Comments on Chapter 8

The following comments should be read as a preliminary critique from two individuals in our group, and not a thorough edit of Chapter 8. In general we feel Chapter 8 is probably too long and goes beyond the intent of the PMSP. We believe that listing products is problematic from many different perspectives, not the least of which is the metric used to justify why the document lists something as more toxic (and by implication, more hazardous) than another. We understand that the EPA has taken to recommend removing these tables from the document, a suggestion that we support, at least for tables in their current form.

We have made a good faith effort to suggest improvements to Chapter 8 in its present format. However, the format itself seems flawed. As a possible alternative we suggest that the pests chapter should cover the following points with emphasis on point 3, critical issues. To do this, more input should be sought from experts in the various pest categories:

1. The most important pests nationally
    a. Where they occur (regional importance)
    b. Reasons for importance
        i. Economic impact
        ii. Health impact
        iii. Nuisance or aesthetic impact
2. General control measures used for different categories of pests
    a. By type: cultural/mechanical
    b. Biological
    c. Chemical option categories and formulations (not necessary to list every active ingredient, perhaps just formulations, their pros and cons, keeping in mind that metrics should focus on relative risk according to application method rather than clinical toxicity of active ingredients.)
    d. Highlights of general IPM or resistance management issues, environmental issues, health issues (balancing pesticide risks vs. pest risks)
3. Critical issues for research, extension and regulatory sectors

Chapter 8 needs a paragraph stating that risk can be reduced by reducing exposure. For example, approaches such as baiting reduce exposure risks significantly over broadcast methods using residual insecticides.

In general, Cooperative Extension Bulletins should not be used in places where refereed journal publications are appropriate.

We recommend that the first paragraph be amended to:

Pg. 57, paragraph 1
"The following section presents major pest groups, geographic distribution, monitoring techniques and a hierarchy of management options including strategies to prevent and avoid problems. ~~Example pesticide options are categorized by toxicity and potential for exposure.~~ Pest-specific emerging issues and priorities are also identified."

Pg. 57, Paragraph 3: *delete this paragraph entirely to keep the chapter consistent with the deletion of the pesticide tables. Paragraph 4 is written generally enough. The flow from para 2 to 4 is fine without paragraph 3.*

~~"Pesticide use, toxicity and potential for exposure should be minimized for a number of reasons in addition to the increased susceptibility of children to toxins. Pesticide applications are generally temporary measures and do not solve the underlying problem. The history of pest management includes many products that were considered safe when used as per label directions at the time they were introduced and were later found to have substantial hazards. Although most pesticide products undergo extensive testing and review prior to entering the marketplace, no amount of testing is adequate to identify all potential hazards including those associated with exposure to multiple toxins in combination. Finally, effective cultural and physical options are available for many nearly all of the pest problems typically encountered in schools.~~

Pg. 57, Paragraph 4:
"A written plan should ideally be in place that details ongoing pest prevention such as monthly or quarterly inspections of food service and other pest-prone areas, and annual inspections of the entire building for pest-conducive conditions. The plan should also include a hierarchy of actions to be taken when a pest problem arises, with an emphasis on identification, diagnosis of the underlying causes and contributing factors. The plan should include both short-term tactics to regain acceptable conditions and long-term preventive solutions.

Pg. 57, Paragraph 5—*We wonder whether this paragraph is appropriate here or should be placed in another chapter.*

"A well-trained IPM coordinator should be in place and charged with implementing the IPM policy and plan, including reviewing proposed pesticide uses to ensure they are compatible with the policy and plan and that reasonable non-chemical measures have been taken. An IPM committee or other committee charged with pest management responsibilities should be in place to regularly review performance and update policies, plans and procedures to reflect current conditions and available options, and ensure continual improvement."

Pg. 61. *Part of the length of the document has to do with its redundancy. This is a perfect example. Feels like proselytizing about chemical hazards; such comments should be kept in the pesticide options section. Suggest deleting the following and keeping the second paragraph*:

Pesticide options for nuisance ants ~~Pesticides should not be used on a routine or calendar-based schedule but only where persistent ant problems occur, the ant species has been identified and non-chemical approaches have proven unsuccessful or uneconomical, e.g., repairs to old structures to exclude ants are not affordable.~~

Pesticide options that reduce potential for exposure include insecticide baits. Baits may be applied in a broadcast fashion or can be delivered in pre-manufactured, enclosed bait stations and gel or liquid baits placed in cracks and crevices. Effective baits are available for most nuisance ant species

~~Pesticide options that increase potential for exposure for students, staff and other facility users include spray formulations applied to exposed surfaces or broadcast granulars. These formulations are typically not required for successful management of nuisance ants in schools. Danger or Warning-labeled pesticides are not required for nuisance ant management. In addition, barrier applications to exposed impervious surfaces including foundations, walkways and driveways are prone to runoff into surface water and should be avoided.~~

Pg. 63—*This section is poorly organized and I recommend deleting the following paragraphs. Fipronil could be considered an "emerging issue", but the issue of pyrethoids in water is not an "emerging issue". The issue of broadcast insecticide use and water quality in general is definitely not an emerging issue. Only the products have changed. "New strategies"—baiting away from the structure is not "new". The pest control industry has been doing this for years. The use of "botanical granulars" should not be included as there are no data that I am aware of to substantiate efficacy.*

Emerging issues, new strategies and priorities for nuisance ants ~~Argentine and other~~

~~ants may be tempted away from areas where they are causing a problem by —bribery|| or~~

~~—diversionary baiting.|| This strategy involves regular maintenance of bait stations placed~~

~~outside and away from buildings, e.g., on the perimeter of a property. Starting by placing the baits outside and adjacent to the building, baits can be gradually moved out to the perimeter, drawing ant activity with them.~~

~~Granular formulations of botanical pesticides are broadcast around foundations to reduce ant activity and more information is needed on efficacy for specific ant species including residual activity.~~

~~Pyrethroids have been found at levels of concern in sediment of surface water in urban and suburban environments and associated with impacts on aquatic organisms. Other pesticides widely used for barrier perimeter treatments for ants including fipronil are also being examined for these potential hazards.~~

The following two sections were edited by Janet Hurley and are contributed as alternative versions of the bat and bird sections, presuming that the current format is retained. We do, however, encourage shortening the pest sections and focusing more on research, extension and regulatory priorities.

BATS

Bats are considered a high-risk animal group for rabies transmission in the United States. A few species are known to frequently roost in buildings (Table 8.6). While tolerable under some circumstances, the presence of bat roosts in close proximity to humans is often undesirable. Biologically (and often legally), the only long-term control technique is bat exclusion.

Bats are highly beneficial wild mammals. Some bat species eat insects and consume up to their weight in food each night. Others are important pollinators. Bats are not flying rodents, but belong to a unique order of mammals called the Chiroptera (Latin for "hand wing"). A common myth about bats is that they are blind. Bats have good vision; however, they can also use sound waves (echolocation) to help them navigate and locate food.

Only about one-half to one percent of bats carry the rabies virus; however, any bat found on the ground, or that is active during the day, should be suspected of being rabid. Anyone who has direct contact with a bat in which a bite may have occurred might have been exposed to rabies.

School administrators and IPM managers should protect students, faculty, and staff from bat species associated with rabies and other potential rabies exposures. Officials should have a general understanding of bats and the principles behind preventing or excluding colony establishment within school buildings. Each district and school should have a written plan for responders to follow when any high-risk rabies species, especially bats, are found on school property

Individuals involved in bat management should be trained in basic bat biology, health concerns related to bats, and identifying signs of bat activity. Many states have laws requiring personnel involved with management projects to have a wildlife handler's permit or license. In other states, those who exclude bats may also need a pest control applicators license, check with your state regulatory agency to learn more. Incidental bats encounters in human living space can occur almost anywhere, bat roosts in buildings often pose a concern with disease like rabies or histoplasmosis.

Table 8.6 Bat species most likely to be encountered in pest situations in school environments.

Common and species name	**Geographic distribution**
Big brown bat, *Eptesicus fuscus*	Throughout the US.
Little brown bat *Myotis lucifugus*	Throughout most of the US.
Brazilian Free-tail Bat (also known as Mexican Free-tail) *Tadarida brasiliensis* *Subspecies: T. b. Mexicana (migratory)* *T. b. cynocephala (non-migratory)*	Roughly the southern half of the US.
Evening bat *Nycticeius humeralis*	Eastern half of US north to southern Great Lakes.
Pallid bat *Antrozous palidus*	Southwestern US and west coast.
Yuma myotis *Myotis yumanensis*	Most of western third of US.

Monitoring and inspection for bats
The first step in bat management is to identify areas of potential bat entry point located in and around buildings. Inspections should be conducted during early evening (dusk) and just prior to dawn to locate bats entering or exiting the building. During cooler months, this step may need to be repeated several nights in a row to establish exit/entry points, as bats do not leave the roost at night if temperatures are too cold. This step is extremely important in identifying where to place bat eviction tubes and nets.

Bats normally enter near the top of structures. Unlike rodents, bats are not generally capable of chewing openings and must use existing holes. An opening ¼-inch by 1½-inch is sufficient for a small bat to squeeze through, but buildings with well-established roosts will probably have larger openings.

During an initial inspection, it should be determined whether any person or pet has been bitten or had direct contact with a bat. If this has occurred, the local health department should be contacted.

Cultural and physical options for bat management
Buildings vary on the degree of structural modification needed to successfully seal bat entry points. Often, spot repairs with simple materials will be sufficient. In some cases, part of the structure (such as the roof) may need to be rebuilt. Still other situations, as with the case of bus barns, total exclusion will not be practical.

Measures can be taken to prevent bats from entering the human living space of a building. Any opening to the walls or roof can provide access to bats. Common sites include gaps under and over attic doors, gaps around pipes passing into the ceiling, pocket doors which slide into the walls, loose fitting baseboards, and broken plaster. Either temporary (towel under attic door, steel wool in wall hole, etc.) or permanent steps can be taken to close these openings. Bats may also enter basements and other rooms through chimneys. The dampers should be kept closed on fireplaces when not in use, and chimney covers can help.

Bat exclusion on the exterior of a building is greatly facilitated with the use of check-valves, or one-way doors, for bats. When installed over the major entry sites, check-valves allow bats to leave but not reenter the structure.

Some work has been done with combining exclusion with the use of bat houses as an alternative roosting site.

Increasing ventilation and illumination of attics and crawl spaces is sometimes done to reduce the environmental conditions attractive to roosting bats.

Although widely marketed to the public, ultrasonic devices purporting to repel bats have not shown in independent testing to be effective.

Table 8.7 Commonly used products for physical, cultural or mechanical management of bats and uses.

Type	Example Products	Uses
one-way exclusion checkvalves	netting, screen, Batcone™	Installed over openings bats use to enter and leave structures such that exit is allowed and reentry is not.
exclusion	sealant, hardware cloth, wood	Permanently seals openings after all bats have exited the structure.
disrupt the calm	ceiling fan, mylar balloons	Bats will not roost in disturbed areas, position fan to move balloons in problem roosting areas for several days.
slick surface		Cover substrate were bats are roosting with a smooth surface; bats will roost elsewhere.

Pesticide options for bat management **(Delete this entire section)**

~~There are no known bat products to repel or destroy bats. In most states it is prohibitive by law to kill bats. The best prevention of bats is to exclude them out and evict them during the fall to late spring months.~~

~~There are very few options in this category. A few products containing naphathalene (same ingredient as moth balls) are labeled for repelling bats. Napthalene-containing products should not be used due to human health hazards; naphthalene is one of the pesticides most frequently implicated in human pesticide poisonings.~~

~~Products containing polybutenes, that form an adhesive surface that are meant to repel pigeons and other birds, have been used around bat entry sites. However, since bats usually are not listed as target pests, this is an off-label use and thus prohibited in some states.~~

~~Until 1991, some states allowed the use of the anticoagulant chlorophacinone tracking powder (RoZol®) for lethal control of bats. This is no longer the case, and there are currently no pesticides that may be legally used to kill bats.~~

Table 8.8 Priorities for bat management.

Research Development of safe and effective repellents for use in bat roosts.

Evaluation of effectiveness of these and other mechanical methods of bat exclusion.

Refinement and evaluation of off-site bat houses as alternative sites when excluding bats from a school building.

Extension

Development of regional management plans to help schools to eliminate bats

Education

Development and distribution of short videos, PowerPoint or other presentations on bats to be delivered to teachers, students and staff. "What to do if you see a bat"

Additional resources for bat management

Arizona Cooperative Extension. 2007. All About Bats. Pest Press. cals.arizona.edu/urbanipm/pest_press/2007/oct_nov.pdf (PDF)

Arizona Cooperative Extension. 2008. Batty About Bats. http://cals.arizona.edu/pubs/insects/az1456.pdf (PDF)

Bat Conservation International. www.batcon.org

Curtis, P.D., J. Shultz, L. A. Braband, L. Berchielli and G. Batchelor. 2004. *Best Practices for Nuisance Wildlife Control Operators; A Training Manual*. NYS Department of Environmental Conservation and Cornell Cooperative Extension. nwco.net

Hurley, J, B. French, M. Goodman, & B. Nix. 2007. Integrated Pest Management Plan for Bats, 6 pages http://schoolipm.tamu.edu/dev/IPM_forms.asp

Hygnstrom, S.E., R.M. Timm and G.E. Larson, eds. 1994. *Prevention and Control of Wildlife Damage.* University of Nebraska-Lincoln. 2 vols. digitalcommons.unl.edu/icwdmhandbook/

Internet Center for Wildlife Damage Management www.icwdm.org

Link, R. 2004. *Living with Wildlife in the Pacific Northwest*. Washington Department of Fish and Wildlife. 392 pp.

Salmon, T.P., D.A. Whisson and R.E. Marsh. 2006. *Wildlife Pest Control Around Gardens and Homes*. University of California. 122 pp.

Tuttle, M.D. 1988. *America's Neighborhood Bats; Understanding and Learning to Live in Harmony with Them*. University of Texas Press. 95 pp.

BIRDS

The presence of nuisance birds in unwanted areas can cause damage to property, and their droppings may create unpleasant odors. Bird droppings can also ruin vegetation, painted surfaces, gutters and awnings, and cause electrical equipment to malfunction. Birds may carry diseases which are capable of infecting humans, and bird droppings can promote soil conditions favoring development of such fungal diseases as *histoplasmosis.* House sparrows can damage rigid foam insulation, and their nests can become fire hazards.

The first step in your bird control program should be identification of the pest bird; if you cannot positively identify the bird, consult an expert before taking action. The Migratory Bird Treaty and Endangered Species Acts prohibit trapping or killing of most birds, eggs or nests without a permit. House sparrows, starlings, and pigeons are not protected under these Acts, but may be covered under local ordinances, so be sure to consult with local wildlife authorities.

Nests on buildings can be unsightly, block ventilation systems and attract other pests such as bird mites or dermestid beetles. Accumulations of droppings can be a health hazard and deteriorate building surfaces.

Flocks of water birds, especially Canada geese and gulls, are an increasing problem on school grounds, especially athletic fields. In addition to creating a nuisance, these species may damage turf, deteriorate pond environments and create potential health hazards including slippery footing for athletes due to copious fecal droppings.

A wide range of other situations may result in birds becoming pests at schools. Roosting turkey vultures can become a nuisance with their distinctive sights and smells. Gulls may harass young children for food. Swallows may nest on the sides of school buildings, creating a problem with droppings and mites or dermestids left behind after they move on.

Crows have damaged certain roofing materials. Woodpeckers often drill into wooden buildings. Mississippi kites will dive at people near their nests. Blackbird roosts in trees can be a locally intense problem.

Table 8.9 Bird species most likely to become pests in school environments.

Common and species name	**Geographic distribution**
Rock Pigeon (formerly known as rock dove; also feral domestic pigeon), *Columba livia*	Throughout the US.

European starling, *Sturnus vulgaris*	Throughout much of the US.
House sparrow (also known as English sparrow), *Passer domesticus*	Throughout much of the US.
Canada Goose (resident, largely non-migratory populations), *Branta Canadensis*	Throughout the US.
Ring-billed gull, *Larus delawarensis*	Throughout the US, especially Great Lakes and coastal regions.

Monitoring and inspection for birds

Monitoring for bird problems at schools consists largely of logging and responding to complaints, and regular inspections of building exteriors including roofs. Early nesting efforts at problem sites, especially ventilation features, can be discouraged, removed and, if possible, prevented from reoccurring by exclusion with netting or spikes. Flocking behavior is generally easier to dissuade before bird patterns are well established.

Cultural and physical options for bird management

The best control measure for birds is exclusion. The most practical method associated with buildings is to look for areas that can become common nesting areas and develop exclusion methods to prevent the birds from nesting on school property. A wide range of approaches are available from common building materials to bird netting, spikes and specialized products including electric tracks. Exclusion of geese and gulls from ponds is also possible using posts and wire or line.

Visual repellents are not as effective as some report. They have limited use, and in general do not work. However, some schools report success with the use of helikites, kites that use helium to remain in flight during periods of no wind, to dissuade gulls from athletic fields.

Auditory repellents and/or devices emit loud noises to startle the target bird: however, they have limited effect on most bird species. Devices that claim to repel birds by the use of ultrasonic waves not audible to humans have consistently proven to be ineffective.

Trained herding dogs have proven to be one of the most effective means to dissuade geese. Several schools have successfully used this technique, usually by hiring specialty companies, which provide and manage trained dogs.

Table 8.10 Commonly used products for physical, cultural or mechanical management of birds and uses.

Type	Example Products	Uses
electrified barriers	Bird Jolt™ Flat Track	Apply to surfaces to deter birds from roosting.
helikites	Allsopp Helikites	Hawk mimic flies continuously

		with or without wind for extended periods to deter birds over a large area.
ledge eliminator	Bird Slope Ledge Eliminator	Apply to ledges to increase slope to discourage birds from roosting.
netting	Bird Net 2000™, PermanNet™	Cover voids to prevent access.
post and wire	FliteLine®, Springuard™	String wire between posts attached to structures to prevent roosting.
spikes	Bird Spike 2000™	Polycarbonate or steel spikes installed on surfaces to prevent birds from roosting.
trained herding dogs	Geese Police Inc.	Trained dogs discourage geese.
traps	Bird Motel™	Capture pigeons, sparrows, starlings.

Pesticide options for birds

There are few options in this category. Polybutylene repellents can be applied to ledges or beams to prevent roosting. These repellents are non-toxic, but feel sticky and unpleasant to birds attempting to land. Apply repellent in tight wavy closely spaced rows. Repellents must be reapplied with some frequency as they can become coated with dust or leaves and lose their sticky feel. Apply masking tape to the surface prior to using the repellent so that it may be more easily cleaned up and reapplied. Repellents are best suited for small- or medium- sized infestations.

Several products contain methyl anthranilate meant to make substances, e.g., turf, distasteful to grazing geese.

Avitrol® baits are poisons with flock-alarming properties. Birds that have fed upon the bait exhibit distress behavior that frightens the rest of the flock away. The baits are registered as chemical frightening agents (repellents) for use on pigeons, house sparrows, starlings and other species. Although true secondary poisoning does not occur, the product remains toxic to any bird that eats it even once it is in a bird's digestive tract. The possibility of a negative public reaction to dying birds needs to be considered when considering Avitrol® use.

A new product, Ovocontrol®, was recently registered for use on pigeons and geese. It reduces reproduction by impacting the hatchability of eggs. This product requires continued use during the breeding season, which can be year round for some species.

Table 8.11 Commonly used insecticide products for birds and uses.

a. CAUTION-label formulations.

Active ingredient	Example products	Uses
polybutenes	Bird Barrier® 55943-1 Bird-X Bird Proof Gel 8254-3-8708 4 the Birds Transparent Bird Repellant Liquid 8254-3 Tanglefoot Bird Repellent 1621-17	Non-drying solution applied to surfaces to discourage birds from roosting.
methyl anthranilate	Migrate™ Turf Spray Rejex-It 58035-9	Spray-applied liquid repellant for turf.
capsaicinate	PiGNX® Bird Repellent	Prevent the roosting & congregation of pigeons in unwanted areas and has been known to work on all types of birds.

b. More hazardous formulations.

Active ingredient	Example products	Uses
methyl anthranilate	GooseChase™ 66550-1	Spray-applied liquid repellant for turf.
4-a minopyridine	Avitrol Concentrate 11649-10 Avitrol Double Strength Whole Corn 11649-8	Dust or treated seed, toxic to birds.
nicarbazin	Ovotrol P 802249-1 Ovotrol G 80224-5	Restricted use pesticide that suppresses reproduction of pigeons, geese or ducks. Applied as granules to an area that must remain under observation with any bait remaining removed after 30 minutes.

Table 8.12 Priorities for bird management.

Research Development of guidelines for bird-proofing new construction especially exterior ventilation structures. Development and testing of the efficacy of reproductive control as a bird management tool. Development of improved strategies for repelling birds. Development of improved strategies for excluding birds. Best management practices for goose and gull management on school grounds. Managing invasive monk parakeets especially nesting behavior on utility poles and substations.

Additional resources for bird management

Arizona Cooperative Extension. 2006. Birds. Pest Press. cals.arizona.edu/urbanipm/pest_press/2006/april.pdf (PDF)

Curtis, P.D., J. Shultz, L.A. Braband, L. Berchielli and G. Batchelor. 2004. *Best Practices for Nuisance Wildlife Control Operators; A Training Manual*. NYS Department of Environmental Conservation and Cornell Cooperative Extension. nwco.net

Hyngstrom, R.M., and G.E. Larson, eds. 1994. *Prevention and Control of Wildlife Damage*. University of Nebraska-Lincoln. 2 vols. digitalcommons.unl.edu/icwdmhandbook/

Link. R. 2004. *Living with Wildlife in the Pacific Northwest*. Washington Department of Fish and Wildlife. 350 pp.

Salmon, T.P., D.A. Whisson and R.E. Marsh. 2006. *Wildlife Pest Control around Gardens and Homes*. University of California. 122 pp.

The Internet Center for Wildlife Damage Management www.icwdm.org

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Pg. 74. Delete.

Pesticide options for carpenter ants ~~Containerized baits and liquid or gel baits placed in inaccessible areas reduce potential for exposure. Containerized baits or reusable bait stations can be placed near ant trails. Liquid or gel baits can be placed in cracks or crevices adjacent to trails or nests. Baits may take up to 60 days to eliminate the colony. Replenish baits as needed until ants are no longer present.~~

~~Dusts may also be applied in a manner that greatly reduces exposure potential, including into voids reached by removing electrical outlet or switch plate covers, or in holes drilled for in infested wood and sealed after the application. Applications of residual-active pesticides to exposed, human-contact surfaces on the interior or exterior of structures, and use of Danger or Warning-label pesticides, are typically not needed and should be avoided. In addition, barrier applications to exposed impervious surfaces including foundations, walkways and driveways are prone to runoff into surface water and should be avoided.~~

Pg. 77, paragraph 4. *Suggest deleting this paragraph. It does not belong in the PMSP.*

~~There is debate among professionals as to whether glue boards should be located in every potentially vulnerable area, e.g., under sinks in classrooms, or just in kitchens and food storerooms, or even used at all in facilities that have never experienced a cockroach problem. Checking these devices takes time and if no captures are recorded over an extended period, perhaps that time is better spent on other priorities.~~

Pg. 78, paragraph 1. *Suggest rewording this so it doesn't sound like information is being hidden from public health inspectors. Wouldn't educating the inspectors have a more sustainable outcome?*

In some locations, public health inspectors have recorded violations when insects are found in these traps during their inspection. If that is an issue, food service staff can be trained to inspect the traps daily, discard any with captures and report the capture to a central office and/or record the capture information directly in a pest sighting log housed at the site.

Pg. 79 *Delete.*

~~**Pesticide options for cockroach management** Chemical management options that reduce potential for exposure include insecticide baits in pre-manufactured, enclosed bait stations, or gel or liquid baits placed in cracks and crevices. Chemical options that increase potential for exposure for students, staff and other facility users include spray formulations applied to exposed surfaces. These formulations are typically much less effective than baits for cockroaches. Chemical options, including baits, should not be used on a routine or calendar-based schedule but only where cockroach presence been confirmed and non-chemical measures are also implemented.~~

Pg. 83, paragraph 2 under **Cultural and physical options for fly management.** *Should probably state that garbage should be removed at least twice a week. What is "frequent" to one might not be to another. Also missing importance of cleaning/washing the dumpsters which will help eliminate habitat and food. Missing issue of trash compactors—cleaning, maintenance.*

"In schools that have programs where wastes are removed frequently, it is unlikely that flies are breeding on the school property."

Pg. 86. *Suggest the following edits:*

Pesticide options for fly management While chemical pesticides may be effective for suppressing adult fly populations in some situations, they are not a substitute for proper sanitation and aggressive elimination of nuisance-fly-development sites. Resistance management techniques should be employed if pesticides are used because flies can quickly build resistance. ~~Because flies can quickly develop resistance to insecticides, use them only as a last resort to obtain immediate control of severe adult fly infestations, after all possible nonchemical strategies have been employed.~~

In most school situations, pesticides are not needed or recommended for fly management. Sanitation along with exclusion to keep flies out should be sufficient. In rare cases where non-chemical methods are not possible or effective, a non-residual aerosol may be used to knock down flies. Outside, a residual insecticide may be applied to surfaces such as walls and overhangs that are being used by the flies as resting areas. Fly baits used in trash or other areas may be effective in reducing the number of adult flies if proper sanitation practices are followed. ~~However, when flies have access to garbage, baits will not effectively control them.~~

Pg. 94. *It is important to stress that these statement are derived from one study of students from two metropolitan elementary schools. Different demographics may yield different numbers, but it is useful to have an idea of potential conversion rates, etc. Screening for nits is also inaccurate in determining infestation rates because of the high rate of misidentification.*

However, screening for nits is not an accurate way of predicting which children will become infested. Only approximately 18% of children with nits alone will convert to an active infestation (Williams *et al.* 2001). Children with 5 or more nits within 1 cm^2 of the scalp are significantly more likely to develop an infestation, still only 1/3 of these higher-risk children convert. Generally, around 30% of school children with nits will also have adult lice.

Pg. 95. *The tables associated with this paragraph should be removed. They are not appropriate for the PMSP. It is sufficient to say that there are prescription treatments available.*

~~**Pediculicide options for head lice** Most treatments for lice are shampoos left on the head for no more than 10 minutes. Most will not kill eggs so a second treatment is suggested. Removing nits close to the head is usually included in the treatment instructions. Most products warn against using the products on broken skin which is practically impossible given that lice-related itching usually leads to excoriation of the scalp which may be severe. If repeated treatments fail, some physicians will prescribe higher levels of permethrin (5%) or resort to scabies treatments (e.g. crotamiton, sulfamethoxazole, trimethoprim, ivermectin, etc.). These are **extremely** hazardous to children and not recommended.~~

Pg. 99-100. *Statements such as "while others are particularly blessed, e.g., Texas with 84" are inappropriately worded for a PMSP. Just state the facts.*

Management strategies for mosquitoes vary depending upon which species are present and whether mosquito-vectored diseases pose a serious public health threat. Some states have relatively few mosquito species, e.g., West Virginia with 29, while others are particularly

blessed, e.g., Texas with 84. Climatic differences between regions as well as unusual weather patterns impact mosquito status. For example, in northern areas where —mosquito season|| begins in June and is over by October, management of mosquitoes at school is more easily accomplished. Tropical and subtropical areas, and school with year-round calendars will have a longer, more challenging season.

Pg. 100. *Suggest the following*:
~~If adult mosquitoes are present, they will find *you*!~~ If mosquito-borne diseases are a concern in your area, capture several intact adults and preserve in a vial of alcohol for identification by mosquito specialists. State or county public health agencies, or pest control companies in mosquito-prone areas may have specialists on staff.

Pg. 101. *Delete the following—this section is supposed to be about cultural and physical options.*

Cultural and physical options for mosquito management
In general, identification and elimination of mosquito breeding sites is more effective and less hazardous than attempting to eliminate adults. Elimination of such pools on a weekly basis preempts the emergence of adults. Adults~~, on the other hand, once flying,~~ are difficult to control by any means, chemical or not. ~~Least-hazardous adult control methods such as predators, traps, —bug zappers etc. do not effectively reduce mosquito populations. In all but the most extreme cases of mosquito infestations, widespread spraying of pesticides for adult mosquitoes around schools poses an unacceptable risk of exposure to non-target organisms including humans.~~

Keep in mind that during warm weather, mosquitoes can breed in any puddle of water that lasts more than four to seven days, depending on the temperature.

Pg. 102-103.
Biological control
Biological organisms used to control mosquitoes include predators of larvae and adult mosquitoes, or formulations of naturally occurring mosquito parasites or diseases. The latter are registered by EPA as pesticides and are covered in the next section.

Many naturally-occurring fish are predators of mosquito larvae. The killifish species *Gambusia holbrooki* and *G. affinis* (Cyprinodontidae) are native to southern and eastern US and have been used quite successfully for larval control in many situations. However, when translocated to new environments, these fish may compete unfavorably with local fish and other aquatic species. Thus, *Gambusia* spp. should be used selectively in self-contained water bodies that are not fed or drained by natural waterways. These include ornamental ponds, abandoned pools, mine pits, livestock waterers, fountains or large birdbaths. **Releasing *Gambusia* into waterways is illegal in some states.** Efficacy and

recommended stocking rates for *Gambusia affinis* are reviewed at www.rci.rutgers.edu/~insects/gamb2.htm

~~While predators of adult mosquitoes such as bats and purple martins can be encouraged, they are opportunistic feeders and so will feed on many insects and may not have a noticeable impact.~~

Pg. 103.

Pesticide options for mosquitoes

Many states have laws governing the use of both chemical and biological pesticides in and around schools or other specific environments. This is particularly true in the case of mosquito control which may involve applications of pesticides to natural bodies of water and thus may pose environmental hazards~~, and be regulated or managed under state and local mosquito control jurisdictions~~. It is important to be informed about these factors prior to using pesticide options.

~~If students are going to be in areas of high mosquito activity, advise their parents of this fact so that precautions can be taken. Insect repellents are considered to be pesticides by the EPA and as such, are not appropriate for application by staff to students. Precautions should be taken to avoid toxic repellents such as DEET. Alternative repellents are available.~~

Larvicides, ~~pesticides used to kill immature mosquitoes,~~ are typically more effective and target-specific than adulticides. Habitat modification is more permanent and preferred where possible. Larvicides include bacteria specific to mosquito and fly larvae, insect growth regulators (IGRs), and chitin synthesis inhibitors (Table 8.38). Conventional larvicides include several non-petroleum oils and monomolecular films.

The timing of larvicide applications depends on the product. Bacterial toxins must be consumed by the larvae and are usually applied well before the fourth molt. IGRs must be applied later in the life cycle to upset the molting process. Chitin synthesis inhibitors are effective throughout the entire larval life cycle. Monomolecular films prevent the insect from remaining at the surface of the water by reducing surface tension, causing the larvae and pupae to die. Non-petroleum oils kill larvae and pupae by suffocation. Conventional insecticides kill larvae at all stages and can be applied whenever larvae are present.

Adulticides targeting mosquito adults and applied from the ground or air ~~are generally the least efficient approach and considered a last resort when all other methods have failed~~. They are often applied as ultra-low-volume sprays in which small amounts of insecticide are dispersed either by truck-mounted equipment or from fixed-wing or rotary aircraft. Pesticide droplets must contact the mosquito to be effective. Aerial applications are usually governed and coordinated by local municipalities.

The application of repellents to students is also often governed by school policy. There are a number of repellents of varying concentrations available.

Pg. 104-105. *The paragraph immediately below is redundant. The paragraph on emerging issues does not clearly define emerging issues or new strategies and should be clarified or eliminated.*

~~Organophosphate products applied to water for larval control are not recommended. (e.g. temephos, Abate®) due to both human exposure hazards and strong potential for widespread non-target impacts. Similarly, aerosol spraying, thermal fogging and/or UltraLowVolume (ULV) fogging for adult mosquitoes with organophosphate, carbamate or pyrethroid products is strongly discouraged, especially on school grounds. Such tactics should only be initiated as a last resort by state mosquito abatement personnel as part of a strategic disease vector management program. Should your school grounds be subject to such spraying, it will be important to close down all ventilation intakes, be sure students are not present and advise parents of the date and time of such applications.~~

Emerging issues, new strategies and priorities for mosquitoes
~~The need for effective mosquito management tools will follow apace with the introduction of new mosquito species and new disease emergence in the US. As such, mosquito management is a moving target. Effective mosquito management requires increased knowledge, understanding of mosquito biology, communication with the public and coordination between managers at the school, community, county and state levels.~~

Pg. 108. *The deleted sections should be covered in a general statements section in the beginning of chapter 8 which will help decrease redundancy, as will references to least toxic products. What do you recommend for overwintering occasional invaders? Is this statement necessary? Seems dependent on arthropod invader.*

Pesticide options for occasional invader management Pesticides are rarely necessary for occasional invaders. However, if established populations are present in exterior perimeter locations and non-chemical methods are unsuccessful in achieving adequate control, crack & crevice or spot applications ~~of a least-toxic product~~ may be required. These treatments should be directed into suspected harborages for the specific pest.

Pesticide treatments are not recommended for overwintering occasional invaders that are present inside a building.

~~Pesticide options that reduce potential for exposure include insecticide baits in enclosed bait stations. A limited number of effective baits are available for specific occasional invaders. If granular baits are needed, these should be used in tamper resistant bait stations.~~

~~Pesticide options that increase potential for exposure for students, staff and other facility users include spray formulations applied to exposed surfaces or broadcast granular products.~~

Pg. 118. *The spider and rodent sections seem to read ok. I would add the highlighted phrase*:
Pesticide options for spider management Vacuuming or sweeping away individual exposed spiders and egg sacs is far more effective than non-residual pesticides and many residual pesticides as well.

Pg. 123. *Bees and other stinging insects are not "aggressive". They are defensive of territory, young, etc. The statistics on numbers of stings and deaths needs a citation as does the information on pollination value. Need citation for yellow jackets and paper wasps being predators of key pests in agriculture, etc.*

STINGING INSECTS Bees, wasps, hornets and yellow jackets are among the insects that can sting humans and other animals. Very few of the many species in these groups are defensive ~~aggressive~~ and prone to cause problems in or around schools. Some types of ants, including fire ants, may also sting and are addressed in a separate section.

Reactions to stings can range from mild itching and swelling to severe allergic reactions with more than 500,000 emergency room visits and 150 deaths reported per year in US. School pest managers are thus justly concerned to limit the potential for stings to students, staff and visitors.

These insects are among the most beneficial organisms economically, with bees providing pollination services worth an estimated $3 billion annually in the US. Yellow jackets and paper wasps are also predators of key pests in agriculture, turfgrass, trees and gardens, including preying on cutworms and other caterpillars.

Pg. 124. Second to last paragraph. *Either delete the last sentence or provide citation.*

Cultural and physical options for stinging insect management

Education is an important element of stinging insect management. Staff and students should be instructed to report stinging insect nests on school grounds, to avoid wearing strong perfumes or eating or drinking outdoors during problem times of year, and to avoid panic when encountering stinging insects or nests. ~~Many more injuries and deaths from encounters with bees result from panic reactions including running into traffic, etc. than from an insect sting.~~

Pg. 124, last paragraph. *I have not seen the reference to running in a straight line, but as someone is running they should cover their mouth and nose with their shirt. AHB attack because we have gotten too close to their colony. The recommendation to avoid other people is in conflict with instructions to those who are trying to aid victims. Stinging victims are encouraged to run to the person trying to aid them so as not to end up with two stinging victims. It would be best to refer people to their state extension service for specific instructions on dealing with AHB since this insect typically deals with more than one agency, or make the recommendation that schools work with someone in their state who is knowledgeable about this bee (Extension or Dept. of Agriculture).*

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In southern regions where Africanized honey bees are potentially present, specific instructions should be provided for avoiding and responding to attacks. These include running away ~~in a straight line~~ to outrun an attacking swarm with mouth and nose covered with your shirt, seeking shelter in a building or vehicle, and ~~avoiding other people to avoid drawing bees to them~~. In certain locations, specific regulations are in place for honey bee management, e.g., in several states, any nests or swarms must be assumed to be Africanized and destroyed rather than collected by a beekeeper.

Pg. 125, last sentence.

Anyone taking action against a stinging insect nest or managing traps should take precautions to avoid being stung, including wearing protective gear where appropriate and taking time of day into account.

Pg. 126. *These are recommendations are unacceptable for stinging insects—to recommend the least toxic products, then recommend testing the efficacy of "botanicals" (which are also considered least toxic) as a research priority. It puts the PMPS in the position of recommending products whose efficacies are undetermined for a pest that can have serious health consequences after a major stinging incident. Dealing with large infestations of these pests is not for the inexperienced or for untested products. Simply irresponsible.*

Pesticide options for stinging insects A number of low toxicity, effective pesticide options are available for stinging insects, including formulations that can be used in a way that minimizes exposure to non-target organisms.

Table 8.58 Priorities for bees, hornets, wasps and yellowjackets.
Research
Efficacy of botanical pesticide products for stinging insects.
Efficacy of yellowjacket trapping.
Education Current distribution of Africanized honeybees.
Appropriate methods for responding to encounters with Africanized honeybees.

Pg. 127. *Maintaining thick turf is NOT sufficient to reduce fire ant mounds. Mechanical options are not considered control. Hot water also burns turf and usually does not get to the queen. These should be eliminated from the text.*

Cultural and physical options for stinging ant management ~~Maintaining thick, healthy turf can reduce the number of fire ant mounds present on school and neighboring property. Frequent mowing can also disturb ant colonies and cause them to move to adjacent undisturbed areas. Mechanical options are limited primarily to physical removal (e.g., excavation) of individual fire ant mounts which does not address encounters with foraging ants from colonies not located on school property. Hot water (109 to 212 F) has been used to eliminate colonies but has the obvious hazard of burning oneself in the process.~~

Biological control for imported fire ants has included releases of parasitic phorid flies and microsporidians which have become established and spread. ~~Effective management of fire ants with biological control is unlikely in the near future and will likely require establishment of a suite of natural enemies for this imported pest.~~ Biological control options work to enhance existing management strategies, but will not manage populations by themselves.

Pg. 127. *Delete this section. Individual mound treatments can limit exposure hazards to what? The ants are far more problematic than the insecticides used to treat them. Individual mound treatments are the least effective. The applicator ends up putting several magnitudes more bait out to take care of one mound than a broadcast application which utilizes the ants' foraging behavior. IMTs also are notoriously poor at finding small mounds, particularly in sandy soils. This is the stage at which we would*

like to control the fire ants. Broadcast baiting takes care of the mounds we can and cannot see. Broadcast baiting decreases insecticide use by 99% when compared with mound drenches. Aerosols are completely ineffective and should not even be considered.

Suggest:
Broadcast baits are the most effective for large areas but require 2-4 applications, depending on area. TopChoice is singularly effective in controlling fire ants with a once a year application which can be made when school is not in session. Other products are available for individual mound treatments including soil drenches, baits, and dusts.

~~**Pesticide options for stinging ants** Treatment of individual mounds with insecticides can limit exposure hazard, particularly if these mounds are made inaccessible during and after treatment. Insecticide baits or dust formulations can be applied to the base of the mound and up to three to four feet away as per label directions. Drenches (liquid insecticide formulations) may also be used to treat individual mounds. It can be difficult to locate all mounds in an area such as a school play yard. Foraging ants and new mounds may appear frequently from colonies in adjacent areas. Aerosols or liquid formulations may also be applied directly to mounds.~~

~~Broadcast applications of insecticide baits are often used twice or three times per year to reduce mound formation.~~

Pg. 128, 129. Table—*Esteem is a bait for pastures and livestock. Distance is the trade name for pyriproxyfen for non-ag areas.*

Pg. 133. *Several states are now making 24 inches the minimum clearance for crawl space inspections.*

Pg. 135. *The active ingredient in Sentricon is now novaflumuron; Impasse is no longer being sold.*

Pg. 136. *Treatments are not boric acid, they are disodium octoborate tetrahydrate or other borate compound.*

Pg. 139—*tick drags are not used for management.*
Table 8.68 Commonly used products for physical, cultural or mechanical management of ticks and uses.

Pesticide options for tick management If tick-vectored disease risk is high, a targeted barrier treatment can reduce tick populations along wooded property edges where human activity is also high. These locations can include along edges of sports fields, along cross-country running trails, at margins of playgrounds. These applications should be timed to coincide with peak nymphal populations.

~~Pyrethrins plus synergist provide limited tick control. Pyrethrins plus synergist with insecticidal soap or silicon dioxide was more effective against ticks in one trial.~~

The landscape material seems to be general enough, but it's out of my area …