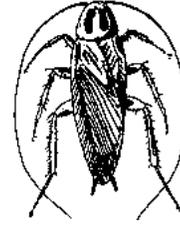




# COCKROACHES

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**C**ockroaches are sometimes found in schools, homes, supermarkets, warehouses and other buildings where food is stored or prepared. The German cockroach is the most common in the Northwest. It is also the most resistant to both high and low toxicity pest control chemicals. Other species found in Washington are the American, brownbanded and oriental cockroach. This document covers general Integrated Pest Management (IPM) techniques for control of cockroaches.

## **HOW TO IDENTIFY A COCKROACH**

Cockroaches are flat, shiny insects with wings and long antennae. They are usually only active at night unless their population is so high that they are driven out in the daytime. They may be detected when lights are turned on in a feeding area at night or when caught in a sticky trap. Colors vary from light brown to dark reddish browns and blacks. Washington species range in size from 9/16 inches to 1 3/4 inches.

# FACTS ABOUT COCKROACHES

## HAZARDS OF COCKROACHES

Cockroaches eat human food and supplies and contaminate them with their saliva and excrement. They also leave a very bad smell where they live. Although they have not been known to harbor any human diseases, they can transport germs on their feet from garbage and bathrooms to contaminate clean areas. Some people (especially children) are severely allergic to shed cockroach skin cells.

## BENEFITS OF COCKROACHES

Cockroaches are scavengers designed to clean up plant and animal wastes in warm and humid environments. They are happy to provide the same service in human structures.

## COCKROACH FOOD

Roaches prefer carbohydrates but will eat almost any organic product or waste, including paint, glue and soap. Most roaches in a building are living on food debris, garbage, pet food, snacks and food supplies that are not properly cleaned up or stored. If you plan to use either homemade or commercial monitoring traps, it is important to know that different species of roach are attracted to different baits

## PREFERRED HIDING LOCATIONS

Cockroach adults prefer to gather with others in favorable areas instead of spreading out. They leave their hiding place to get food and water, then return. The best conditions for roaches are a combination of warm temperatures, moisture and readily available food. Kitchens are ideal, with crumbs found near kitchen floors and counter moldings, and under stoves and refrigerators. They like cracks and gaps between walls and moldings or around appliances where their body is in contact with the wall or floor surfaces on several sides.

## THE COCKROACH LIFE CYCLE

### CONTENTS

<b>FACTS .....</b>	<b>1</b>
<b>HOW COCKROACHES GET INTO SCHOOLS .....</b>	<b>2</b>
<b>THE KEY TO CONTROLLING COCKROACHES ...</b>	<b>3</b>
<b>COCKROACH CONTROL TECHNIQUES FOR SCHOOL PERSONNEL .....</b>	<b>4</b>
<b>TECHNIQUES FOR PEST CONTROL PROFESSIONALS .</b>	<b>7</b>

The life histories of all species are about the same, with some differences in the life span and the number and frequency of eggs laid. German cockroaches, for example, lay **30 to 48 eggs** in a leathery case that looks similar to a kidney bean in size and shape. German cockroach mothers carry their case around until a few days before the eggs hatch. Other species deposit their cases near a food supply or in a sheltered place.

German cockroach eggs hatch in about a month and produce **nymphs** which look like small wingless adults. Nymphs molt several times and become fully **adult** in one and a half to four months. Adult females live up to a year and produce about 4 egg cases in their life. The warmer it is, the faster roaches will hatch and grow.

## **HOW COCKROACHES GET INTO SCHOOL BUILDINGS**

Cockroaches are usually brought into the school in cartons, sacks and containers of food and drinks. They can also come in with appliances, furniture or other school supplies.

Cockroaches will readily migrate from one building or room to another. A clean-up in neighborhood buildings will drive the survivors into near-by structures. Nearby use of insecticides having a repellent effect on roaches will scatter them into new areas.

## **THE KEY TO CONTROLLING COCKROACHES**

The keys to successful control of cockroaches are:

- cleaning up sanitation problems to eliminate their food, water and habitat;
- properly storing food supplies to eliminate their access to food;
- destroying the existing population in the building; and,
- using monitoring traps to detect new roach populations early.

# METHODS IN INTEGRATED PEST MANAGEMENT: COCKROACH CONTROL

## TECHNIQUES FOR SCHOOL PERSONNEL

### IDENTIFY THE PROBLEM

#### Identify infested rooms

There are several effective methods to determine if cockroaches are in an area. Remember, if you see one roach, there will be more that are not visible.

- ☑ Use a flashlight to inspect crevices and behind and under appliances. Turning the lights on in a darkened room will often reveal roaches as they run for cover.
  
- ☑ Use commercial or homemade insect traps to monitor for cockroach activity. This method has the advantage of giving you an actual count of insects to judge how extensive the problem is and how well your methods are working.

#### Identify the areas of concentration or harborage within the infested rooms

Once you know that roaches are in a room, you will need to find the areas where they are hiding. Cockroaches gather in specific hiding places and return to those places after foraging for food. The traps tell you where your management efforts should be directed.

- ☑ Use several monitoring traps spread out over the area to find roach concentrations. Sticky traps are very effective as a monitoring tool if **correctly placed** along roach runways or near roach harborage. Place them where floors or counters and walls meet, also on ceilings and cracks in the upper part of a room. Cockroaches often hide or travel where water pipes and heat ducts penetrate the building's walls.

Commercial roach traps are available in grocery and hardware stores, and usually are specific to particular species.

You can make a homemade trap by putting food bait in the bottom of a quart size glass jar and petroleum jelly around the inside of the mouth. Leave the jar out for a week. White bread or molasses are effective baits for German cockroaches.

### **Identify the species of roach before you start management efforts.**

Different species of cockroaches are attracted to different habitats and food baits. More than one species can be in a building at the same time. Having the species you trap identified by an extension agent is a good idea.

## **SANITATION AND REPAIRS TO MAKE YOUR SCHOOL UNATTRACTIVE TO COCKROACHES**

Unless the conditions that support cockroaches are removed any population that is destroyed will easily re-establish itself when roaches are brought in with supplies or wander in from neighboring properties.

### **Improve sanitation to remove food sources**

- Thoroughly clean floors, counters, under appliances and kitchen and bathroom cabinets.
- Sweep up or vacuum crumbs and food debris daily. Remember classroom pet food.
- Clean grease vents and drains.
- Remove food residues before recycling cans or bottles.
- Close garbage cans tightly and wash them occasionally.
- Store all food in roach - proof (glass with a rubber gasket or plastic with a snap on lid) containers. This includes snacks in or on desks.

### **Do physical repairs to remove water sources**

Moisture and water are more important than food for roach survival.

- Shut off or drain water leaks, drips and standing water sources.
- Dry wet surfaces and counters after cleaning.
- Pay extra attention to food reduction where there are water sources that can't be dried up.

## **Roach-proof all entrances to harborage in infested rooms**

Cockroaches have hiding places in the rooms they infest to escape from lights, human activity and cleaning efforts. Cockroaches like to have their body in contact with something on at least two sides. **Note: Cockroaches can squeeze into cracks as small as 1/25 of an inch.**

- Seal cracks and crevices with paint or caulk. Prioritize the cracks where monitoring shows roach populations are a problem.

The Pacific Northwest is too cold in the winter to support outside populations of over - wintering cockroaches so sealing or caulking exterior windows and vents is not as important as it is in the southern United States.

## **Examine supplies for insect pests when they are brought into the school**

Roaches are almost always brought in with school supplies, and future populations become established where there is access to food, water and shelter.

## **HOW TO KILL AND REMOVE COCKROACHES.**

There are several non-toxic ways to get rid of cockroaches that have already made their way into the building.

### **Most effective and non-toxic methods**

**Vacuum and wash an area to remove egg cases, roach feces and food debris before sealing the cracks.**

Use a crevice extension and disrupt the insect's hiding places by using a vacuum. Building cracks or crevices need to be sealed to prevent them from re-establishing the harborage if they return. Insects can be vacuumed up with some cornstarch in the vacuum bag to suffocate them. It can be difficult to reach adult cockroaches with a vacuum if they can run up inside wall voids or appliances to escape the suction.

- Use a vacuum with a High Efficiency Particulate Air (HEPA) filter to protect workers from insect particles which can cause allergic reactions in individuals with shellfish allergies (insect exoskeletons and crustacean shells are composed of the same biological substance - chitin). HEPA filters can be purchased for conventional shop vacuums.
- Use a mask with a HEPA filter for personal protection.
- Always remove the vacuum bag, tape or seal the openings, and dispose of it promptly to prevent any living insects from escaping.

## **Thermal treatments**

**Steam cleaning** can be used on some upholstered furniture (don't use on veneers), but is most effective on appliances and food preparation equipment. There is a risk of damage to some surfaces or glues. Steam will kill most roaches and drives the survivors out of the treated area where they can be vacuumed up.

**Freezing** is a very effective method for killing cockroaches. If you have costumes, books or other materials that are infested with roaches, you can securely double bag it and put it in a freezer to kill the insects.

## **Ineffective methods:**

### **Ultrasonic Devices**

Devices that emit sound beyond the human range of hearing are advertised as a way to repel a variety of insects or animals. In 1984 the Federal Trade Commission studied them and determined **they do not work.**

# **TECHNIQUES FOR PEST CONTROL PROFESSIONALS**

Pest control professionals hired to eradicate cockroaches in a school cannot do an effective job unless the school staff undertakes and maintains sanitation and habitat corrections, such as food and garbage clean-up, building maintenance and plumbing repairs. For example, a baiting program will not work if cockroaches have access to food from garbage or student lockers.

## IDENTIFY THE PROBLEM

An effective monitoring program is essential to eliminate any cockroach population. IPM pest control contractors can usually do a more thorough trapping and monitoring coverage of a building than can the school staff, because they have a greater knowledge of the biology and habits of the roach species that are present and because it is their primary job - not an additional task. Pest control companies also have insect monitoring methods and devices that are not used by schools.

## HOW TO KILL AND REMOVE COCKROACHES

### **Most effective and non-toxic methods**

The following methods are very effective to eliminate a large cockroach infestation in a building, but they are not practical as a periodic control method. There is no toxic residue or residual pest control action. Professional help and equipment are needed for these methods.

### **Vacuum cockroaches out of their harborages**

Pest control companies use vacuums with HEPA filters and special attachments to quickly and effectively remove roaches from their hiding places. Cockroaches can be driven out of the walls with a pyrethrin spray and then vacuumed up.

### **Thermal treatments**

A heavily infested building can be wrapped in plastic and the air inside heated to over 120 degrees F, destroying cockroaches, drywood termites, ants, fleas and wood boring beetles. Heated air can also be forced into spaces such as wall voids or crawl spaces. Heat sensitive valuables must be moved out and the building cannot be occupied for several hours. This is an expensive process generally used for buildings or rooms with valuable stored materials.

### **Most effective and lower toxicity methods**

“Effective” and “lower toxicity” are relative terms. A compound will have varying degrees of effectiveness or risk to the organism (insect or human) that is exposed to it, depending on the age, physical condition and chemical sensitivity of particular individuals. Different pathways of exposure for the same compound, for example by mouth, through the skin and/or by inhalation through the lungs have very different effects. In this context, “most-effective lower-risk” means the most effective compound against the pest, with the lowest toxic risk to non-target organisms.

With any pesticide or toxic substance it is essential to read and follow the label, both for self- protection and for the most effective use against the pest. The label is the law. Manufacturer’s Material Safety Data Sheets must be kept on file where they can be accessed in case of an emergency or accidental exposure.

Pesticides are mixed in many different formulations designed for different pests and locations. A lower toxicity ingredient may have other higher toxicity ingredients added to it, or a product may be used or misused in a method of application or a location where its effects are much more toxic.

### **Poison baits**

Poison baits for insects have advantages for an IPM program, because the pesticides are concentrated where the insects come to get them rather than being spread all over the building or room. As long as the bait stations are placed where

children cannot encounter them, there is little chance that children will get into the bait. Bait station containers can easily be moved or removed. These baits can also be applied in a crack and crevice treatment.

### **Abamectrin (Avert<sup>®</sup>)**

This product is an extract from a soil microorganism. It is applied in a crack and crevice treatment as a powder, aerosol, gel or paste and is ingested when roaches pick it up on their bodies and then swallow it while grooming. It kills most roaches in a week or so but takes several months to kill the remainder. It works very well against roaches and can be used near people with allergies and respiratory problems.

### **Boric acid**

Boric acid is a very effective stomach poison that can be applied by lightly spreading as a scattered dust. It has very little odor, so it does not repel insects before they come into contact with it. Cockroaches walk over the boric acid and then swallow it when they groom themselves. They will also track it back to their harborage where other roaches will pick it up. Ants, carpet beetles and silverfish which contact it will also be killed. Like the desiccating dusts, it takes several weeks to kill most of the insects.

Boric acid pastes which include a food attractant can be applied to cracks and crevices. Because they are less irritating to apply than dusts, a mask or goggles are not needed. Pastes must be applied thinly so that roaches have room to get into a crack and eat the bait. It takes 3 to 4 weeks for the results to show. **Warning! Boric acid also is sold in tablet form, but should not be used in a school, because the tablets look like candy to children.**

### **Hydramethylnon**

This product is an insecticidal bait with low toxicity to mammals that acts as a slow - acting stomach poison when eaten by cockroaches, termites and ants. Some products are available in hardware stores (Combat<sup>®</sup>), some are only available to commercial pest control companies (Siege<sup>®</sup> gel in a syringe or gun, Maxforce<sup>®</sup> in a bait station). The bait stations are small and can easily be hidden from children.

## **Indoor crack and crevice treatments**

In a school, dusts or sprays should only be used in confined spaces, such as wall voids and in crack and crevice applications, to prevent children from contacting the dust or any vapors. As long as dusts are kept dry and are not disturbed, they will last indefinitely in a wall void. The dusts can pose a health risk to workers who open the wall later unless they are wearing respiratory protection. Do not stir dusts up again once they have been applied. Some products can be used in food preparation areas. They are especially

useful in areas in and around appliances, ductwork, around electrical outlets and wiring, and in wall and ceiling voids.

Pest control professionals have power spray equipment that can correctly distribute pesticidal dusts or sprays in a very thin layer. The desiccating dusts, boric acid, pyrethrins and pyrethroids can be applied this way. The dusts must be very lightly applied because insects will walk around particles they can detect. Sprinkling little piles of dust will not be effective.

### **Desiccating dusts**

These products work by absorbing the protective coating on an insect's cuticle (protective shell) which causes it to die of dehydration. Applicators need to use a protective dust mask and goggles. Although these dusts are almost non-toxic to mammals, they are respiratory irritants when inhaled.

Cockroaches walk over these dusts and then spread them on their bodies when grooming. They do not work quickly; it may take several weeks to kill most insects unless they are combined with a quicker killing pesticide such as pyrethrin. The insects may become more visible before they die because they emerge from shelter to look for water.

Dusts provide protection against cockroaches, carpenter ants, other ants, some beetles, termites, ticks, fleas and silverfish that are in the buildings. Insects do not seem to be able to develop a genetic resistance to them. They are not effective outdoors or in any damp area.

### **Diatomaceous earth**

Diatomaceous earth both absorbs moisture and ruptures the skins of insects. **Caution: never use the treated diatomaceous earth sold for swimming pool use!** - It has crystals that cause the lung disease, silicosis, in humans. Only use natural diatomaceous earth products sold for garden and animal use. Diatomaceous earth is combined with pyrethrins in Diacide® to provide a quicker kill.

### **Silica aerogel**

Silica aerogel is used to kill cockroaches, carpenter ants, other ants in buildings, termites, ticks, some beetles, fleas and silverfish. It is also used in pill bottles and electrical equipment to absorb moisture. The silica aerogel used is a food grade product, not the crystalline silica which causes the lung disease, silicosis. It is very toxic to fish - do not use where it can get into aquariums. Tri-Die® and Dri-Die are commonly used products. Another product is Drione® a silica aerogel mixed with pyrethrin.

## **Boric acid**

Boric acid is relatively non-toxic to mammals in low doses - it is used in eye drops. Ingestion through broken skin or the mucus membranes of higher doses are toxic to humans, however. Roach Prufe® and Roach Kill® are two products with anti-caking compounds added to resist moisture. An aerosol formulation is easier to apply in wall voids than dusts.

## **Pyrethrins**

Pyrethrin insecticides are extracts of natural chrysanthemums which attack the nervous systems of insects and paralyze them almost instantly. Cockroaches have developed a genetic resistance to pyrethrins so they are no longer effective as poisons. Pyrethrins are often an allergen for people with hay fever or ragweed allergies.

Pyrethrins can be effectively used as a **flushing agent** to drive roaches out of their hiding places. The flushing is done with special spray equipment in a crack and crevice application. As the roaches run out of their hiding places they can be vacuumed up. The pyrethrins in a flushing agent are designed to dissipate in a hour or so and not to leave a pesticide residue.

## **Pyrethroids**

Pyrethroids are synthetic insecticides chemically similar to pyrethrin extracts of natural chrysanthemums. They are formulated to be more persistent in the environment than pyrethrins. Pyrethroids are less likely to cause allergic reactions than pyrethrins. They are common ingredients in “bug bombs”, which should not be used in a classroom, and in sprays, which could be used in wall void or crack and crevice treatments against cockroaches. Micro-encapsulated formulations, such as Suspend®, are excellent in wetter or greasy conditions. The pesticide particles are the size of a dust particle but have a protective capsule around the ingredients. They are applied in a crack and crevice application with special tools. Like a dust, the particles are picked up on the insect’s body and swallowed during grooming. Pyrethroids are often used with insect growth regulators.

## **Insect growth regulators (IGRs)**

Insect growth regulators are hormones that keep immature cockroaches from developing and reproducing. They do not kill roaches directly. IGRs are slow acting and cannot affect insects that are already mature, so they are often used after other methods have destroyed the main population. The immatures that have hatched since the adults were killed by other methods will become unable to reproduce. IGRs have very low toxicity to mammals. They should be applied as a

spot treatment to cracks and crevices, but never be applied in a room fogger. Hydroprene (Gentrol®) comes in a pad with a capsule that is broken open over the pad. It has the advantage of being movable and recoverable. Pyrproxifan (Nylar®) is an IGR that is applied to cracks and crevices as an emulsifiable foam spray.

### **Other methods that vary in effectiveness and are moderate to high toxicity**

Once the roach harborage and feeding areas are identified and habitat and sanitation changes are made, the cockroach population in a school should be destroyed with the least toxic methods described above rather than the carbamates and organophosphates.

Cockroaches have developed a genetic resistance to many formulations of pesticides, particularly carbamates and organophosphates. These products will make them sick and even kill some individuals but too many will recover to seriously limit the population.

Where and how a pesticide is applied have a great deal to do with how effective it is against a pest and how safe it is for people who share the area. Some formulations will persist for a long time, particularly inside a building. In a school, the more effective formulations could only be used in confined spaces, such as wall voids and in crack and crevice applications, to prevent staff and children from contacting the dust or any vapors.

### **Organophosphates**

Organophosphates are highly to moderately toxic pesticides which interfere with the actions of the cholinesterase enzymes, which affect the nervous system and thus the muscular control of vertebrates. Organisms are eventually killed by paralysis of the muscles responsible for breathing. Several products that are currently used against cockroaches are propretamphos (Seraphos® and Catalyst®) and chlorpyrifos (Dursban® and Lorsban®).

### **Carbamates**

Carbamates are highly to moderately toxic pesticides which also act by interference with the enzyme cholinesterase. Roaches have developed resistance to many formulations of carbamates. Examples of products now used against roaches are bendiocarb (Ficam®) and propoxur (Baygon®).

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