclusions: The most common stinging insects at the locations we worked at were yellowjackets *(Vespula spp., Dolichovespula maculata)* and paper wasps *(Polistes spp.* especially *P. dominulus).* Preventative exclusion, sanitation, and removing nests when small were the best methods for reducing wasp numbers at our study locations.

Semi-monthly inspections were sufficient for maintaining control of paper wasps and locating yellowjacket nests. Physical methods and low toxic sprays were effective in removing paper wasp nests. The removal of yellowjacket nests was more difficult. Vacuums and low toxic insecticides (especially dusts) were among the most promising tools. Physical methods of removing yellowjacket nests were labor intensive. Success may be enhanced by developing effective biocontrols.

Large numbers of stinging insects, especially yellowjackets, can be captured in baited container traps. More work needs to be done to ascertain if such trapping actually lowers the risk of being stung.

References:

- Example of Suffolk County survey (for a printed copy of this report, contact Joyce Rodler, jr247@cornell.edu)
- Managed/unmanaged schools survey form, http://www.nysipm.cornell.edu/grantspgm/projects/proj01/comm/school_survey.doc

Photos:

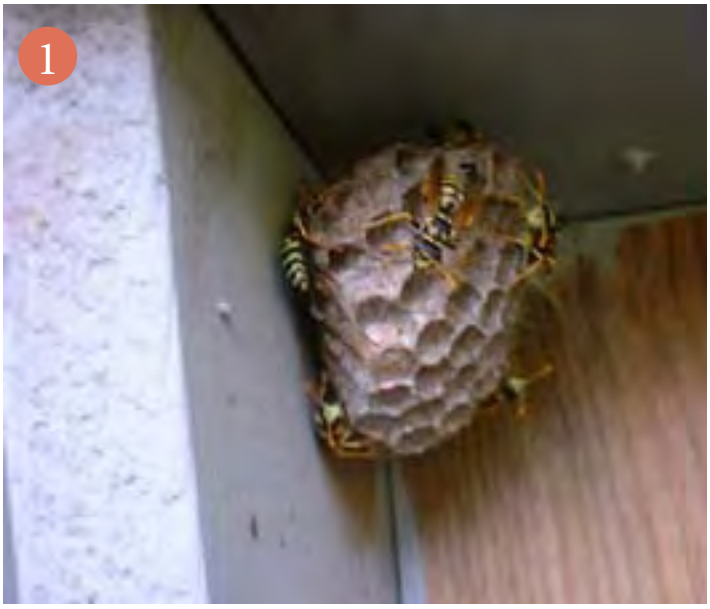
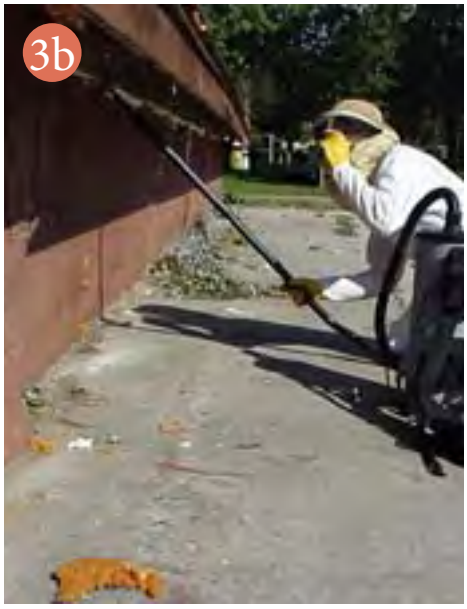


Photo 1: *Polistes* nest

Photos 2a, 2b, and 2c: Exclusion with foam.



Photos 3a, and 3b: Nest vacuuming.

Photo 4: Nest site.

Photo 5: Baiting yellowjacket trap.

Photos 6a, 6b, 6c, 6d, and 6e: Yellowjacket trap trial plots.