



German Cockroaches and Their Risks

The German cockroach is the most common species of cockroach found in homes and buildings all over the world.

German cockroaches are introduced into homes in resident belongings, grocery bags, cardboard boxes, and furniture. They reproduce quickly and spread throughout multiunit housing easily, feeding on any drop or crumb of human food, pet food, garbage, and many other substances, including toothpaste, hair, and paper.

A German cockroach infestation can negatively affect human health. Cockroaches can transmit bacteria that cause food-poisoning^{1,2,3} and trigger asthma and allergies or make existing symptoms of those conditions worse⁴.

An integrated pest management (IPM) plan is based on individual unit/apartment and building assessments with monitors and regular inspections. Regular assessments help determine the most effective way to manage cockroaches and cockroach allergens that will result in healthier buildings for staff and residents.

Purpose of This Guide

This guide will:

- Help property managers understand, evaluate, and improve pest management practices for German cockroaches.
- Develop or improve an official IPM policy.
- Provide advice about educating residents and housing staff about pest prevention, proactive monitoring, and inspecting.
- Give you information about hiring and overseeing a contractor who uses IPM.

While this document focuses on German cockroaches, there are a number of other cockroach species commonly found in home environments. Thus, it is important to make sure the cockroaches in your building are identified correctly because the habits and control methods differ for each species.

This guide does not cover biology and identification of cockroaches. For more information, see the resources mentioned under “Additional Information”.

Throughout this guide, we will use the abbreviation PMP, which stands for pest management professional. PMPs include both contracted pest control operators and housing staff responsible for pest management; each must meet state requirements regarding applicator certification and direct supervision.

Cockroaches in Multifamily Housing

Multifamily housing is particularly prone to German cockroach infestations because the insects are readily introduced on items brought in, and they move easily between units.

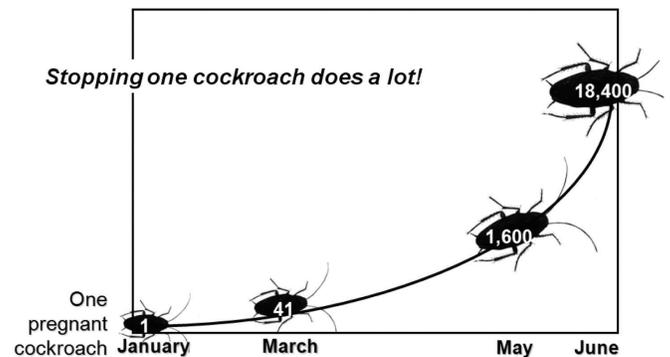


Figure 1. German cockroaches have an extremely high reproductive rate. Stopping an infestation early can save time and money before the infestation spreads. This figure shows how many offspring can result from a single pregnant female in six months.

Once established in a building, German cockroaches reproduce rapidly and can become increasingly difficult to control (Figure 1). Therefore, stopping an infestation early can save time and money.

Key Pest Management Elements for Property Managers to Understand

Monitoring and Inspection

Regular inspections can catch infestations early, and sticky monitoring traps are a key inspection tool.

There are various brands and styles but, essentially, they all work the same way: they are placed where cockroaches are likely to be, and the cockroaches walk over the surface and get stuck. High trap catches can indicate severe and widespread infestations (Figure 2). Complete building assessments should include the setting, collecting, and review of monitoring traps, which:

- Are best placed in kitchen and bathroom areas against a wall inside a cabinet, under a sink, or between the refrigerator or stove and cupboards.
- Should *not* be accessible to children or pets.
- Should be dated and checked regularly.

Trap-catch counts can then be used to determine how widespread the infestation is and how high the populations are.

To control German cockroaches throughout buildings, it is important to do a whole-building inspection. This involves visual inspection and use of sticky monitoring traps in all common rooms, offices, storage areas, and boiler rooms, and in each unit/apartment.



Figure 2. Adult and multiple nymphal stages of German cockroaches on a sticky monitoring trap. (S. Reese)



Figure 3. Close-up of a German cockroach egg case. About 30 cockroach nymphs will emerge from this egg case. (M. Frye)

MYTH

“Clean and tidy apartments/units will not have cockroaches.”

Unfortunately, this is simply not true.

Once buildings have a significant number of apartments/units infested, you can expect to see them caught on traps in even the cleanest homes.

Sealing cracks and crevices between units can help stop the spread between units.

Cockroaches often reside in wall voids and interior spaces above ceilings and below floors, and although they rarely venture out into the open, sticky traps will still catch them and provide clues to where they venture out looking for food and water.

PMPs can record the presence of cockroaches on traps, replacing them as needed. Typically, two sticky traps in the kitchen and one under the bathroom sink or toilet is sufficient.

Such monitors can alert you to an infestation early on (Figure 3), when it is easier and less costly to treat. PMPs can use infestation levels—indicated by the number of cockroaches caught on the monitors—to determine which units need greatest attention: more frequent visits, more time spent per unit by PMP, and more pesticide bait placed.

Monitors can be purchased in bulk and maintained by PMPs or housing staff.

Record Keeping

Keep records of treatments and infestation levels with the help of your PMPs. Periodically review them together to discuss possible reasons for control failure and appropriate next steps.

Good records can also be useful in the event of legal action taken by tenants. They serve as proof that pest control efforts have occurred or that housekeeping was a reoccurring issue.

Focus Units

Use monitoring-trap catch numbers and your records to prioritize highly infested units/apartments, as they are often the source of infestations in surrounding homes. These are your **focus units**.

Address sanitation issues with the resident. Make sure your PMPs are investing enough

FOCUS UNIT TRACKING LOG

Name/Address of Property: _____

The IPM team identifies areas or units of focus and coordinates IPM efforts. This sheet unites pest control, housing, and maintenance record-keeping systems. Keep it in the front of the IPM log.

Date	Unit / Location	Name of Staff Member / Technician	Pest Level	Repairs Needed		Recent or Current Focus Unit?	Housekeeping / Lease Compliance	
			Note any pests and circle the level of infestation. Involve your PMP.	Work order number or problem description	Check when completed	Yes or No	Housekeeping level* (circle one)	Action taken (e.g., met with tenant, sent violation notice)
			Type of Pest: Light Moderate Heavy				G F P	
			Type of Pest: Light Moderate Heavy				G F P	
			Type of Pest: Light Moderate Heavy				G F P	
			Type of Pest: Light Moderate Heavy				G F P	
			Type of Pest: Light Moderate Heavy				G F P	

*** Housekeeping level:**

- G** Good—little or no food or water accessible to pests, easy to move throughout the unit, and inspection in all areas is possible
- F** Fair—dishes left undone for more than one day, or plenty of food or water accessible to pests, or PMP has to step over or move items to inspect
- P** Poor—multiple days of dirty dishes, sloppy food storage methods, or PMP’s inspection and service limited by clutter

Figure 4. An example of the Focus Unit Tracking Log. This document is available for download at <http://stoppests.org/go/IPMlog>

time finding the harborages and applying enough bait. Records can be kept with a focus unit tracking log like the example in Figure 4.

Ask your PMPs to visit focus units every one to two weeks for inspection and treatment until there are no cockroaches caught on the monitoring traps. Be aware there may be “reservoir units” that don’t allow access, causing the surrounding units to have repeat issues. To successfully eliminate the infestation, your PMP will have to access and treat those units.

Sanitation and Repairs

Contrary to popular myth, poor sanitation does not cause infestations, but it does contribute to ongoing infestations by making them more difficult to manage.

It may be necessary for property managers to seek housekeeping assistance for residents. Consider lease enforcement of sanitation standards as a last resort. Repairs

and maintenance should be done regardless of sanitation levels.

Working with Residents

We highly encourage property managers to explain to residents how they play an important role in pest management.

- **Inform residents** about common pests and reporting procedures, verbally and using printed IPM information, during resident intake orientation. When residents sign the lease/contract, property managers should clearly explain resident responsibilities regarding sanitation standards and why they are so important. StopPests.org has resources for residents, including a video, “The Tenant’s Role in IPM,” in English

and Spanish, and picture-based materials for printing that help to communicate the IPM message.

It is important to let residents know that they will not be punished for reporting pests, and that prompt reporting is critical. Residents should be made aware that German cockroaches are introduced in and on deliveries and personal items. They will constantly be introduced over time.

- **Address housekeeping issues** identified during housekeeping or pest inspections.

Let residents know that limiting access to food and water is an important part of pest management and that cleaning up dead cockroaches and droppings reduces allergens that are asthma triggers for sensitive individuals (Figure 5).

- **Be aware of residents who have asthma** or other respiratory impairments.

Many communities have community health educators who conduct in-home asthma assessments and education that includes information about reducing asthma triggers in the home.

You can find asthma resources in your area by checking with your area health department, online with the American Lung Association (www.lung.org) or the Asthma Community Network (www.asthmacommunitynetwork.org), or with your regional children's hospital.

- **Encourage residents to adopt the following habits:**
 - Clean up spilled food and drink daily.
 - Avoid leaving dirty dishes out overnight (even in the sink).
 - Avoid leaving pet food out overnight. Put uneaten pet food away at the end of the day.
 - Bag kitchen garbage securely and discard in outside dumpsters or garbage chutes daily.
 - Foods such as cereal, crackers, cookies, cakes, muffins, sugar, and bread should be stored in airtight, sealed containers or inside the refrigerator.
 - Report leaky pipes and dripping faucets.
 - Report gaps and holes in walls where pipes and electrical conduit pass through, especially in kitchen and bathroom areas. Maintenance staff should seal and caulk around wall penetrations, sinks, and cabinetry when possible.
 - Discourage self-treating with home remedies, as these have not been tested for efficacy or potential risks and are often ineffective.

Also discourage the use of total release foggers (bug bombs); these products do not reach into the hidden cockroach harborage areas. Residents should



Figure 5. Discourage residents from self-treating with home remedies or over-the-counter sprays (a.) and bug bombs. The white powder (b.) seen here is a resident's attempt at treating for cockroaches with an unknown dust. When applied wrong, even dusts you might consider "safe" can be hazardous. (J. Windham) (S. Reese)



Figure 6. Note housekeeping conditions, the grease pot on the stove and dishes in the sink could provide cockroaches with a food source at night. (J. Windham)

also avoid sprays and dusts (Figure 5). If applied incorrectly, these products leave pesticide residues on surfaces where people eat and children play.

The use of over-the-counter foggers and aerosol sprays can repel cockroaches, making cockroaches scatter further into hiding and into surrounding apartments. In addition, over-the-counter-products and scented oil products can make the PMP's job more difficult by contaminating baits designed to kill the cockroaches that eat them.

If a resident wants to use an over-the-counter product, encourage them to buy containerized bait stations. These may be safely used by residents and can be helpful. For any product residents use, it's important that they follow label directions in order to prevent food contamination and to protect themselves, their family, and their pets.

Support of Maintenance Staff

We highly encourage property managers to explain to maintenance staff how they play an important role in pest management.

- **Consider requesting that a maintenance staff member accompany PMPs as a door opener** so access to units/apartments is faster and more efficient.

This person can report maintenance needs, help the residents understand their role, and help residents understand PMP preparation and after-treatment instructions.

- **Ask staff to address pest-related issues promptly**, especially fixing leaky pipes and dripping faucets, and sealing cracks and holes that cockroaches use for travel and harborage (Figure 7).
- **Ask staff to inspect, clean, and monitor trash chutes regularly**, and also have your PMP service these areas regularly (Figure 8).
- **Have staff place and review sticky monitoring traps in apartments** if contracted PMPs do not monitor as part of their service.

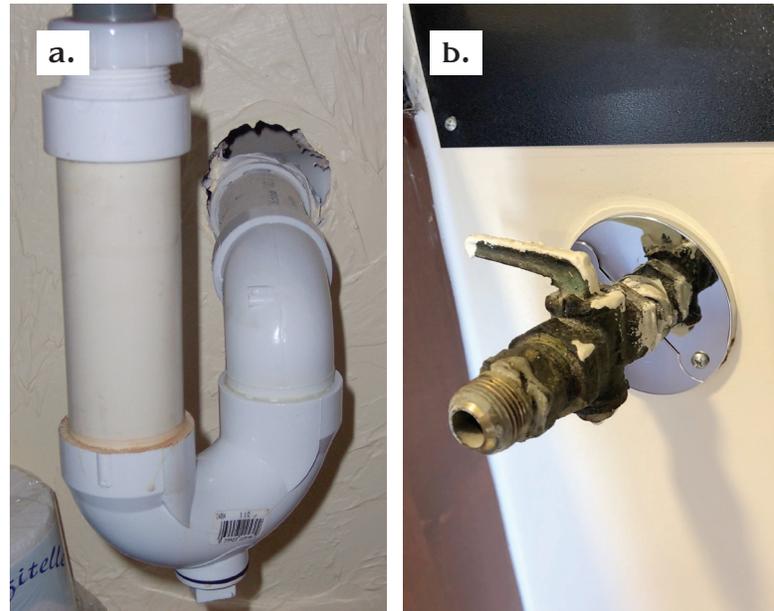


Figure 7. A missing escutcheon plate (a.) and a hole around this pipe allows cockroaches access to wall voids where it is difficult to treat them, and from where they can travel to neighboring homes. An installed escutcheon plate (b.) prevents pest access to wall voids. Escutcheon plates should be affixed to the wall with an appropriate sealant. (L. Kastermeyer & S. Reese)



Figure 8. Common areas, like trash chutes and basements, should be inspected, cleaned, and monitored regularly. (J. Windham)



Figure 9. Cockroach monitoring traps placed along the wall. (D. Gouge)

Monitors are invaluable indicators if reviewed regularly. They should be checked every time a member of the maintenance staff visits a unit/apartment. (Figure 9)

- **Have maintenance staff look for pests at unit turnover**, vacuum up live and dead cockroaches, and correct any pest-conducive conditions in units/apartments, including water leaks, openings around pipes and wall penetrations, and cabinet openings to voids (Figure 7).

Work together with your PMP to access and apply an insecticidal dust in the wall and cabinet voids through the service lines, outlets, and perhaps the radiator and cable lines.



Use a HEPA vacuum to remove high populations of cockroaches.



Figure 10. Unit turnover is great time to caulk and seal around kitchen cabinets (a.) and replace or seal loose cove base. The cove base shown here provides the perfect space for cockroaches to hide (b.). (S. Reese)

Understanding the Contractor's Role and Providing Oversight

Property managers should understand what good service entails and be familiar with best practices for cockroach management. Communicate with procurement staff and make sure you understand the scope of work that the company has been contracted to do.

It is important to note that pest management practices and tools change constantly and significantly over time, so contract specifics must be revised regularly to incorporate the changes. We encourage property managers to communicate regularly with PMPs.

Service agreements should take in to consideration the following:

- **Ongoing pest monitoring using sticky monitoring traps.** Contractors should place traps (and replace them after treatments) in all units/apartments and have them there at all times. The monitoring traps are the basis for proactive, assessment-based pest control. PMPs should invest time and product in the most heavily infested units/apartments first, as opposed to treating all units/apartments the same. Pest control is not a one-size-fits-all process!

Monitoring traps help determine if treatments have been successful. They should be checked (and replaced if they caught any cockroaches) during all pest control visits, and infestation levels recorded. If the number of cockroaches on traps does not decrease over time, housing managers should explore improvement options with the PMPs. Service providers should also use population levels to assess how much bait is needed, in accordance with recommendations specified on the product label. If all the bait disappears between visits, the PMP should be applying more.

- **Proactive inspections should occur in all units/apartments at least one or two times a year** if they don't have a history of German cockroaches and quarterly if they do.

Cockroach treatment scheduling should be assessment-based, *not* a complaint-based or calendar-based/one-size-fits-all. The fact is that many residents will not report any pests at all, regardless of whether any are present. Heavily infested units/apartments should be treated every one to two weeks until the infestation has been resolved.



Figure 11. Housing staff, pest control technicians, and residents should inspect for signs of German cockroaches with the help of a flashlight. (A. Allen)

German cockroaches harbor in small, tight spaces that are warm and moist. Visual inspections should include checking for and reporting openings around pipes and conduits, edges around sinks and cabinets, refrigerator gaskets, edges of wall-mounted frames and electrical panels, mirrors, light fixtures, and emergency lighting.

Inspections should focus extra time on areas where food and water are present (Figure 11). Inspection takes time! PMPs should spend more than a minute or two to do a thorough inspection.

- **PMP follow-up inspections and treatments should be scheduled automatically** when cockroaches are found. Follow-up visits should *not* depend on ongoing resident complaints. Light infestations may be monitored and treated monthly. Heavy infestations should be treated every one to two weeks until there are no cockroaches caught on the traps.
- **Service tickets should indicate which units/apartments the PMP visited, what treatments (chemical and non-chemical) were used, and any pest-conducive conditions noted during the visit.** Take the time to read through and understand the service you are getting.

You can find out how long the PMP is spending on average in units by dividing the time spent on-site by the number of units/apartments visited. Suppose, for example, that the technician checked in at 9 a.m., checked out by 4 p.m., and visited 45 units/apartments. Taking a possible lunch break into account, you can estimate that they spent about eight minutes in each unit/apartment.



Figure 12. Pesticides that present the least risk of exposure to residents should be used whenever possible.

Considering the amount of time it takes to get into a unit/apartment—which can sometimes exceed two or three minutes—in this scenario, the time spent actually doing treatments was likely only four to five minutes. While that is enough time to do a quick routine service, it is not enough for heavily infested units/apartment.

Pay close attention to these numbers. If technicians are trying to get through too many apartments per day, the quality of the service will be negatively affected.

- **Consider the appropriate cost of cockroach control.** Regular cockroach treatment should require *at least* five to ten minutes per apartment (more for clean-outs and heavily infested buildings). Costs vary by region and service specifics, but the follow-

ing is given as an example to help you determine realistic costs and expectations.

Suppose pest control company “Bug Busters” needs to make \$1.50 per minute. You can figure out an estimated cost for pest control, given that rate: $\$1.50 \times 10 \text{ minutes} \times \text{number of units/apartments} \times \text{number of visits} = \text{approximate cost of labor}$.

Take the example of a contract for a 3,000-unit facility with every apartment/home visited quarterly, and you get $\$1.50 \times 10 \times 3,000 \times 4 = \$180,000$. The baseline cost of the time invested for a typical cockroach service for this development could cost \$180,000 for just four visits per year to each apartment. Remember, there are some apartments that need weekly treatments, there are product costs, and there are additional costs for clean-outs, all of which must be factored into overall expenses. And this estimate

does not include service for bed bugs, rodents, and other pests.

You could consider using a licensed in-house team for jobs that will take more time (heavy infestations), but you may or may not save money. In-house pest management staff may be less constrained by time limits and profit than an outside contractor, but if staff don’t have time to effectively address infestations, it is more important—and ultimately more cost-effective—to have the job done correctly, fully, and in a timely manner by an outside contractor.



Figure 13. Using liquid aerosol sprays should not be common practice. Cockroaches like to hide in places where chemical sprays may not reach them. (D. Gouge)

What You Need to Know about Insecticide Treatments

- You can reduce resident pesticide exposure by having your PMP apply insecticidal baits, desiccant dusts, and insect growth regulators (IGRs) (Figure 11). The broadcasting of liquid aerosol sprays should not be common practice, and total-release foggers (bug bombs) should be avoided (Figure 12).

If PMPs use residual sprays, they should be used as crack-and-crevice treatments and applied as part of a treatment protocol—not as a stand-alone method and not on a calendar-based schedule as a preventative.

- **PMPs are required to follow the label.** If the label gives instructions to vacate pets and people from a home for a certain number of hours, residents must follow these instructions. Provide space for them to be comfortable until they can return to their home. Let them know it's for their own safety!



Figure 14. The use of strategically placed gel bait is more effective and generally presents less exposure risk than chemical sprays. (S. Reese)



Figure 15. Insect growth regulators (IGRs) cause cockroaches to look deformed and leave them unable to mature into sexually reproductive adults. This effectively reduces population growth. (B. Harbison)

- **Bait formulations are preferred over sprays to reduce German cockroach populations.** After initial clean-out efforts that may involve vacuuming and/or spray pesticide applications, ongoing population reductions can be maintained using baits (Figure 13). Baits applied near activity or harborage can be attractive to cockroaches, allowing them to feed directly on the insecticide.

Calendar-based sprays will not prevent or eliminate infestations. Management can require their contractors to stop this practice even if it is included in the contract. Inspections, on the other hand, can be calendar-based.

Baiting is by far the most effective method for controlling German cockroaches. Research has demonstrated that the strategic placement of insecticidal bait results in sustained cockroach elimination over 12 months and has also been associated with improved asthma outcomes in children⁵. Baits come in a variety of formulations (plastic feeding stations, flowable granular forms, pastes, and gels) and with a variety of active ingredients (A.I.s).

A.I.s include hydramethylnon, fipronil, indoxacarb, imidacloprid, boric acid, abamectin, and many others. So, keep track of what is being used, and ask PMPs to rotate A.I.s if ongoing baiting is failing. Specialists recommend rotating bait with every treatment⁶. Make sure your PMP is rotating products with different active ingredients *at least* every three months.

YOUR TROUBLESHOOTING CHECKLIST

- Do *not* blame residents; instead, consider all factors.
- Be aware of which units/apartments have been identified and documented as focus units/apartments to be prioritized. Failure to adequately address these units/apartments with treatments every one to two weeks will result in control failure and spread of the cockroach population.
- Make sure enough bait is being used by PMPs and placed in areas where cockroaches are active.
- Confirm that the PMP is rotating bait active ingredients.
- Be aware of which units/apartments refuse entry to PMPs, are inaccessible for some reason, or cannot be treated because of a resident illness or chemical sensitivity. Have a plan for monitoring and treating these units/apartments. Do not allow missed units/apartments to support cockroach populations.
- Are follow-up treatments automatically scheduled until the infestation is eliminated? You can't rely on resident complaints to schedule treatments. Many don't report.
- Address structural deficiencies when a PMP, resident, or staff member identifies a repair need.
- Ensure trash chute, basement, and common areas are well maintained, monitored, and treated when appropriate. Trash chutes, compactors, and trash rooms can be the source of large numbers of cockroaches if not managed properly. Pay particular attention to sanitation, monitoring, and treatment of these areas.

Baits can provide highly effective control when applied to harborage and foraging sites in sufficient amounts and frequency. While they are most effective when other potential food sources are eliminated, they can still provide steady control even if residents do not reduce other food resources. *Even in buildings with poor sanitation and plentiful harborage (clutter), many baits are highly attractive to cockroaches and will reduce populations over time*⁷. Baiting can take weeks to reduce populations, and other aerosol sprays should be avoided during this time if possible. Baits are best applied *after* heat treatments have occurred.

Baits may also be tested to determine if cockroaches readily consume them. If cockroaches are not consuming bait, a different bait should be applied. If *all* the bait is consumed before the PMP's next visit, a greater amount of bait should be applied.

- **Bait placement is important.** Gel bait should be applied where cockroaches are active. Kitchens and bathrooms are the primary locations, but you may find them in other rooms. Gel bait is most often applied in pea-size dots in cracks and crevices around cabinets and other inconspicuous places.
- **Clean-out treatments** may be needed when a heavily infested unit is identified. PMPs use this tactic to rapidly knock down high populations. HEPA vacuums are the preferred IPM tool to remove a high volume of cockroaches, because they will also remove some of the cockroach allergens. Clean-out protocols vary but may include: flushing cockroaches out of cracks and crevices, vacuuming up dead and live cockroaches, dusting cabinet voids and wall voids, baiting, and performing crack-and-crevice treatments with a residual chemical spray. Follow-up visits should be scheduled every one to two weeks until the unit/apartment is free of cockroaches. Contractors may charge extra for a clean-out service. Be aware of what your contract includes.
- **Insecticidal dusts** can be applied in wall voids and other out-of-reach places to provide additional control and limit the movement of cockroaches. Boric acid-based or desiccant dusts like diatomaceous earth or silica gel-based products are highly effective. Desiccant dusts will have the added benefit of killing bed bugs in wall voids.

- **Insect growth regulators (IGR)** are a low-toxicity control option. IGRs work by disrupting the growth cycle of the cockroach. They take several weeks to reduce populations. PMPs typically apply them as crack-and-crevice sprays or use point source discs (small discs that slowly release the IGR), but IGRs can also be found in some bait products. IGR sprays are often used in combination with baits.

Additional Information and Literature on the Web

For more information on controlling pests with IPM in multifamily housing, visit www.stoppests.org.

“The Tenant’s Role in IPM,” in English and Spanish,

www.stoppests.org/working-with-residents/residents-briefing-video/

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PA IPM Program: “Got Cockroaches?,” extension.psu.edu/got-cockroaches

NYS IPM Program: nysipm.cornell.edu/whats-bugging-you/cockroaches/

Boston Housing Authority’s “Integrated Pest Management: A Guide for Managers and Owners of Affordable Housing,” www.bphc.org/whatwedo/healthy-homes-environment/healthy-prest-free-housing/Documents/IPM%20Guide%20for%20Owners%20and%20Managers.pdf

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