



The Healthy Home and Garden

for You,
Your Family,
and Pets

ACKNOWLEDGMENTS

PROJECT DIRECTOR

Gina Purin
Marin County Stormwater Pollution Prevention Program

PRINCIPAL WRITER, INTRODUCTORY PAGES

Debi Tidd
The Gardens at Heather Farm
Walnut Creek, CA

PRINCIPAL WRITERS, FACT SHEET SERIES

Tanya Drlik, Bio-Integral Resource Center
Michael Baefsky, Baefsky & Associates

DESIGN/LAYOUT

Lauren Wohl Design, Oakland, CA

GRAPHICS

Central Contra Costa Sanitary District
Responsible for originally developing the Our Water – Our World IPM Outreach Program

For more information, contact:

Marin County Stormwater Pollution Prevention Program
P.O. Box 4186
San Rafael CA 94913-4186
415-499-6528
mcstoppp@co.marin.ca.us

Funding for this project has been provided in full or in part through an Agreement with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Water Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

CONTENTS



How to Create a Healthy Home and Garden	1
A Safer Way to 'Bug' Pests	3
Ants	5
Aphids	7
Cockroaches	9
Fleas	11
Lawns	13
Mosquitoes	17
Roses	21
Snails and Slugs	25
Spiders	27
Yellowjackets	29
Weeds	31

Pesticides and Water Pollution	33
Use and Disposal of Pesticides	35
Managing Pests Naturally (Beneficial Insects)	37
Finding a Pest Control Company	39
Learn More About Pesticides and Safer Alternatives	41



OUR WATER – OUR WORLD: HOW TO CREATE A HEALTHY HOME AND GARDEN

You can maintain a lovely home and garden and still protect the health of your family, your pets, and the environment! This booklet will tell you how—by offering some less toxic, common-sense techniques for managing some common pests found in the home and/or garden.

If you can't find the answer to your pest problem in this booklet, visit the *Our Water – Our World* website where you can ask a question and get a personal response from our “bug” experts at: www.ourwaterourworld.org

The *Our Water – Our World* program is a partnership between many different water pollution prevention agencies and stores that sell pesticides to the public. The goal is to help you manage home and garden pests in a way that protects the health and safety of your family, pets, and the environment.

This program can help you identify methods and techniques for managing pests without using any pesticide products. However, if you do need a pest control product, you can use the website listed above to find the name of some of the least toxic alternatives available—as well as a list of stores in your community where they can be found. In addition, the fact sheets in this booklet provide some product information.

When you shop for less-toxic products in one of the many stores participating in this program, you'll find the tags shown below. Look for them to help you locate less-toxic products quickly and easily.



Not All Alternatives Are the Best Choice for Water Quality!

Be aware that some products that are advertised as alternatives to conventional pesticides, e.g., synthetic pyrethroids, are actually very toxic to aquatic life. These pyrethroids may be listed on products under a variety of names such as bifenthrin, cyfluthrin (including beta-cyfluthrin), cypermethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, permethrin, and tralomethrin. Though not used as widely outdoors (therefore less of a threat to water quality), pyrethroids such as resmethrin and tetramethrin can be found in aerosol products. Aerosols disperse chemicals in a way that significantly increases the risk of exposure to unintentional targets—including you, pets, and your family.

INTEGRATED PEST MANAGEMENT: A SAFER WAY TO “BUG” PESTS

Aphids on your roses, ants in your cereal, fleas on the dog—we’ve all been bugged by pests. For many people, the first response to pest problems is to reach for the bug spray. But the chemical products we use to control these pests can cause serious health and environmental problems, especially where children are concerned. There is a better way to solve pest problems, and it is called Integrated Pest Management or IPM.

WHAT IS INTEGRATED PEST MANAGEMENT (IPM)?

IPM is an effective and environmentally friendly approach to pest management that uses a combination of strategies to keep pest damage at an acceptable level. With IPM, the focus is on preventing pest problems through healthy gardening practices and avoiding the use of chemicals when they are not really needed. The goal of IPM is to manage garden and household pests with as little impact to our families, pets, and the environment as possible.

WHY SHOULD I USE IPM?

When rain and over-watering wash fertilizers, pesticides, and herbicides into storm drains, they wind up in local creeks and waterways. If these products are poured (or the containers are rinsed) down household drains, many of the chemicals cannot be removed by sewage treatment plants—so again they end up in the water. This growing chemical pollution has an impact on the health of our families and pets, it degrades the environment, and it harms wildlife. IPM uses chemical controls only as a last resort, relying on the least-toxic chemicals possible.

Also, keep in mind that **98% of the bugs in our gardens are actually working hard for us by eating pests, pollinating plants, recycling dead plant material into healthy soil, and providing food for wildlife.** Pesticides kill these helpful bugs along with the pests.

HOW DOES IPM WORK?

IPM emphasizes checking your garden and home often to catch pests before they become a major problem. When you do find a bug, make sure it is actually a pest. Many bugs and their larvae may look ferocious but are actually good for your garden. Before trying to get rid of it, ask yourself if real damage is taking place or if the damage is at an acceptable level. When you do need to control pests, try a combination of the following IPM techniques:

Horticultural Controls

Keep gardens healthy and pest free by practicing the following: select native plants and/or disease resistant plants that are appropriate to your area, choose the right plant for your type of soil and weather conditions, rotate crops, clean up overripe fruit and diseased leaves, use compost or slow-release fertilizers, and mulch to prevent weeds.

Physical Controls

Hand pick pests, protect delicate seedlings with fabric row covers, attract and trap pests with sticky traps, spray plants with a hose to dislodge and kill pests, and caulk or seal up cracks where bugs might enter the house.

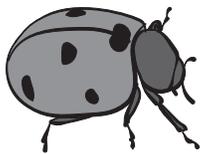
Biological Controls

Many of the bugs found naturally in a healthy garden, including dragonflies, spiders, ladybugs, praying mantids, and lacewings, eat huge numbers of pests. Plants with small flowers and lots of pollen, like yarrow, alyssum, dill, and buckwheat, will attract these "good bugs" to your garden.

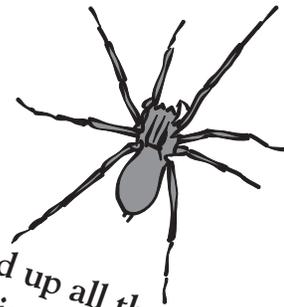
Chemical Controls

If a chemical control is needed at all, choose a less-toxic product such as insecticidal soaps, horticultural oils, and boric acid. Use only the amount needed, and keep these products safely stored in the original container.

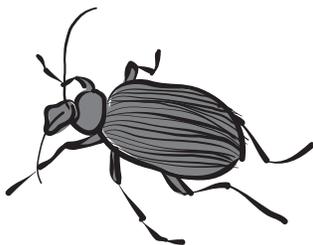
Following these IPM strategies will help you create a natural balance in your garden, making your home and garden a safer place for your family, pets, and wildlife.



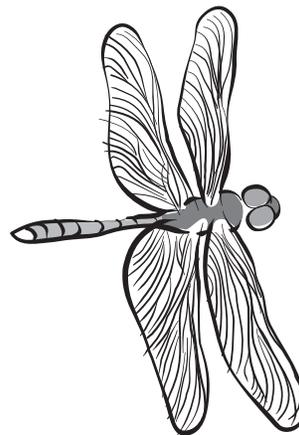
One ladybug can eat 5,000 aphids in its lifetime.



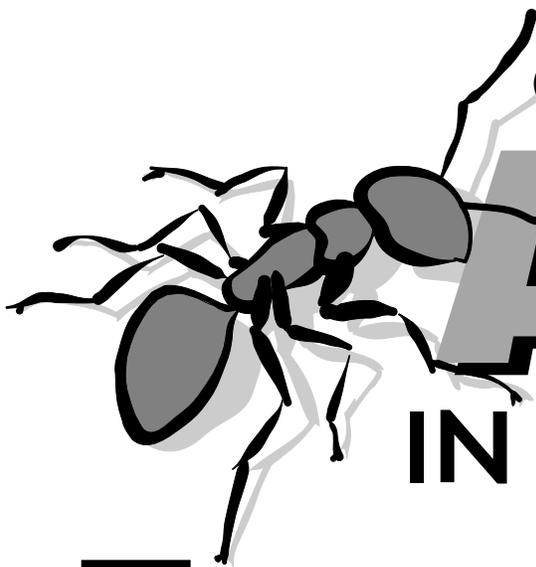
If you piled up all the pests that spiders eat in a year, they would weigh more than 50 million people!



At night, ground beetles use their powerful jaws to munch on garden pests such as snails and slugs.



Dragonflies have huge appetites and can eat 300 mosquitoes in a day.



CONTROLLING ANTS IN YOUR HOUSE

The Argentine ant is a frequent invader in California homes. Although they can be pests, ants provide an ecological cleansing and fertilization service of considerable importance. For example, they kill and eat many pest insects, aerate the soil, and recycle dead animal and vegetable material.

Because of these beneficial aspects, it is undesirable (and probably downright impossible) to eliminate ants from their outside habitat. The best approach to ant management is to try to keep them outdoors.

DETECTION

Look for individual “scouts” or long lines of ants in or around the house near food or water. Distinguish Argentine ants from Carpenter ants by size. Argentine ants are small ($\frac{1}{8}$ "), and their queens are slightly larger. Carpenter ants are $\frac{1}{4}$ " or larger and require different management techniques from those listed below for Argentine ants.

LESS-TOXIC CONTROLS

INSIDE YOUR HOME

- **Kill the scouts** so they can't call in the hordes when they find a tasty tidbit.
- **Use ant baits** because they use a minimum of insecticide and confine it to a very small area (see “Tips for Using Ant Baits” on back).
- **Use insecticidal dusts** such as diatomaceous earth (DE) in wall voids and cracks before they are sealed. Use a hand duster to apply DE and wear a dust mask and goggles. DE has little toxicity to humans or pets, but kills insects by absorbing their outer waxy coating, causing dehydration and death.

OUTSIDE YOUR HOME

- **Use sticky barriers** around the trunk of a tree or bush to prevent ants from protecting aphids and other “honeydew”-producing insects. Prune any branches that touch walls, fences or the ground so ants cannot find alternate routes into the plant.
- **Ant Baits.** If you can find the spot outside where ants are entering the building (this is often difficult to do), place bait stations there; otherwise use baits only inside. Outside, rain and sprinklers can wash baits away, and you may end up *attracting* ants to your house.

PREVENTION

- **Store food in containers that seal tightly** or in the refrigerator when you notice ant activity.
- **Keep things clean and dry** and fix leaking faucets and pipes (ants need food *and* water).
- **Caulk cracks** where ants are entering the house. Weather-strip doors and windows.
- **Put pet dishes in a soapy moat.** Partially fill a wide, shallow container with soapy water and place pet dishes in the water.

TIPS FOR USING ANT BAITS

Ant baits contain a pesticide mixed with an attractive food substance. Ants take small quantities of bait back to their nest to share with their nest mates. In this way the entire nest can sometimes be eliminated.

- Use baits with boric acid, hydramethylnon, fipronil, or arsenic as an active ingredient.
- Keep several different baits on hand because Argentine ants change their food preferences frequently. If one bait is not working, try another. Wait at least a day to see if they take the bait.
- Use baits inside (outside you may attract more ants to the house and rain and sprinklers will wash away bait).

TIPS FOR USING ANT BAITS, CONT.

- Do not spray insecticide around the bait; it will repel the ants.
- When ants are gone, remove the bait so you don't attract more ants. If the bait you are using comes enclosed in a bait station, return it to its original

box to save and use again. Put the box inside a plastic bag and seal it with a twist-tie.

- Baits may take several weeks to kill the ants. At first you may see more ants coming to the bait, but after a few days to a week you should see a significant reduction.

PRODUCTS

Examples of trade names of products listed in this fact sheet

Desiccating Dust: Concen Diatomaceous Earth Crawling Insect Killer, Safer Ant and Crawling Insect Killer

Hand-Duster: Pest Pistol

Sticky Barrier: Tanglefoot and Stickem Tree Pest Barrier

Baits containing Boric acid: Terro Ant Killer II, Drax Ant Kill Gel

Baits containing Hydramethylnon: Combat Ant Control

Baits containing Arsenic: Grants Kills Ants

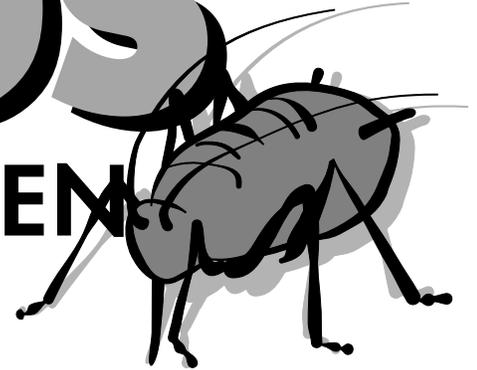
Baits containing Fipronil: Combat Quick Kill Ant Bait



QUICK FIX FOR AN ANT EMERGENCY

1. Find what ants are after (usually left-over food) and where they are entering the room (usually through a crack in the wall). Mark it so you can find it again. If you can't find an entry point, see Step 5.
2. Don't remove the food until after Step 3 because ants will scatter. They are easier to kill in a line.
3. Clean up lines of ants with a vacuum, or spray ants with soapy water and wipe up with a sponge. Soap washes away the chemical trail ants follow.
4. Next, block entry point temporarily with a smear of petroleum jelly or a piece of tape. Use silicone caulk to permanently close cracks in walls, along moldings and baseboards, and in gaps around pipes and ducts.
5. If you can't find an entry point, clean up the ants (Step 3) to a convenient (preferably out-of-the-way) spot. Place the bait station on the line the ants had been following. Always remove the bait station when the line of ants has disappeared so you don't attract more ants into the house (see "Tips for Using Ant Baits").
6. If ants are nesting in a potted plant, move it outdoors. Water it thoroughly and place it in a bucket filled with water that comes an inch below the rim of the pot. Using a stick, make a bridge for the ants to get out of pot and bucket without getting in the water. The ants will soon begin carrying their white-colored young to safety. When no more ants emerge, drain the pot and return it to the house.

CONTROLLING APHIDS IN YOUR GARDEN



Most plants can tolerate low to moderate numbers of aphids without noticeable damage. On some plants, however, large numbers of aphids can distort foliage and flowers and stunt plant growth. Some species of aphids can also transmit plant diseases when they puncture plant tissues to feed.

Aphids excrete “honeydew,” a sweet substance that forms a harmless but sticky coating on leaves. The honeydew is soon colonized by a fungus called “sooty mold,” which is also harmless, but makes leaves look black and dirty. Argentine ants love to feed on honeydew, and to ensure a continuing supply, they protect aphids from their natural enemies. When this happens, aphid management must include ant management (see the Ant fact sheet in this series).

DETECTION

Aphids are very small insects with soft, pear-shaped bodies. They have long legs and antennae, and most have two tube-like structures called cornicles on their hind end. Adults of some species have wings. Aphids can be many colors and are usually on buds or the undersides of leaves.

TOLERATE SOME APHIDS

- **Tolerate low to moderate numbers of aphids** as long as they aren't causing noticeable plant damage. There is a reason for this: aphids have many natural enemies such as spiders, ladybugs, lacewings, and minute parasitoids (tiny non-stinging wasps) that often keep aphid numbers below damaging levels. These beneficial insects rarely appear on the scene until *after* aphids have begun attacking plants. This “lag-time” can be a day or two or as long as several weeks. As the season progresses, aphid control by these natural enemies improves because more natural enemies are attracted to your garden and more stay to breed.
- **Aphids commonly found on trees will not infest your garden annuals**, and these aphids can help attract natural enemies that will attack pests on other plants.

LESS-TOXIC CONTROLS

- **Learn to recognize beneficial insects.** Among the most important natural enemies of aphids are the tiny wasp parasitoids that lay their eggs inside the bodies of aphids. These tiny wasps *cannot* sting people. A parasitized aphid (called a “mummy”) looks puffed-up, and its skin hardens and changes color, often to tan, light brown, or black.
- **Attract beneficials to your garden** by planting a wide variety of flowering plants. (See fact sheet in this series called “Growing a Healthy Garden to Manage Pests Naturally”). The adult forms of many beneficial insects, including tiny wasps and lacewings, feed on pollen and nectar.
- **Consider buying beneficial insects** (see the Products and Resources box on back). Lacewings are more likely to stay in your garden than commercially available ladybugs.
- **Buy beneficials before aphid numbers are high.** If you have an aphid emergency, first use soap or oil sprays (see Products and Resources below) to reduce the population. Then, if necessary, release natural enemies. On the other hand, don't purchase beneficial insects before you have aphids. You will be releasing them into your garden to starve.

LESS-TOXIC CONTROLS, CONT.

- **Wipe off or prune away** colonies of aphids from leaves and buds.
- **Use a forceful stream of plain water** to wash off aphids and honeydew. Do this on a warm, sunny day so that foliage dries off before night.
- **Use insecticidal soaps** to kill aphids on contact and spare beneficials such as lacewings. These products do not leave toxic residues.
- **Use spray (horticultural) oils** to control aphids without leaving toxic residues for natural enemies.

Note: Soaps and oils must coat the bodies of the insects to be effective.

PREVENTION

- **Use slow-release fertilizers.** Some aphids reproduce more quickly on plants with high levels of nitrogen in their leaves and buds. Fertilizers such as compost, sewage sludge, or encapsulated materials are better because they slowly release moderate levels of nutrients.
- **Avoid excessive pruning** because it stimulates aphid-attracting growth.
- **Use a row cover** to exclude aphids and other pests but allow air, light, and irrigation water to reach plants.
- **Control ants** by spraying or painting a 4" wide sticky barrier around woody shrubs or trees. (See the Ant fact sheet in this series.)

APHIDS — SO MANY, SO FAST

The remarkable life cycle of aphids helps to explain how they can quickly appear in large numbers. In spring in temperate climates, female aphids called “stem mothers,” emerge from “overwintering” eggs. These plump, distinctive-looking aphids do not need to mate to reproduce. Stem mothers give birth to live daughters, and these offspring give birth to more live daughters — all without the need of mating. The swiftly growing female aphid colonies cluster around the stem mother and continue to multiply long after her death. At the end of the season, aphids begin to produce both sons and daughters. When these males and females mature, they mate and the females lay eggs on bud scales or bark to “overwinter” and begin the cycle again.

PRODUCTS AND RESOURCES

Examples of trade names of products listed in this fact sheet:

(Note: Product labels should list plants to be treated.)

Insecticidal Soaps:

Safer Insecticidal Soap, Bonide
Insecticidal Soap, Garden Safe
Insecticidal Soap, EB Stone Insect
Soap, Concern Insect Killing Soap

Insecticidal Soap w/Pyrethrin:

Safer Yard and Garden
Insect Killer

Spray (Horticultural) Oils:

SunSpray Ultrafine, Volck

Sticky Barrier:

Tanglefoot, Stickem Tree Pest
Barrier

Encapsulated Fertilizers:

Osmocote

Row Covers:

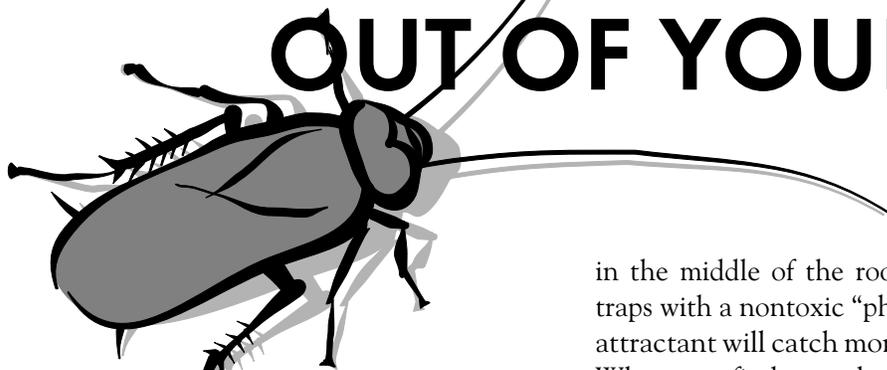
Fast Start Seed Blanket, Easy
Gardener Plant and Seed Blanket

Sources for Lacewings:

Buena BioSystems
P.O. Box 4008
Ventura, CA 93007
(805) 525-2525
www.buenabiosystems.com

Rincon-Vitova Insectaries
P.O. Box 1555
Ventura, CA 93002
(800) 248-2847
www.rinconvitova.com

KEEPING COCKROACHES OUT OF YOUR HOUSE



Although cockroaches are useful outdoors, where they help recycle plant and animal wastes, they are not welcome indoors. Research clearly indicates that roaches can carry disease-causing organisms from sewers, garbage cans, or bathrooms to kitchen counters and human food. Cockroaches can also trigger allergic reactions in some people.

DETECTION

Except for size and markings, all cockroaches have a similar appearance. These insects are dark in color, oval-shaped, and have long antennae. Roaches are mainly active at night and generally remain hidden during the day in cracks and crevices near their source of food.

- **Use nontoxic sticky traps to locate roach habitat.** Roaches like to travel by touching the edges of objects. Place traps along the edges of walls, appliances, cupboards, etc., and not

in the middle of the room. Sticky traps with a nontoxic “pheromone” attractant will catch more roaches. When you find out where roaches are hiding, you’ll know where to concentrate your efforts.

LESS-TOXIC CONTROLS

- **Use sticky traps for small infestations.** If you only have a few roaches, you may be able to control the problem with sticky traps.
- **Use a strong vacuum with a crevice attachment** to pull roaches from their hiding places.
- **Use insecticidal dusts such as diatomaceous earth (DE) or boric acid** in wall voids or cracks and crevices before you seal them, under large appliances, or in other prime habitats. One way to gain access to a wall void is to remove the cover plates on electrical outlets and switches. Always turn off the power before applying products near electrical outlets.

When properly used, DE has little toxicity to humans and pets, but kills insects by absorbing their outer waxy coating, causing dehydration and death. Use DE sold for pest control and *not* for pool filters.

Although boric acid has a low acute (immediate) toxicity for humans and pets, it should be handled carefully and kept out of the reach of children and pets. For roaches, boric

acid is a slow-acting but effective stomach poison.

When applying these dusts, use a hand duster and wear a dust mask, gloves, and safety goggles. Apply a very light coating because roaches will avoid piles of dust.

- **Use cockroach baits** because they use minimal amounts of insecticide and confine the poison to a very small area (see Tips for Using Cockroach Baits on back).

PREVENTION

Prevent cockroach infestations by denying them access to your home and to the food, water, and shelter they need to survive.

- **Store food in the refrigerator or in containers that seal tightly.**
- **Keep things clean and tidy.** Thoroughly clean counters and vacuum or sweep floors daily in eating and food preparation areas. Don’t leave dirty dishes out overnight, even in the dishwasher. Any garbage containing food scraps should be removed from the house nightly. Thoroughly clean recyclables before storing them. At night, place pet food and water bowls in a moat of soapy water. Reduce clutter in all rooms (it provides habitat for roaches).
- **Keep things dry.** Fix leaky plumbing. Keep kitchen surfaces dry whenever they are not in use, especially overnight.

PREVENTION, CONT.

- Seal cracks and crevices. Before sealing, vacuum and wash the area to eliminate all roach egg cases, fecal matter, or other debris. Caulk and paint cracks around baseboards, cupboards, pipes, sinks, etc. Use mildew-resistant caulk in moist areas.
- **Weatherstrip** around doors and windows and repair holes in screens.
- **Inspect materials you bring into your house** for roaches or their egg cases (small, dark, kidney bean shaped). Pay special attention to used furniture and appliances and cardboard cartons from food stores.
- **Monitor with sticky traps.** Once you have eliminated roaches or significantly reduced their numbers, con-

tinue to use sticky traps to alert you to a new infestation or a rise in the population. This is especially important in apartment buildings, condominiums, or other connected dwellings where roaches can easily move from one household to another.

TIPS FOR USING COCKROACH BAITS

- Use baits indoors.
- Use baits with boric acid, fipronil, or hydramethylnon.
- Reduce or eliminate food sources so roaches will feed on baits.
- If you are using a gel bait, put small dabs in a number of locations rather than large blobs in a few locations.
- Place baits near areas where roaches are hiding and between their hiding places and food sources.
- Place baits where roaches are most likely to travel or congregate, such as along the edges of walls, appliances, cupboards, etc. — *not* in the middle of the room.
- Keep baits out of the reach of children and pets.
- Check bait stations frequently, especially if you have a large infestation. Empty bait stations should be removed because they make great roach hiding spots.

PRODUCTS

Examples of trade names for the products listed in this fact sheet:

Desiccating Dust: Concern® Diatomaceous Earth Crawling Insect Killer, Grow More® Diatomaceous Earth, Surefire® Crawling Insect Killer

Boric Acid Powder: Roach Prufe®, Victor® Boric Acid Powder

Hand-Duster: Pest Pistol® (if unavailable locally, call (888) 784-1722 or visit www.groworganic.com)

Sticky Traps: Black Flag® Roach Motel

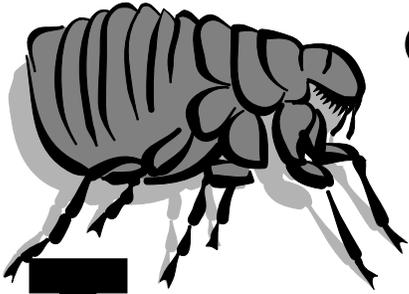
Sticky Traps with pheromone attractant: Victor® Roach Magnet

Baits containing boric acid: Niban® Granular Bait, Niban® FG, Seabright® Roach Free System Bait

Bait containing fipronil: Combat® Quick Kill Roach Bait Stations, Combat® Quick Kill Roach Control Gel

Bait containing hydramethylnon: Combat® Roach Control System, Combat® Roach Control Gel

KEEPING FLEAS OFF YOUR PETS AND OUT OF YOUR YARD



The flea most commonly found in and around the home is the cat flea, *Ctenocephalides felis*. Despite its name, the cat flea finds dogs and humans quite tasty too. Flea bites cause irritation, but also serious allergies in some animals and humans.

DETECTION

Adult fleas spend almost all of their time on an animal's body. In order to know when to begin and end your flea-control efforts, use a specially manufactured flea comb on your pet to keep track of the flea population.

Look for tiny eggs and tiny, white, worm-like flea larvae on the floor, in rugs, in cracks and crevices, and anywhere pets rest or sleep. Larvae feed on dried blood excreted by adults.

Flea traps can help you pinpoint a problem if you don't own a pet but still have fleas. Animals nesting near your house may be the source.

LESS-TOXIC CONTROLS

INSIDE YOUR HOME

- **Comb your pet** with a metal flea comb, available at pet stores. Focus around the neck and base of the tail. Keep a wide container of soapy water nearby to drown captured fleas.
- **Bathe dogs** to drown fleas. Use a dog shampoo and increase effectiveness by using a flea comb while the pet is lathered. It is not necessary to use shampoo with insecticide.
- **Vacuum carpets, floors, and upholstered furniture frequently** throughout the year. Vacuuming carpets picks up adult and egg-stage fleas, but is less effective at removing larvae. Clean cracks and crevices; or better still, seal permanently with caulk. Try gently vacuuming your animal's coat to remove adult fleas.
- **Use diatomaceous earth (DE)** to treat carpets, upholstered furniture, and pet bedding or blow it into cracks and crevices. Use a hand duster to apply a fine layer of DE. Wear a dust mask and goggles and avoid getting dust in your pet's eyes. DE has little toxicity to humans and pets, but kills fleas by absorbing the waxy coating on their bodies, causing dehydration and death.
- **Use borate-based carpet treatments.** Borates have a low toxicity to humans and pets. Fleanix carpet treatment can control fleas in carpet-

ing for up to a year. Mix the powder with water in a rug shampooing machine with or without detergent. During shampooing, borate binds to carpet fibers and cannot be vacuumed up. Borate applied in water poses less hazard to the lungs than borate applied as a dust.

- **Flea traps** attract adult fleas to the warmth and light of an electric bulb and the fleas are caught on sticky paper. Fleas prefer a warm body so traps will work better in areas where you can exclude animals and humans.

OUTSIDE YOUR HOME

- **Treat outside only where you have found high flea populations.** To find these areas, walk around the yard in a pair of white socks. Check areas where animals rest, sleep, or regularly travel. You will easily see fleas that jump onto the socks.
- **Do not try to combat fleas by spraying around the perimeter of your house or spraying your entire yard.** Spot-treat only those areas where you find large populations of fleas. Fleas will more likely be on an animal or inside your home. Concentrate your efforts there.
- **Check for wild animals** like raccoons and opossums nesting under the house or porch. Dead animals can also be the source of a flea infestation. Treat nests under the house with diatomaceous earth.

OUTSIDE YOUR HOME, CONT.

- Use **beneficial nematodes** in soil where you have found fleas. Apply beneficial nematodes to soil where you have found fleas. The soil temperature must be between 60°F and 90°F, and the soil should be moist.

Irrigate before and after application, but don't soak the area. For sources of nematodes, see the Products and Resources box.

FOR YOUR ANIMAL

- **Ultrasonic collars and machines are not effective.** There is no scientific evidence that these products affect fleas, and they are not recommended.

The following insecticides should only be used during flea season. Unnecessary use may speed up the process of fleas becoming resistant to these chemicals:

- **Fipronil (Frontline) and imidacloprid (Advantage)** are applied to the skin of the animal in a small amount at one spot, usually at the base of the neck or between the shoulder blades. The insecticide spreads over

the entire body of the pet and is effective for at least a month. These products have a low acute toxicity for mammals (chronic toxicity of fipronil unknown) but can be irritating to eyes and should not be ingested. Use gloves when applying them.

- **Lufenuron (Program)** is given orally to the animal. Fleas that ingest this chemical produce only a few viable eggs, and larvae from those eggs cannot mature. Because lufenuron accumulates in fat and crosses the placental barrier, do not treat pregnant, nursing, or very young animals.
- **Insect growth regulators (IGRs)** such as methoprene (Precor) and pyriproxyfen (Nylar) do not kill adult fleas, but break the flea reproduction cycle by preventing flea larvae from turning into adults. IGRs are sold in a variety of applications including spot-on formulations and tablets for your animal. Some products combine IGRs with other pesticides. In general, products containing just IGRs pose the fewest risks. IGRs have low toxicity

to mammals, but are toxic to some aquatic organisms; therefore, it's best to limit the use of IGRs to indoor applications where the product won't go down an indoor drain.

PREVENTION

- **Restrict pets to a regular sleeping space** so you can focus cleaning efforts on fewer areas.
- **Use washable pet bedding** that can be gathered up easily by the four corners and laundered frequently. Soapy water destroys all flea stages.
- **For highly allergic people:** Protect yourself by wearing a long-sleeved shirt and long pants tucked into socks. If the weather is hot, just a pair of long white socks will offer some protection. Pick off fleas and drop them into soapy water. Apply insect repellents to shoes and clothing rather than to skin.
- **Keep wild animals and rodents away from the house.** Patch holes or cover them with screen (1/4" hardware cloth) to prevent animals from getting in.

PRODUCTS AND RESOURCES

Examples of trade names of products listed in this fact sheet:

Insecticidal Dusts: Safer and Concern Crawling Insect Killer

Hand Duster: Pest Pistol (If unavailable locally, call (888) 784-1722 to order); www.groworganic.com

Borate-based Carpet Treatments: Fleanix (If unavailable locally, call (415) 459-4003 to order)

Flea Trap: Raid Flea Killer Plus

Beneficial Nematodes (*Heterorhabditis bacteriophora*):

Rincon Vitova Insectaries, P.O. Box 1555, Ventura, CA 93002; (800) 248-2847; www.rinconvitova.com

Buena BioSystems, P.O. Box 4008, Ventura, CA 93007; (805) 525-2525
www.buenabiosystems.com

TIPS FOR A HEALTHY

BEAUTIFUL LAWN



Lawns *can* look beautiful without using pesticides and fertilizers which may contribute to water quality problems in a local creek, the Bay or Delta. The tips below will help you maintain a healthy and beautiful lawn that can outcompete weeds and other lawn pests.

Problems with lawns, including insect pests and diseases, can most often be traced to stresses caused by an inappropriate choice of grass species or improper care. Prevention is always the best way to go, but if you do have lawn problems, first identify the underlying causes and pests. For tips on troubleshooting lawn problems, visit: www.ipm.ucdavis.edu/TOOLS/TURF/.

IRRIGATE AN ESTABLISHED LAWN PROPERLY

- Before you irrigate, check the soil moisture with a soil probe or trowel. The top 2" to 3" should feel almost dry before you add more water.
- After watering, test for water penetration again with the soil probe or trowel. Push a trowel into the soil and tilt it forward. If the soil isn't wet 4" to 6" down, continue watering until it is. Grass roots will grow deeper and the lawn will be healthier. Track the watering time so you know about how long to water.
- Irrigate slowly so that water doesn't run off. Overwatering is wasteful and can wash pesticides and fertilizers into the storm drains.
- If water runs off or pools even with slow irrigation, soil compaction may be a problem (see Lawn Aeration on the next page).
- Clay soils hold more moisture and dry out more slowly; thus they may need less frequent irrigation.
- Sandy soils dry out more quickly and may need more frequent irrigation.

FEED YOUR SOIL BY LEAVING GRASS CLIPPINGS ON THE LAWN

- Grass clippings can provide most of the nutrients needed by a lawn if the clippings are small enough to decompose quickly without forming mats on top of the living grass. Remove only $\frac{1}{3}$ of the blade at any one time (see Mow the Right Way, below).
- To decompose clippings, soil must be biologically active, i.e., contain bacteria, fungi, insects, worms, and oxygen. Soil under a lawn that has been heavily fertilized or frequently treated with pesticides may be deficient in these conditions.

MOW THE RIGHT WAY

- Mow when the grass is dry.
- During the summer months, cut the grass higher to help retain soil moisture.
- Remove no more than $\frac{1}{3}$ of the leaf blade at one cutting. Removing more can be very stressful for the plant and increase pest and disease problems.
- Alternate your mowing pattern frequently to avoid compacted ruts.

MOW THE RIGHT WAY, CONT.

- Keep mower blades sharp. Dull blades wound the grass and make it more vulnerable to pests and diseases.
- If rust disease is present in your lawn, clean your mower between mowings to prevent spreading the disease.

For information on keeping a pesticide-free lawn, visit www.beyondpesticides.org/pesticidefreelawns.

DEAL SENSIBLY WITH WEEDS

- Decide how many weeds you can tolerate. It is not realistic to expect a completely weed-free lawn.
- Dig up weeds by hand and sprinkle grass seed on any bare spots so weeds can't fill in. Water regularly with a fine spray until the grass sprouts.
- Keep grass growing vigorously to crowd out weeds. Don't mow grass too short; taller blades can shade the soil enough to prevent some weed seeds from germinating.
- Use corn gluten meal to prevent certain broadleaf weeds from germinating. Apply in spring or fall a few weeks before annual weeds begin to germinate.
- Using combination weed and feed products is not the most accurate way to control weeds; unnecessary herbicides are likely to be broadcast onto lawn areas where there are no weeds and into adjacent areas where non-target plants will be damaged. Certain trees growing in lawn areas can also be damaged when their shallow roots take up herbicides.

LAWN AERATION

- Aerate spots where you can't push a screwdriver five to six inches into the soil, where water pools, where grass looks thin, or where there is heavy traffic.

- Use a hollow-tined aerator that removes plugs of soil, either a foot-operated or motorized model.
- Irrigate deeply (soil should be moist 5" to 6" down) so you can push the aerator into the soil as far as possible. Allow soil to dry slightly before you begin.
- Leave the plugs on the lawn and break them up with a garden rake.

DETHATCHING LAWNS

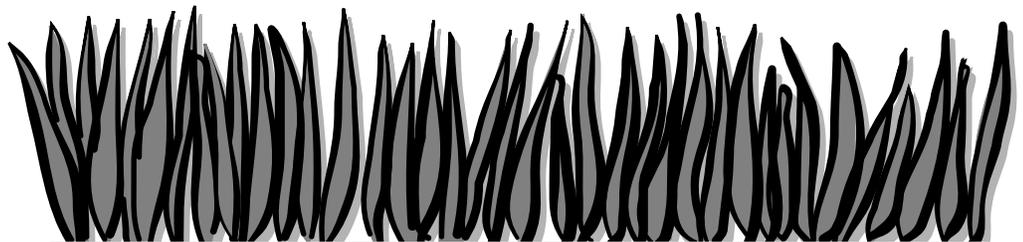
- Thatch is dead and dying, matted grass parts that accumulate on top of the soil. Thatch prevents air, water, and fertilizer from reaching the soil.
- Remove thatch with a rake if more than 1/2" thick.
- Aeration (see above) can help prevent thatch buildup.
- When soil is biologically active, grass clippings decompose and do not contribute to thatch buildup. This is a good reason to eliminate the use of broad-spectrum pesticides that can destroy soil organisms.

FERTILIZING

- Unless the soil texture is sandy, nutrient deficiencies are unlikely and you may not need to fertilize at all. If in doubt, have your soil professionally tested.
- Grass clippings left on the lawn can provide most of the fertilizer.
- If you need to fertilize, use natural fertilizers or slow-release fertilizers, such as sulfur- or polymer-coated urea. These products release nutrients slowly over a longer period, allowing the grass to absorb nutrients more efficiently.
- Fertilizers, if misapplied, can kill soil life and ruin soil structure in even the best soils.

LAWN SUBSTITUTES

Americans spend a great deal of time on their lawns, using an abundance of water, fertilizer, pesticides, and time. If a grass surface is not required, consider replacing all or some of your lawn with an attractive alternative. The following plants require little water and will accept occasional foot traffic:



SOME PREFERRED GRASSES FOR CALIFORNIA

“Cool Season” Grasses (growing season is during cool weather)

Tall fescue (*Festuca arundinacea*)

Dwarf tall fescue (dwarf varieties of *Festuca arundinacea*)

“Warm Season” Grasses (growing season is during warm weather)

Bermudagrass (*Cynodon dactylon*): loses color during cold weather; hybrids need more care

St. Augustinegrass (*Stenotaphrum secundatum*): most shade-tolerant of warm season grasses

Buffalograss (*Buchloe dactyloides*): cannot tolerate shade, dies back in winter

- Woolly Yarrow (*Achillea tomentosa*) — Plant from flats or small pots, 6" apart; mow in March and July to a height of 2". Yellow flowers. Keep soil on the dry side
- Caraway-Scented Thyme (*Thymus herba-barona*) — Plant all thymes from flats or small pots, 6" to 8" apart. Mowing is not necessary. Rose-pink flowers in early summer attract bees.
- Creeping Thyme (*Thymus praecox-arcticus*) — Mow to 1½" in July and fertilize; purple flowers in summer attract bees.
- Strawberry Clover (*Trifolium fragiferum*) — Plant from seed in fall; mow to 2" in April, June, August; white to pink flowers in summer attract bees.
- Garden Chamomile (*Chamaemelum nobile*) combined with strawberry clover — Plant chamomile from flats or from small pots, 6" to 8" apart. Plant strawberry clover as noted above and mow both ground covers to 2" in April, June, and August. In areas with serious drainage problems, chamomile may not grow. In those spots, combine the clover with either of the thymes listed above.

See "For More Information" and "Products and Resources" sections for sources of information on other lawn substitutes.

PLANTING A NEW LAWN

START OUT RIGHT

- Have your soil professionally tested so you know the texture, pH, and salt and nutrient levels.
- Choose a mixture of the right varieties of grass suited to your climate and the conditions in your yard (see Preferred Grasses for California).
- Choose pest- and disease-resistant varieties (ask your nursery).
- Choose sod that has been propagated in soil similar to your own.

WHITE GRUBS



California lawns sometimes suffer from white grubs, the larval (immature) stage of several species of beetles. The genus of beetles most common in California is *Cyclocephala*, the masked chafer. Masked chafer adults do not eat but in their grub stage can cause patches of lawn to die when they feed on grass roots.

Birds, moles, raccoons, opossums, and skunks can add to the damage when they dig in the turf looking for tasty grubs. But just finding wilted patches of grass or animals digging in the lawn does not mean that you have white grubs! You need to find grubs by verifying their presence in several places.

DETECTION

The C-shaped grubs can be up to an inch long and are white with a brown head and three pairs of conspicuous legs.

Damage from grubs can begin to show as early as June or July or as late as August or September and can be mistaken for wilted grass under drought stress. Later, irregular patches die and can be lifted up or rolled back like a carpet. Grub feeding can make the ground feel spongy.

If you have had white grub problems before or suspect you have them this year, begin looking in mid-May by using a cylindrical bulb planting tool to extract a core of lawn so you can examine the roots. Pay particular attention to spots that look unusual.

WHAT CAN YOU DO?

- Pay special attention to drainage and compaction. Healthy lawns can recover more easily from white grub damage.
- Products with imidacloprid may be used to control grubs. This material has a low acute toxicity to mammals. However, imidacloprid can easily wash off and leach into groundwater, and if the insecticide becomes as popular as diazinon was, its use also may lead to water quality impacts. The best approach for grub control is to maintain a healthy lawn without using insecticides.
- Don't treat late in the season when you find dead patches of turf. By this time grubs have done all their damage for the season and are ready to stop eating. Treating now is fruitless. Remove the dead grass, cultivate, and reseed the area.
- Plant warm season grasses, such as bermudagrass, St. Augustinegrass, or buffalograss, or cool season grasses, such as tall or dwarf fescues. These grasses are more tolerant of white grubs.
- Apply beneficial nematodes (*Heterorhabditis bacteriophora*) in late spring before adult beetles emerge, or in mid summer to early fall when larvae are maturing. Nematodes must be applied when the soil temperature is between 60°F and 90°F and the soil is moist. Irrigate the soil before and after application, but don't soak the area. Nematodes need moisture to move around in the soil and to prevent their bodies from dehydrating. Apply nematodes in early evening to minimize damage from UV light. Avoid using fertilizers 2 weeks before and 2 weeks after the application.

Choose a reputable supplier. To make sure nematodes are alive, place a small quantity of the nematode-containing material in water and observe whether they are moving. Look closely because the nematodes are very small. A hand lens or magnifying glass will make it easier to see them. For more information, see the web sites listed on the back page.

PREPARE THE SOIL BEFORE INSTALLING A NEW LAWN

- Don't work the soil when it is very wet. You can damage its structure.
- Thoroughly mix soil layers of different textures before planting. Poor

soil preparation can cause poor drainage, resulting in weak turf.

- Break up all clods into fine particles and remove pebbles and stones.
- Check for low spots by irrigating. Smooth out areas where you see puddles (very important if you are seeding a lawn).

IRRIGATE A NEW LAWN

- Be sure to keep the soil under a new lawn thoroughly moist until the lawn becomes established, but don't drown the plants. Too much water can also wash away seeds.

PRODUCTS AND RESOURCES

Soils Laboratory (see also the Yellow Pages)

A&L Western Agricultural Labs
1311 Woodland Ave., #1
Modesto, CA 95351
209-529-4080
www.al-labs-west.com

Corn Gluten Meal (pre-emergent herbicide)

Supressa
Concern Weed Prevention Plus

Slow Release Fertilizer

Vigoro Lawn Fertilizer and organic fertilizers such as Ringer Lawn Restore, Dr. Earth Lawn Food, EB Stone Nature's Green Lawn Food, Bradfield Organics

Beneficial Nematodes (*Heterorhabditis bacteriophora*):

Rincon Vitova Insectaries, P.O. Box 1555, Ventura, CA 93002; (800) 248-2847; www.rinconvitova.com
Buena BioSystems, P.O. Box 4008, Ventura, CA 93007; (805) 525-2525; www.buenabiosystems.com

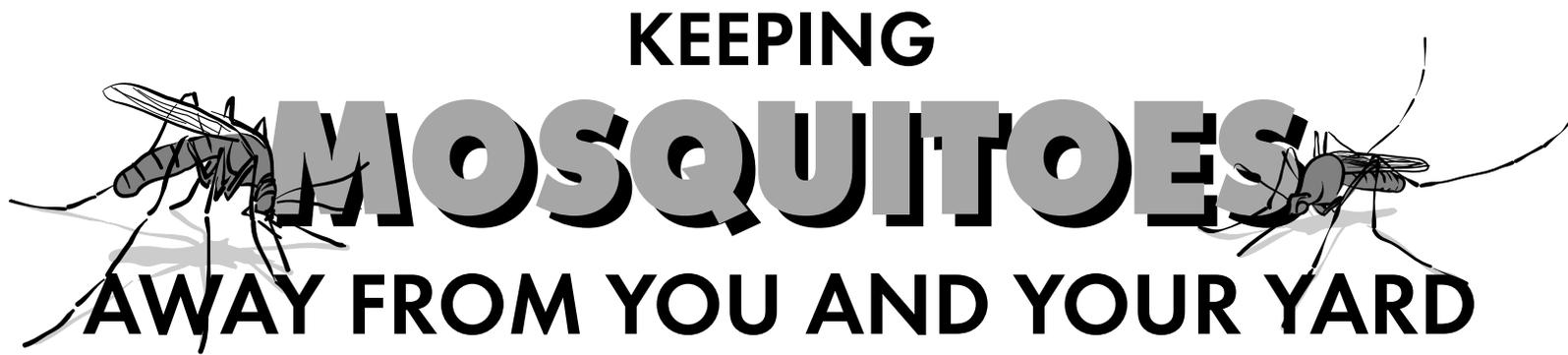
For more information on how to apply nematodes see:
www.oardc.ohio-state.edu/nematodes/default.htm

or
www.hort.uconn.edu/ipm/homegrnd/htms/39nemat.htm

Recommended Reading

- *Down to Earth Natural Lawn Care*, by Dick Raymond, published 1993 by Storey Communications, Inc., Pownal, VT.
- *U.C. Guide to Healthy Lawns* online at www.ipm.ucdavis.edu.
- *The Chemical-Free Lawn*, by Warren Schultz, published 1993 by Rodale Press, Emmaus, PA; (610) 967-5171; www.rodalepress.com.

KEEPING MOSQUITOES AWAY FROM YOU AND YOUR YARD



Mosquitoes are delicious food for fish and other aquatic creatures, but their buzzing and itchy bites make them a great annoyance to people. Mosquitoes can also carry a variety of diseases; so controlling them, especially by eliminating breeding sites, should be a priority for everyone in the community.

The emergence of West Nile virus (for more information, see inside) has focused public attention on mosquitoes. Fear may cause us to reach for a pesticide spray can, but this is an ineffective control. Pesticide sprays reach relatively few mosquitoes, and outside, they probably cause more harm to beneficial insects. Residents can have a greater effect on the numbers of mosquitoes in urban areas by following the tips in this fact sheet.

The young (or larvae) of mosquitoes live in water and feed on microorganisms and organic matter. Just about any area or container that can hold water for more than a few days can produce a large crop of mosquitoes. Only adult female mosquitoes bite humans and

Note: If you are experiencing serious or persistent mosquito problems, call your mosquito and vector control district (see inside) before considering the use of pesticides.

other animals to feed on blood. Adult male mosquitoes feed on flower nectar.

There are many different species of mosquitoes. Some bite during the day, while others feed at night. Although some mosquitoes can fly long distances from their watery breeding sites, others travel only a short distance to find their blood meals. Your bites may be coming from mosquitoes you are raising in your own backyard.

PREVENTION

The most effective way to control mosquitoes is to find and eliminate their breeding sites.

- **Eliminate standing water in containers** around the home, including water in cans, plastic containers, potted plant saucers, buckets, garbage cans, barrels, wheelbarrows, and any other container that holds water for more than a few days. Empty the water and then either: invert, cover, punch drainage holes in, or dispose of these containers.
- **Change water in birdbaths** and pet water dishes at least once a week, preferably every 2 to 3 days.

- **Fix leaky outdoor faucets and sprinklers**, and don't overwater your yard. Any standing water can produce mosquitoes.
- **Recycle tires or store them so they do not collect water.** Tires are extremely hard to drain, and each one can produce thousands of mosquitoes.
- **Keep roof gutters clean** so water drains; otherwise mosquitoes can breed in the leaf and water mixture.
- **Don't dump yard waste into street gutters, storm drains, or creeks.** It can impede the flow of water, allowing mosquitoes to breed. The decaying organic matter then provides food for dense numbers of growing mosquito larvae.
- **Drain plastic wading pools or fountains when not in use**, or cover tightly to deny access to mosquitoes. If the fountain is large enough, stock with mosquitofish (see below).
- **Keep swimming pools and hot tubs chlorinated and filtering.** When not in use for extended periods, cover pools or tubs tightly or stock with mosquitofish (see below). One untended pool or hot tub can breed enough mosquitoes to affect a whole neighborhood.
- **Use mosquitofish (*Gambusia affinis*)** in backyard ponds or water gardens, watering troughs, and stockponds. These fish are available, at no cost, from your mosquito and vector control district (see inside).

PREVENTION, CONT.

Gambusia are cannibalistic, so be sure to provide rocks and plants in your backyard pond to help shelter young fish, but not so many plants that the pond becomes heavily shaded. *Gambusia* do not require supplemental food. Overfed fish may not feed on mosquitoes, and excess food in the water may cause bacterial blooms that harm the fish. Do not release mosquitofish into the wild. *Caution: Check with your water district before using tap water to fill your pond. Water containing chloramine is toxic to mosquitofish and must be chemically treated first. Products (such as Aqua Plus) are readily available at pet stores.*

- **Fill tree holes** with a polymer such as Soil Moist or Broadleaf P4. In the winter, the granules absorb water and eliminate mosquito breeding habitat. The granules can last for many years, absorbing water in winter and drying out in the summer. If necessary, consult a certified arborist about the condition of the tree.

The western tree hole mosquito is the primary vector of canine heartworm in this area. Keep your dog's heartworm medicine up to date.

- **Contact your local mosquito and vector control district** if you are aware of uncontrolled mosquito sources in your neighborhood, or if you need assistance with a mosquito problem on your property. Most district services are provided free of charge.

PROTECT YOURSELF

- **Install screens on windows and doors** and keep them in good repair.
- **Certain species of mosquitoes are attracted to light, so keep outside lighting to a minimum near entry doors;** keep those doors screened or close them at sunset.

* For more information on DEET, see the *New England Journal of Medicine* (www.nejm.org), July 4, 2002, Volume 347, Number 1, pages 13 to 18: "Comparative Efficacy of Insect Repellents against Mosquito Bites" by Mark S. Fradin, M.D., and John F. Day, Ph.D.

- **Wear long sleeves and long pants** when mosquitoes are biting. Learn the times of day when mosquitoes are most active in your area and avoid outdoor activity at those times.
- **Use insect repellents.** Studies show that DEET-based repellents are the most effective.* (DEET has been in use for 40 years. After nearly 8 billion human applications, fewer than 50 cases of serious toxic effects have been documented in the medical literature.) Don't use a stronger or longer-lasting product than you need. The American Academy of Pediatrics says that repellents with a DEET concentration of 30% are safe for both children and adults, but that a concentration of 10% can be used on children if there is concern about potential risks and the threat of mosquito-borne disease is low. Apply repellent to exposed skin and wash treated skin with soap and water after coming indoors. Do not apply to infants under 2 months old, and follow all directions on the product container.

PRODUCTS AND RESOURCES

Examples of trade names of products listed in this fact sheet.

Polymer for filling tree holes (also for use in soil to reduce plant waterings):

Soil Moist
Broadleaf P4

***Bacillus thuringiensis* subsp. *israelensis* (Bti):**

Bayer Mosquito Preventer Granules
Mosquito Dunks
Mosquito Bits
Vectobac

Insect Repellents

Bite Blocker (active ingredients: soybean, coconut, and geranium oils)
Cutter Advanced Insect Repellent (active ingredient: picaridin)
OFF! (active ingredient: DEET)
Repel Lemon Eucalyptus (active ingredient: oil of lemon eucalyptus)

Product for making chloramine-treated water safe for fish:

Aqua Plus

Methoprene (insect growth regulator):

Pre-Strike (granule type only)

Bite Blocker, made from soybean, coconut, and geranium oils, is the next most effective repellent. In one study, it compared very favorably with a 6.65% concentration of DEET for repelling mosquitoes for 3½ hours.

Note: If mosquito-borne disease is a serious concern, other repellents should not be relied upon for prolonged protection.

Wristbands treated with insect repellent have been shown to be ineffective since repellents protect only a few centimeters from the site of application. Ultrasonic devices are also ineffective. Products containing other plant oils, such as citronella, have been found to provide little if any protection.

- Use a screen tent for outdoor eating (it will keep out yellowjackets too).

MOSQUITO TRAPS AND ELECTRIC BUG ZAPPERS

Propane powered traps, such as Mosquito Magnet, are not recommended by the American Mosquito Control Association. Although they attract adult mosquitoes with carbon dioxide

and heat, they do not reduce the chance of being bitten. These devices can be very expensive and they only remove adult mosquitoes without addressing their source. Energy and money would be better spent reducing breeding habitat and purchasing products containing *Bacillus thuringiensis* (see left) that can provide more effective control.

Don't use electric bug zappers because they kill far more beneficial and neutral insects than mosquitoes.

LESS-TOXIC CONTROLS

The products described below can be used in ponds and water gardens, bird-baths, fountains, pools, tree holes, and other standing water where mosquitoes lay eggs. Apply when mosquito larvae are first noted in the spring and continue at the intervals recommended on the package.

- *Bacillus thuringiensis* subsp. *israelensis* (Bti) is the active ingredient in a number of mosquito control products (Mosquito Dunks, Mosquito Bits, Vectobac) that are used in water. This bacterium is a stomach poison and must be con-

sumed by mosquito larvae to be effective. Only mosquitoes, black flies, and some midges are susceptible. Other aquatic life are unaffected. Follow all label directions.

- **Methoprene** (Pre-Strike) is an insect growth regulator that interferes with the normal development of mosquitoes. It must be present in the larval habitat to be effective. Larvae continue to grow until they reach the pupal stage, at which point they die. Do not apply to waters that drain into public waterways.

OTHER PESTICIDES

- Do not use pesticide sprays to control adult mosquitoes. Use a combination of the techniques listed above or call your mosquito and vector control district.
- Do not treat street gutters or storm drains with pesticides. Storm drains are connected directly to the Bay, and pesticides cause serious problems for aquatic life. Call your mosquito and vector control district if you suspect mosquitoes are breeding in the storm drains or catch basins.

WEST NILE VIRUS

West Nile virus made its appearance in the U.S. in 1999. Most of the small number of serious cases in this country have been among the elderly. According to the Centers for Disease Control and Prevention, only 1% of people bitten by infected mosquitoes become seriously ill — most people who get infected do not develop any disease.

Birds serve as a host for this virus. Mosquitoes acquire the virus from infected birds and then transfer the virus to people. The Department of Health Services is encouraging anyone who finds a dead bird (especially a crow, raven, magpie, jay, or hawk) to report it by calling:

877-WNV-BIRD (877-968-2473)

Do not pick up the bird with your bare hands.

WEB SITES FOR MORE INFORMATION:

California Department of Health Services: www.westnile.ca.gov

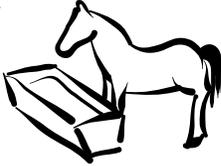
Mosquito & Vector Control Association of California: www.mvcac.org

including contact information for your local Mosquito and Vector Control District.

Target the source.

Trough

- Stock large troughs with mosquitofish.
- Clean small weedy troughs weekly.



Hole in Tree

- Check frequently for water.
- Consult tree specialist to see if hole may be safely filled with a polymer product.
- Place Bti larvicides in hole.



Pool/Hot Tub

- Operate filter and skimmer every day to remove egg rafts and larvae.
- Provide drainage for filter and pump sumps.
- Remember, chlorine will NOT kill mosquito larvae.
- Keep covers tight. Remove water from top of cover weekly.
- Stock unused pools with mosquitofish.

Open Boat

- Keep tightly covered. Check and drain cover weekly if necessary.



Clogged Rain Gutter

- Clean frequently to remove leaf litter and keep water flowing.

Bird Bath

- Change water weekly.



Rain Barrel

- Screen top with fine wire mesh.
- Change water weekly. Treat with Bti.



Anything That Will Hold Water More Than a Few Days

- Dispose of, turn upside down, or store indoors.



Storm Drain

- If mosquito breeding is suspected, contact vector control.



Leaky Water Equipment

- Repair.



Pond/Water Garden

- Stock with mosquitofish or use *Bacillus thuringiensis israelensis* (Bti) larvicides (i.e., Mosquito Dunks). Inquire at your local hardware store or nursery.
- Thin out aquatic vegetation.



Street Gutter

- If standing water persists for more than a few days, remove source of water (for example, adjust sprinklers to stop overwatering).

Protect yourself and your family.

WONDERFUL ROSES!



To grow beautiful roses, you don't need to use pesticides and fungicides that may contribute to local water quality problems. By choosing appropriate rose varieties, planting roses properly, and carefully following recommended cultural practices, you can grow roses that are less susceptible to pests and diseases. Roses have certain minimum requirements, so if you have soil that drains slowly or a shady yard (roses need six hours of direct sunlight a day), look for plants that will be more appropriate for your garden.

The following tips can help you to protect your family's health and the environment while you grow strong, healthy roses with glorious blooms.

CHOOSING THE RIGHT ROSE

- Start with healthy plants. Look for glossy foliage and an evenly moist rootball. Avoid plants with spindly stems, discolored or spotted leaves, or roots that are coiled around the container.
- Choose rose varieties that are disease-resistant *and* suited to your particular climate. Some roses are difficult to grow successfully in the cool and foggy summers of our coastal areas. No roses are completely disease-free, but many can be grown with minimal care.
- Visit a local rose garden at various times during the growing season to see what particular varieties look like and to learn about different roses' growing habits and requirements.
- Ask local gardeners and rosarians for suggestions. Try to find people who are growing roses with minimal pesticides.
- Contact local rose societies, nurseries, and Master Gardeners for lists of roses they recommend for your area.

PLANTING ROSES

Before you plant, spend some time finding the best spot in the garden for your roses.

WHERE TO PLANT

- Roses need full sun, which means at least six hours of direct sunlight per day. Sunlight encourages blooms and discourages disease.
- Roses require good drainage. In the spot you've chosen for planting, dig a hole the size of a gallon jug and fill it with water. If the hole doesn't drain in one hour, you should choose another spot or make a raised bed for planting the roses.
- Give your roses plenty of room to grow so that they won't be crowded. Get an idea of the mature size of the rose when you buy it. Good air circulation is crucial in preventing disease.
- Consider planting roses in mixed beds rather than traditional rose beds. This diversity of plants will attract beneficial insects and cut down on the spread of rose pests and diseases.

WHEN TO PLANT

- Roses purchased in pots can be planted any time of year, but the best selection is available in nurseries from December to May. Potted roses can be planted immediately, or they can remain in their pots for several months.
- Bare root roses (plants with no soil on their roots) are available December through February. They should be planted right after you buy them so that they don't dry out. Soak the plants overnight in water before planting.

HOW TO PLANT

Planting in Containers

For container planting, choose roses that don't grow more than 4 feet tall. Choose a container at least 20" deep and wide. Use a premium commercial potting soil. You may also want to add organic matter such as compost or high-quality rose planting mix. Water well after planting.

Planting in the Ground

- Dig a hole the depth of the container and at least two times the diameter of the container. For bare root roses dig a hole that will comfortably hold the roots of the plant. Roots need to reach out laterally as far as possible in order to take advantage of water and nutrients.
- Do not amend the soil in the planting hole. Research has shown that soil amendments are not necessary in most soils, including clays.
- Place the rose in the hole so that the bud union (the knobby part of the trunk where the rose was grafted) is 2" to 3" above the soil. For roses grown on their own roots, look for the "root crown," the area where the roots meet the trunk. Plant with the root crown above the soil, but not so high the roots are exposed.
- Fill in the hole with the soil you removed and gently tamp it down.

- Water thoroughly. If the rose sinks after watering, you may need to remove it and replant it higher to keep the soil from touching the root crown or to keep the bud union at least 2" above the ground.
- Cover the soil with 2" to 3" of organic mulch. See below for more details.

CARING FOR YOUR ROSES

WATERING

The amount of water your roses will need depends on the climate and the weather, the type of soil, and the type of rose. In areas with summer fog, roses will need less water than in areas with summer heat. You will have to water more frequently if you have sandy soil than if you have clay soil. It is important to give your roses the right amount of water. Waterlogged soil will kill roses, and drought conditions can stress plants, making them more susceptible to pests and diseases.

- Keep the soil moist. Use your finger or a soil probe to test the soil and check roses in pots at least twice a week.
- Watering with soaker hoses or a drip irrigation system delivers water to the soil without wetting the foliage. This can help prevent fungal diseases. If you water with a sprinkler, water early in the day so the foliage will dry out before evening.
- If you use granular fertilizer, water it in with a hose. Drip systems don't provide enough water to dissolve the granules.

FERTILIZING

Roses prefer a slightly acidic soil (pH 6.2 to 6.8) that is not high in salt. Fertilizers such as alfalfa meal, cottonseed meal, blood meal, and bat guano can acidify the soil. Animal manures are generally high in salts.

- Use slow-release fertilizers such as compost or those listed above or encapsulated materials such as Osmocote.

These fertilizers release nutrients slowly over a long period, preventing spurts of succulent growth which attract aphids and diseases. Organic natural fertilizers, including compost, will also provide soil structure and moisture retention and will improve food for essential soil organisms.

- If you choose a synthetic commercial fertilizer, choose one formulated for roses and try applying it at half-strength.
- If you have sandy soil that is deficient in nutrients and organic matter, you may need to apply fertilizer every month during the growing season. (Note that a slow-release fertilizer like Osmocote does not have to be applied every month.) Roses growing in clay soil containing organic matter may need fertilizing only once a year.
- Avoid using fertilizer/systemic insecticide combinations. These can cause stunted and deformed leaves, especially when the weather is cool. They may also harm soil-dwelling organisms.
- Fertilize during the growing season after the soil has warmed up. Plants will not take up fertilizer when the soil is cold.
- Sweep up any fertilizer that spills on driveways or paths and place around plants. Irrigation or rain can wash fertilizer into storm drains where it causes problems for aquatic life when it reaches a creek or the Bay.
- If you are concerned about the fertility of your soil and are considering an extensive fertilization program, have your soil tested by a professional lab first. The lab analysis will provide you with recommendations for specific amendments. (Try A&L Western Agricultural Labs, 1311 Woodland Ave., #1, Modesto, CA 95351; (209) 529-4080; www.al-labs-west.com).

MULCHING

Mulching with organic materials, like compost and shredded leaves, helps to conserve moisture, control weeds, improve soil structure, and keep roots cool in summer heat. Mulch can also prevent the spread of diseases like black spot by keeping disease spores from splashing up onto the plant from the soil. Spread a two- to four-inch layer of mulch around each plant, keeping the mulch a few inches away from the trunk.

PRUNING

Careful pruning can keep roses healthy and help to prevent disease and pest

problems. Pruning allows you to remove dead, spindly or diseased plant material, helps to shape plants and promote flowering and new growth, and provides good air circulation to discourage diseases. Use sharp tools so you won't tear the bark or damage the cane.

- During the growing season, remove any leaves and shoots affected by disease but do not prune too heavily. The plant will respond with new, succulent growth that is susceptible to aphids and powdery mildew. During winter pruning (December to February), remove any diseased portions of the plant.
- Good sanitation is essential in reducing disease problems. Remove all

diseased prunings and rake up any diseased leaves and blossoms as they fall. Do not compost them unless you have reliably hot compost that you turn regularly. Diseases can be transmitted from stems, leaves, and petals lying on the ground and from diseased plant material.

- The modern Hybrid Tea Roses and Floribundas only produce flowers on new growth so prune to remove last year's wood. Cut these bushes back every winter, leaving 2/3 of the canes' height at the base for light pruning, 1/2 of the height for medium pruning, and 1/3 of the height for heavy pruning.

MANAGING COMMON ROSE PESTS AND DISEASES WITHOUT PESTICIDES

Inspect plants regularly to detect any diseases or pests before they become a problem. Become familiar with the pests and diseases that are common in your area. Before you treat plants for insect problems, look for beneficial insects such as ladybugs, lacewings, syrphid flies, and orange-and-black soldier beetles. If you see these natural enemies of rose pests, refrain from using an insecticide because you will kill more useful insects than pests. (See following page for less-toxic chemical control for rose diseases.)

APHIDS

Tiny (1/8"), sucking insects that feed on plant sap. Often found in clusters on new shoots and flower buds, especially on over-fertilized plants. May cause leaves to discolor or turn black with sooty mold. Natural predators can reduce their numbers. **Controls:** Wipe off by hand or spray off with water, prune off infested growth, spray with an insecticidal soap, use slow-release fertilizers to prevent growth spurts.

BLACK SPOT

Optimum conditions for infection: 64°F to 75°F and 95% relative humidity. Spores must be continuously wet for 7 hours for infection to occur. **Symptoms:** circular black spots with fringed edges on leaves and stems. Leaves may yellow and drop. Spores overwinter on infected stems and fallen leaves and are spread by splashing water, cultivation, and insects. This disease is more common along the coast. Inland it may indicate excessive moisture, insufficient light, or poor air circulation. **Controls:** Choose resistant varieties, prune away and destroy infected plant material, increase air circulation, destroy fallen leaves, mulch to prevent spread of spores.

POWDERY MILDEW

Optimum conditions for infection: Night — 61°F and 95% to 99% relative humidity; day — 81°F and 40% to 70% relative humidity. Grows well only on new growth. **Symptoms:** curled leaves and a white or gray powdery coating on leaves, shoots, and flower buds. Spores overwinter on leaves and leaf buds, and are spread by wind. **Controls:** Plant disease-resistant varieties, wash leaves in early afternoon with a strong spray, avoid heavy fertilization or heavy pruning that causes spurts of new, highly susceptible growth.

RUST

Optimum conditions for infection: 64°F to 70°F and continuous moisture for 2 to 4 hours. Cold winters and very hot summers limit development. **Symptoms:** small orange or yellow spots on any green portion of the plant. On the leaves, symptoms start on the undersides and progress to the upper surfaces. Infected leaves may drop. Overwinters on leaves and stems and is spread by wind, rain, and overhead watering. **Controls:** Choose resistant varieties, remove and destroy fallen leaves, mulch to prevent spread of spores, remove and destroy infected shoots (look for dark, corky lesions). Use soaker hoses or drip irrigation.

PRUNING, CONT.

- Arching shrub roses should be pruned lightly so their naturally elegant shape is not destroyed. Thin the canes so they do not cross or rub, and cut back the lateral shoots.
- Climbers should also be pruned lightly. Don't cut back long canes. Train them into a horizontal or diagonal position to encourage lateral shoots that produce flowers all along the cane rather than just at the tip. Trim back lateral shoots to 2 or 3 nodes. Remove canes that cross or rub.
- Roses that bloom once in the spring should be pruned right after they have flowered.
- For more information, look for classes at public gardens, garden clubs, your local nursery or University of California Cooperative Extension Master Gardeners.

LESS-TOXIC CHEMICAL CONTROLS

If disease or pest problems are persistent in your garden, you may want to use one of these less toxic chemicals. Because these products prevent *but do not cure* disease, treatments must begin before symptoms are widespread. Be sure to coat both sides of the leaves. To decrease the possibility of burning leaves or flowers, water plants the day before you treat them and test a few leaves and petals before spraying the whole plant.

- Potassium bicarbonate is similar to common baking soda and can be used to prevent powdery mildew. It must be applied weekly. Or, use this baking soda mixture: 1 tablespoon baking soda, plus 2 tablespoons horticultural oil in 1 gallon of water. Spray when you first detect disease, and repeat when new symptoms appear.
 - Sulfur and lime can be effective against black spot, powdery mildew, and rust. Do not use when temperatures exceed 85F° because you will burn the leaves.
- Antitranspirants and horticultural oil have been observed to provide roses with protection from fungal diseases. They create a thin coating that can prevent spores from fungal diseases from invading the leaves. Treatment is begun when new leaves appear in spring and must be repeated whenever you see new growth.

NOTE: In its ready-to-use form, the antitranspirant Cloud Cover is too strong for roses. The concentrate can be mixed 1 part Cloud Cover to 12 parts water to prevent burning. Use a 1% solution of horticultural oil and water (about 3 tablespoons of oil in 1 gallon of water).

- Neem oil can help prevent powdery mildew, black spot, and rust. Neem oil can be toxic to bees, so it is safest to spray it in the evening.
- Biofungicides attack and outcompete pathogens for nutrients and for space on leaves.

PRODUCTS AND RESOURCES

Examples of trade names of products listed in this fact sheet:

Horticultural Oil: Bonide All Seasons Spray Oil

Slow Release Fertilizer: Osmocote

Neem Oil: Rose Defense, Bonide Rose RX 3 in 1, Garden Safe Fungicide 3

Potassium Bicarbonate: Kaligreen

Soil Probe: Check your nursery

Antitranspirant: Cloud Cover; Wilt Pruf

Biofungicide *Bacillus subtilis*: Serenade Garden Disease Control

Recommended Reading

Contact local rose societies, nurseries, and Master Gardeners for lists of roses they recommend for your area.

Handbook for Selecting Roses, American Rose Society. 1998. Shreveport, LA. (318-938-5402)

Healthy Roses, University of California, Div. of Agriculture and Nat. Resources. 2002. Berkeley. (800-994-8849)

The Natural Rose Gardener, Lance Walheim. 1994. Ironwood Press.

The Organic Rose Garden, Liz Druitt. 1996. Taylor Publishing Company. Dallas.

The Rose Book, Maggie Oster. 1994. Rodale Press. Emmaus, PA.

CONTROLLING SNAILS AND SLUGS IN YOUR GARDEN



Amazing as it seems, our pest snails were originally imported from France for culinary purposes. Unfortunately, they escaped to become a major garden and agricultural problem. Snails and slugs are closely related. They both have soft, oblong bodies and produce quantities of slime to help them move around. The most obvious difference is that snails have shells.

DETECTION

Are your vegetable and flower seedlings being devoured overnight? Are you finding large ragged holes in your prized ornamentals? Do you see slime trails across your walkways? If so, your garden is probably harboring snails and slugs.

Snails and slugs are active mostly at night and on dark, cloudy days. On sunny days they can be found in moist, shady spots. Look for their eggs in the soil (about an inch down) or under rocks, boards, or plant debris. The eggs are laid in masses of up to 100 and resemble small pearls. When you find

eggs, crush them or scoop them into a plastic bag, seal it, and put the bag in the garbage.

LESS-TOXIC CONTROLS

Keeping down the population of slugs and snails requires persistence. By using a combination of two or more of the following methods, you should be able to reduce their numbers, and keep snails and slugs at acceptable levels in the garden.

HAND-PICK AT NIGHT

- To be effective, hand-picking must be thorough and it must be done regularly. Collect nightly until it's hard to find snails and slugs, then check once a week.
- The best time for hand-picking is before dawn or after 10 or 11 pm when they come out to feed. You can go out earlier, but you won't find as many.
- A flashlight and pair of gloves or tongs will make collecting these slimy creatures easier.
- Crush snails and slugs completely (otherwise they may recover and walk away) or drown them in a pail of soapy water (they survive in plain water). A few dead snail and slug bodies left on the soil surface will attract more snails and slugs and make your collecting easier, but large piles will breed flies. Burying crushed

mollusks 3 or 4 inches underground will add nutrients to the soil and avoid fly problems.

USE BARRIERS

Before using barriers, hand-pick for a couple of nights. After the barriers are in place, check for snails and slugs caught inside the barrier.

- Wrap a strip of copper (Safer Slug and Snail Copper Barrier Tape) around a tree trunk, flower pot, or the wooden sides of garden beds or fences. Snails and slugs are repelled by the unpleasant reaction between their bodies and the copper.
- Cover seedlings with small cages made from plastic or galvanized metal window screen. Push the cages into the soil so snails and slugs can't squeeze under.
- Cover rows of vegetables with special horticultural fabric (Fast Start, Seed Blanket) that lets in light and water but excludes snails and slugs.
- Use a product like SlugStop (coconut oil soap) to repel slugs and snails. Apply the material in a ring around individual plants.
- Snails and slugs may cross barriers such as diatomaceous earth, lime, sawdust, ashes, etc., especially when these barriers are wet. Lime, sawdust, and ashes can also be detrimental to your soil.

USE TRAPS

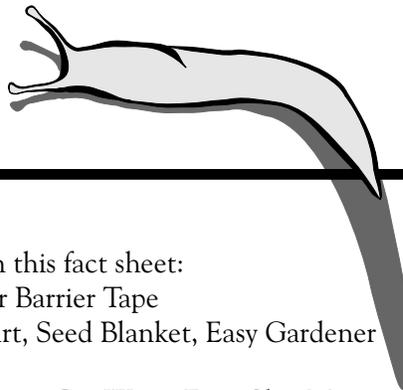
- Snails and slugs can be trapped under upside-down flower pots, dark-colored plastic sheeting, and wooden boards. Place these traps around the garden and collect snails and slugs in early morning.
- Homemade or commercial pit traps that use beer or yeast mixtures to lure snails and slugs to a drowning death may help, but hand-picking will probably still be necessary.

ENCOURAGE NATURAL PREDATORS

Many common ground beetles kill snails and slugs. Most of these beetles are large (1 to 2 inches), black, tank-like creatures. They are found in the same moist habitats as their prey: under rocks, boards, leaves, etc. Avoid killing these allies.

USE IRON PHOSPHATE BAIT

- Choose a bait product carefully. Baits containing methiocarb kill earthworms and beneficial insects.
- Baits containing iron phosphate (see product list below) are safer for children and pets than baits containing metaldehyde. Nevertheless, always keep this and all other pesticides out of the reach of children and pets.
- After eating iron phosphate, snails and slugs stop feeding and die within 3 to 6 days. They often crawl into secluded places, so you may not see dead bodies.
- Reapply iron phosphate baits every 2 weeks.



PREVENTION

- Snails and slugs find large expanses of ivy, nasturtiums, and other succulent ground covers particularly attractive, and they also hide in clumps of agapanthus, lilies, daffodils, and iris. They are less attracted to plants with dry, hard leaves like rhododendrons, junipers, and bamboo. If you can't remove the attractive plants, regularly search them for pests.
- Moisture makes an area much more attractive to snails and slugs. Avoid over-watering and use drip emitters to deliver water only where it is needed. Water early in the day to allow the area to dry out before nightfall. It may be necessary to remove mulch from areas with severe problems.
- Remove any boards and flower pots that you aren't using as traps.

PRODUCTS

Examples of trade names of products listed in this fact sheet:

Copper Barrier: Safer Slug and Snail Copper Barrier Tape

Horticultural Fabric (Row Cover): Fast Start, Seed Blanket, Easy Gardener Plant and Seed Blanket

Baits containing Iron Phosphate: Sluggo, Escar-Go, Worry Free, Slug Magic, Bayer Advanced Dual Action Slug and Snail Killer Bait, Garden Safe Slug and Snail Bait, Spectracide Snail and Slug Killer Bait

LIVING WITH SPIDERS

THE HELPFUL HUNTERS



Spiders are beneficial creatures. Because they feed on large quantities of insects, they should be tolerated as much as possible in the home and garden. Spiders are not insects. They are classified as “arachnids” and have eight legs. Insects have six legs.

FEW SPIDERS ARE DANGEROUS

There are over 3,000 species of spiders in the U.S. and only a small number of these are dangerous to people. In California, there are only a few spiders that cause concern for people (see box on back).

CASES OF MISTAKEN IDENTITY

People often think they have been bitten by a spider when the culprit is actually a flea, tick, mite, or even a disease condition. Very few spiders are equipped with mouth parts that can pierce human skin. If the bites you are discovering are small, mild, and disappear within a day or two, there is prob-

ably nothing to be concerned about. Of course, if a bite affects a large area, is very painful, and/or is followed by dizziness, fever, nausea, or any other severe symptoms, seek medical advice immediately. Try to capture the offending spider, drop it into a small jar of rubbing alcohol, and save it for identification.

WHAT CAN I DO?

Harmless or not, the presence of spiders or their webs in the house is upsetting to many people. Unfortunately, spider webs are often associated with poor housekeeping, under the mistaken assumption that a “clean” house harbors no insects or spiders at all. On the contrary, spiders can be an asset to the conscientious housekeeper since they capture and consume many pest insects before the human residents ever see the pests.

INSIDE YOUR HOME

- **Vacuum instead of spraying around the house for spiders.** If you cannot endure spiders or their webs in your home, the easiest and safest way to get rid of them is to vacuum up both spiders and webs. The dust inside the vacuum bag will quickly suffocate any spiders you catch. Make a periodic check of the areas

where you most often find the eight-legged creatures.

- **Get rid of webs.** If you’re willing to share your house with a few spiders, you can periodically vacuum up webs that are eyesores or embarrassing to you as a housekeeper. Leaving the spiders will allow them to continue to do their pest control work.
- **Take spiders outside.** Catch spiders in a container, cover the container with a piece of paper, and release them outside.
- **Keep spiders out of the house.** Caulk cracks and crevices. Install screens on windows and doors.
- **Reduce their food supply.** What are those spiders eating — fruitflies? Try storing ripening fruit in paper bags that are folded over twice and sealed with a large clip. Are they feasting on the insects attracted to a porch light? Try a yellow bulb. Are houseflies the spider’s treat? Install screens on windows and doors.

OUTSIDE YOUR HOME

Don’t spray your garden or around the outside of your house to kill spiders. Outdoors, spiders are providing a very useful pest control service. Leave them to do their job.

BLACK WIDOW, BROWN WIDOW, AND RECLUSE SPIDERS

The black widow that is found in California is the shiny black *Latrodectus hesperus*. The female sports a characteristic red hourglass-shaped mark on the underside of her abdomen. The brown widow (*Latrodectus geometricus*), which occurs in Southern California, is a mottled brownish yellow. The brown recluse spider (*Loxosceles reclusa*) is not known to exist in California. There are, however, other recluse spiders in California that can cause problems for people. Recluse spiders vary from tan to dark brown, but they all have 6 eyes arranged in pairs. Usually it takes an expert to definitively identify a recluse spider.

Deaths from the bites of these three spiders are very rare. For many people, bite symptoms are not significant enough to warrant medical attention. Bites are of most concern to the very young, the very old, and those who are seriously ill.

These spiders are not aggressive and they are rarely encountered by people.

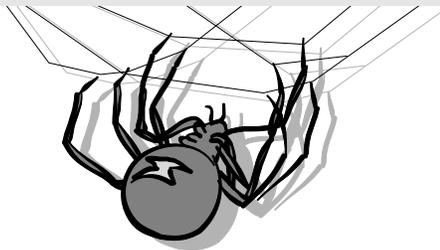
Ordinarily, the widow spiders and the recluses are reluctant to bite people. They spend their lives in their webs waiting for prey. They do not go out hunting.

Where are these spiders found?

- Usually (but not always) near the ground
- Dark, dry, protected crevices in and around buildings
- Lower portions of seldom-used cupboards, closets, or other dark, dry storage areas.
- Woodpiles, lumber piles, or rock piles
- Stacked patio furniture, flower pots, or baskets
- Rodent burrows
- Water meter boxes
- Irrigation control boxes

How to avoid bites from black widows, brown widows, and recluse spiders:

- Wear gloves to clean up garages, debris, or woodpiles outside, and relatively undisturbed storage areas and piles of clutter inside.
- If you live in an area where these spiders are common, check your bed before getting in, don't leave clothing on the floor, and shake out your shoes before putting them on.
- Teach children not to tease spiders in their webs or to poke bare fingers into dark cracks and crevices.
- Always pay attention to where you place your hands.





CONTROLLING YELLOWJACKETS AROUND YOUR HOME

With their potent sting, yellowjackets can be menacing creatures when it comes to a showdown over the picnic table. In years when the spring is warm and dry, yellowjacket populations can increase to the point of making outdoor activities difficult. But few people are aware that yellowjackets are voracious predators of insect pests such as caterpillars and flies.

IDENTIFICATION AND DETECTION

Yellowjackets are a type of wasp but they are often mistaken for bees. Sometimes they are confused with other less aggressive predatory wasps, especially paper wasps. Yellowjackets are relatively short and stout compared to paper wasps. Paper wasps have longer more slender bodies and long dangling legs. Yellowjacket nests are spherical and are enclosed in a papery envelope with a small entrance hole at the bottom. Paper wasp nests are usually suspended from eaves or porch ceilings and look like tiny umbrellas filled with hexagonal cells.

LESS-TOXIC CONTROLS

REMOVING AN INDIVIDUAL YELLOWJACKET FROM INSIDE THE HOUSE

If you are not hypersensitive to yellowjacket stings:

- don't aggravate the yellowjacket by swatting at it,
- wait until it lands on a flat surface,
- place a glass or plastic container over the insect,
- slide a stiff piece of paper under the opening of the container, and
- seal the container and place it in the freezer overnight to kill the yellowjacket or take it outside and release the insect.

If you are finding many yellowjackets inside, you may have a nest in a wall void.

DESTROYING NESTS

Because of the danger of multiple stings, we strongly recommend calling your local vector control district or a private company for information and assistance.

Yellowjackets build nests in abandoned rodent burrows and other holes in the ground, in attics, in wall voids, in shrubs and trees. Sometimes they hang their nests from eaves.

TRAPPING YELLOWJACKETS

Traps can provide temporary relief from yellowjackets, however individual yellowjackets can sometimes escape traps. There are a number of traps on the market, some disposable and others reusable. Experiment to find the trap or traps that work best for you.

- Follow label directions for setting traps, disposing of trapped yellowjackets, and cleaning and reusing traps that are reusable.
- Place a number of the traps around the periphery of your yard or picnic area to lure the yellowjackets away from your activities and food.
- Set the traps out a few hours before bringing food outdoors so the insects change their foraging patterns.
- If one of the traps is not attracting yellowjackets, move it. If you set out several traps and none of them are attracting yellowjackets even though they are present, try changing the bait. Use baits such as tuna-flavored cat food in the spring and early summer. Try using grenadine or the attractants that come with the traps in late summer and fall.

POISON BAITING

As a last resort in years when yellowjacket populations are extremely high, poison baiting may be necessary. Call a pest control professional.

PREVENTION

- Seal holes and cracks in foundations, walls, roofs, and eaves to prevent yellowjackets from entering your home.
- Cover attic and crawl space vents with fine mesh insect screen.
- Yellowjackets scavenge for meat and sweet foods and drinks in outdoor garbage and recycling bins. Clean recyclables before storing them. Keep garbage cans clean and tightly covered, or seal all food garbage in plastic bags.

WHY YELLOWJACKETS STING

Yellowjackets seldom sting when they are foraging for food, unless they feel threatened. They are, however, likely to attack when their nests are disturbed by a direct blow or by vibrations that are detected by the wasps inside. Mowing the lawn near an underground nest, construction work near a nest in a wall void, or even walking near a nest can provoke an attack by one or more

yellowjackets. This is especially true if the nest has been disturbed before.

AVOIDING STINGS

When a yellowjacket approaches:

- Remain calm
- *Do not* strike at a yellowjacket with sharp, sudden blows. Slow, gentle motions that mimic the movement of a branch in the breeze will be safer in encouraging the yellowjacket to leave.
- You can brush the yellowjacket off with a piece of paper or some other object as long as you move slowly and deliberately.
- Do not squash a yellowjacket. When crushed, many yellowjacket species emit a chemical that can cause other nearby yellowjackets to attack.

Yellowjackets can be a problem in May and June, but they are most noticeable and annoying late in the summer. During yellowjacket season, the following tips will help prevent stings.

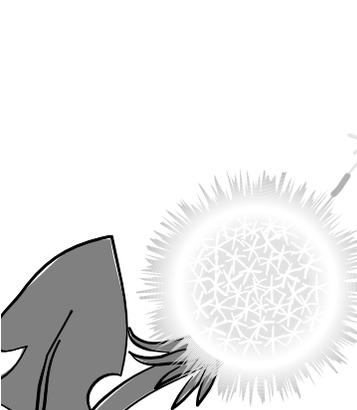
- Wear protective clothing when mowing grass where you suspect underground nests.
- If you are hypersensitive to yellowjacket stings, avoid outdoor cooking or eating. Hypersensitive people should wear clothing that covers as much skin as possible, and carry an epinephrine kit (available by prescription) at all times.
- Outdoors, do not drink soft drinks or other sugary drinks from open containers. Use cups with lids and straws, and look before you sip. Do not carry snacks containing meat or sugar in open containers.
- Do not wear perfumes. Use unscented deodorant, sun screen, hair spray, etc.
- Avoid going barefoot, especially in vegetation.
- Always examine wet towels or wet clothing before you pick them up outdoors.
- Wear light-colored clothing without patterns.

PRODUCTS

Examples of trade names for products listed in this fact sheet

Traps:

- Rescue! Yellowjacket (disposable)
- Rescue! Trap (reusable)
- Victor Yellow Jacket Trap (use liquid bait such as apple juice)
- Victor Yellow Jacket and Flying Insect Trap (use liquid bait such as apple juice)
- Seabright Yellow Jacket and Wasp Trap (use solid bait such as tuna catfood); (800) 284-7363; www.seabrightlabs.com



HOW TO CONTROL WEEDS

It is unrealistic to think that we can have a garden or a lawn that is entirely weed-free. We need to manage weeds so they don't become an overwhelming problem. This means tolerating some weeds in some situations. If you really want to solve your weed problem, you will need to spend some time, have some patience, and expend some effort.

WHAT IS A WEED?

A weed in the garden is usually a plant growing in the wrong place. This includes not only plants we normally think of as weeds, such as the dandelion, but also the tens of tomato seedlings coming up in the worm compost we've spread on a flower bed.

INVASIVES

There are, however, a number of non-native plants that are very serious pests. When these plants are introduced into natural areas, they overwhelm native vegetation and degrade the environment for wildlife and humans alike. The worst of these invasive plants are classified as noxious weeds, and the government spends millions of dollars every year to remove them.

Some commonly available garden plants are actually invasive weeds that can "escape" from our gardens into wildlands. Don't use these plants and remove any from your yard (see "Don't Plant a Pest!" brochure from Cal-IPC; www.cal-ipc.org).

WEEDS CAN BE BENEFICIAL, TOO

Deep-rooted weeds such as thistles, pigweeds, and nightshades can bring up minerals from the subsoil that are then deposited in the topsoil when the plants die and decompose. Deep roots can open pathways for water and for roots of less aggressive plants. Weeds in the sunflower (Asteraceae), parsley (Apiaceae), and mustard (Cruciferae) families produce flowers that feed beneficial insects with their nectar and pollen.

NON-CHEMICAL STRATEGIES FOR CONTROLLING WEEDS

To solve your weed problems in the long run, you must make the habitat in which weeds are growing inhospitable to them. In general, weeds prefer bare soil with lots of light; therefore, keep the soil in between your plants covered with mulch that excludes light from the soil. Patch cracks in paving, or fill cracks with special caulking compounds designed for asphalt or concrete.

It is very important to prevent weeds from going to seed. If you can reduce the number of weed seeds in and around your garden, you have won half the battle.

HAND WEEDING

Weeds are easiest to pull when they are fairly small and when the soil is moist, but not wet. There are a number of useful weeding tools for sale, and gloves will protect your hands. Any weeds you pull up (or cut off) can be used as mulch around desired plants or can be composted, *as long as they have not yet flowered and are not the kind that reproduce from plant fragments, tubers, or bulbs*. Once weeds flower, there is a danger that seeds will mature on the plants even after they are pulled.

With established perennial weeds, concentrate on digging up the roots or depriving them of energy. If you cannot dig up the roots, cut the plant down to the ground. Cover the area with thick mulch, and if plants send up new shoots, cut them down again. Don't allow the plants to flower, produce new leaves, or go to seed. With no leaves to produce energy, the roots will eventually use up their reserves and be unable to produce new shoots.

WATER MANAGEMENT

Prevent weeds from growing by keeping the soil too dry to support plants. Drip irrigation systems with drip emitters deliver water only to desirable plants.

MULCHING

A thick layer of mulch deprives weeds and their seeds of light. Organic mulches, such as compost, leaves, sawdust, straw, newspapers, and cardboard, have the added benefit of providing organic matter for soil organisms to feed on. Weed control fabric and black plastic will also exclude light from weeds and their seeds. It is important to understand that mulches only prevent weeds that are under them from growing. Most organic mulches provide a good growing medium for weed seeds that blow in on top of the mulch, but you can more easily pull weeds growing in mulch than in soil. Weeds will also grow on top of weed fabric or plastic once enough soil or organic matter has accumulated.

The particle size of the mulch will determine the depth of the application. Apply coarse-textured mulches, such as bark and wood chips, 4" deep for weed control. Apply fine-textured mulches, such as shredded leaves or dry grass clippings, about 2" deep. Keep all mulches several inches away from the stems of plants or the trunks of trees and shrubs to prevent disease.

Weed control fabric, black plastic, or layers of cardboard and newspapers are excellent for large areas with very vigorous weeds. Place drip emitters in a 12" grid on the soil under newspaper and cardboard mulch to provide water to the roots of any desirable plants in the area and to hasten the decomposition of the weeds under the mulch. Cover these "sheet" mulches with wood chips or another organic mulch.

Use sawdust mulch only where you don't want anything to grow (e.g., in a pathway) because decomposing sawdust temporarily depletes nitrogen from the soil surface and makes it hard for plants to survive.

All organic mulches deteriorate over time, some more rapidly than others. Be sure to replenish them as they decompose.

COMPETITIVE PLANTING

Vigorous ground covers and plants with dense foliage can shade the ground enough that weed seeds have difficulty germinating. Lawns that are cut high will be able to shade out most weeds. When you remove weeds from a lawn, sprinkle some grass seed in the spot so that lawn rather than weeds will fill the hole.

CULTIVATION

Cultivation is using a tool, like a shovel, hoe, or rototiller, to turn the soil or remove weeds. Cultivation can bring new weed seeds to the surface, disrupt the food web of soil organisms, and ruin soil structure, so use this technique sparingly.

MOWING

Mow weeds or cut them with a weed-whacker before they produce flowers or go to seed.

LESS-TOXIC HERBICIDES

Products containing clove oil (Burn Out II) or soap (Concern Fast Acting Weed Killer) will kill the above ground portions of weeds, but will leave roots that may resprout. Plants will be most susceptible when they are young. To kill older annual weeds or tough perennials, you will most likely have to repeat the herbicide application a number of times.

Caution: When spraying any kind of herbicide, protect desired plants from coming into contact with the spray. Do not spray on windy days. Prevent people and pets from having access to the area until the material has dried.

PESTICIDES AND WATER POLLUTION

Commonly used pesticides can be harmful to people, pets, and the environment. Part of the problem is the toxicity of some pesticides, but even more important is the sheer volume of pesticides used in this country every year. Much of it finds its way to our water, air, and soil. **Studies show that the most commonly used pesticides are the ones most likely to cause water pollution.**

Who applies all these chemicals? You might think that farmers are mainly responsible for pesticide problems, but more than half of California pesticide use is in urban areas — by residents, home gardeners, and pest control professionals in and around schools, businesses, and homes.

The *Our Water, Our World* program was developed in 1997 by clean water agencies in response to pollution problems caused by two of the most commonly used residential pesticides at that time — chlorpyrifos (Dursban) and diazinon. Both stormwater runoff and wastewater treatment plant discharges contained levels of these two pesticides that were high enough to kill aquatic organisms at the bottom of the food web. In fact, in 1998 the U.S. Environ-

mental Protection Agency (EPA) listed 85 California waterbodies as “impaired” due to diazinon.

And in 2000, because of growing concerns about the effects these chemicals have on human health, EPA announced an agreement with pesticide manufacturers to remove most products containing chlorpyrifos and diazinon from retail store shelves and to end most residential and professional uses by the end of 2004. Generally, since January 2005 professionals have virtually stopped using these two pesticides in residential areas. In spite of sales of these products being discontinued, residents may still be using old supplies — potentially causing the same problems that led to their removal from the market.

Water quality agencies urge the public not to use pesticides that contain chlorpyrifos (Dursban) or diazinon. Instead, dispose of them at a household hazardous waste facility (see below).

NEW THREATS TO WATER QUALITY

Chemical pesticides designed to replace these banned pesticides are available, but substituting another toxic chemical won't help the environment. With the phase-out of diazinon and chlorpyrifos, pesticide products have either been replaced or reformulated using other chemicals (referred to as “active ingredients”), including:

- **Pyrethroids:** Many diazinon and chlorpyrifos products have been replaced with formulations using pyrethroids. As a result, the use of synthetic pyrethroids in pesticide products has nearly tripled in just the last few years. Pyrethroids are used in hundreds of products including pesticides used outdoors on lawns or for spraying the perimeters of houses.

Pyrethroids are broad-spectrum, long-lived *synthetic* chemicals that interfere with the function of the nervous system. Designed to kill a wide variety of insect pests, (such as ants, cockroaches, and lawn grubs) they are also highly toxic to fish, aquatic insects, crustaceans, and the beneficial insects (such as ladybugs, lacewings, and earthworms), that keep pest populations under control naturally. Beneficial insects are often far more sensitive to pesticides than the pests you might be trying to kill. Once pesticides eliminate the beneficial insects, pests are free to multiply without a natural check.

Products containing pyrethroids have ingredient names typically ending in “-thrin,” including: permethrin, bifenthrin, cyfluthrin (including beta-cyfluthrin), cypermethrin, deltamethrin, lambda-cyhalothrin, and tralomethrin (one exception is esfenvalerate). The pyrethroids resmethrin and tetramethrin are used less widely outdoors so are not as big a threat to water quality; however,

NEW THREATS TO WATER QUALITY, CONT.

they are present in aerosol products, which disperse chemicals in a way that significantly increases the risk of exposure to unintentional targets — including people and pets.

- **Malathion and Carbaryl (Sevin):** Although these pesticides have been available for many years, with the discontinuation of diazinon, their use has increased. These chemicals, twice as toxic in salt water as in fresh water, are already detected frequently in urban and suburban waterways across the country. They are also water soluble — meaning rain and overwatering can easily cause them to wash off lawns and gardens and enter storm drains and local waterways.

PYRETHRINS VS. PYRETHROIDS

Unlike long-lived synthetic pyrethroids, natural pyrethrins are short-lived pesticides made from chrysanthemum flowers. Though natural pyrethrins are less persistent in the environment than the synthetic pyrethroids, they are still toxic to birds, fish, and beneficial insects until they break down after a few hours in sunlight. Take steps to prevent pyrethrins from running off to a street, gutter, or storm drain.

WHAT SHOULD YOU DO IF YOU HAVE UNWANTED PESTICIDE PRODUCTS AROUND THE HOUSE?

If you have unwanted or leftover pesticides, do not pour them in ANY drain inside or outside your house. Do not put pesticides in the trash. Instead, take them to a household hazardous waste collection facility or event. Call 1-800-CLEANUP or visit www.ourwaterourworld.org/disposal_info.cfm for times and locations in your community. Empty five-gallon or smaller containers with no free-flowing liquid may be put in the trash.

HOW CAN YOU BOTH MANAGE PESTS AND HELP PROTECT THE HEALTH OF PEOPLE, PETS, AND OUR ENVIRONMENT?

- Follow the suggestions for less-toxic pest control and *pest prevention* in the *Our Water, Our World* fact sheet series that can be found online at www.ourwaterourworld.org and in participating stores.
 - Another source of information on pest control alternatives is the University of California Statewide IPM Program at <http://ucipm.ucdavis.edu>.
- Try to keep your garden healthy and your home pest-free without resorting to chemical pesticides. Remember that when you apply pesticides, you are treating the *symptom*, rather than the *cause* of pest problems. **Physical barriers** (window screens and caulking to keep pests out), **biological controls** (introducing beneficial insects), and **cultural controls** (keeping a clean house and a healthy garden that attracts beneficial insects) are always preferable to chemical pesticides. In situations where a pesticide is necessary, however, the best products for the environment are *less toxic, less persistent, and more targeted on pests and not on beneficial insects and plants*.
 - Avoid wearing insect-repellent clothing. EPA recently found that wearing clothing treated with permethrin (a synthetic pyrethroid) more than once a year could increase cancer risks.

USE AND DISPOSAL OF PESTICIDES

Even when applied according to label directions, pesticides make their way into our waterways, air, rain and fog. Even small amounts of pesticides can be lethal to marine life, birds, and other life forms. Just one granule or seed treated with diazinon, a common household pesticide, is enough to kill a small bird. **So what can we do?** Instead of relying on conventional pesticides as our first line of defense against a pest, consider them as a last resort. Check out the other fact sheets in this series for tips on safer and effective alternatives for preventing and managing pest problems in your home and garden. For more information, contact the sources listed on the reverse side of this fact sheet.

IF YOU MUST USE PESTICIDES:

- Identify the pest and the afflicted plant, and then choose a product labeled for use on that pest and plant. Not all pesticides are effective against all pests.
- Aerosols may be the worst option you can choose for pest problems. They disperse chemicals in a way that significantly increases the risk of exposure to unintentional targets, including beneficial insects, birds, pets, you and your family.
- Choose the least-toxic product available. Baits and traps are safer options.
- Spot treat whenever possible.
- Buy ready-to-use products instead of concentrates. An undiluted pesticide that requires mixing is more hazardous than one that is already diluted. And, ready-to-use products avoid the use of measuring and mixing that could result in spills. When rinsing a pesticide from measuring cups, applicators or containers, use the rinse as you would the pesticide — for the target pest. Don't wash it down a drain. (See *Proper Disposal* section.)
- Read the label and use only the amount recommended to do the job. More is not better.
- If the label instructs you to use protective gear, heed the advice — your health could depend on it. The use of gloves, for example, is not intended to avoid staining your hands; rather, it offers protection against having the chemicals enter your blood stream through your skin.

- Homeowners who apply pesticides outdoors (including applications on lawns) can unknowingly carry residues into their home on clothing and shoes. Pets can also be carriers. Be mindful that residues, whether tracked in from outdoors or as a result of indoor use, can contaminate carpets and floors where children play.

SIGNAL WORDS

Caution, Warning, and Danger are signal words placed on product labels to alert consumers to the relative toxicity of the products — *Caution* being the least toxic and *Danger* being the most toxic. These signal words, however, pertain only to the **acute** or **immediate** hazard of the product. Labels do not provide information about the chronic or long-term hazards to humans, animals or the environment. For example, *nothing* on the product label tells you whether a product contains a chemical suspected of causing birth defects, kidney or liver damage, cancer, lung disease, etc.

INERT INGREDIENTS

Inert ingredients (called “inerts” or “other ingredients” on product labels) can comprise up to 99.9% of a pesticide product. Contrary to what the name implies, inerts are not necessarily safe chemicals — nor have they necessarily been tested for any long-term health implications like cancer, nervous system damage, reproductive harm, or gene mutations. If you want to try to avoid exposure to chemicals suspected of causing long-term health impacts, select pest control products that are non-toxic (e.g., traps), those that offer the least amount of pesticide exposure (e.g., baits), or those that offer the least toxic chemical (e.g., horticultural oil). For more information on choosing the least-toxic pest control product available, refer to the other fact sheets in this series or contact the organizations listed in this fact sheet. For more information on inert ingredients, go to: www.pesticide.org.

KNOW WHAT YOU'RE BUYING

- Just because a product is purchased over-the-counter, doesn't mean that it has been tested for its ability to cause long-term health or environmental damage. In 2001, the U.S. Environmental Protection Agency worked with product manufacturers to remove the pesticide Dursban (or chlorpyrifos) from being sold because of its toxicity to children. Chlorpyrifos was first registered for sale in 1965. Diazinon, a close relative, will be removed from store shelves by 2005 — also because of its toxicity to children. It has been registered for sale since 1956.
- Research has shown that pesticide residues are detected on many foods

purchased from grocery stores. For more information about pesticides in food, go to: www.foodnews.org (Environmental Working Group); or call the Natural Resources Defense Council at (415) 777-0220.

- If you have any questions about the safety, environmental impact, or proper use of a pesticide, call the National Pesticide Information Center 24-hour hotline at (800) 858-PEST, www.npic.orst.edu.

STORING PESTICIDES AND APPLICATION EQUIPMENT

- Store pesticides in their original containers, in a place that cannot be accessed by children or pets.

- Never remove the labels.
- Clearly mark containers, applicators and utensils used for mixing or applying pesticides and store them with the pesticides. Never use them for any other purpose.

DISPOSE OF PESTICIDES SAFELY AND LEGALLY

- Unwanted pesticides should be brought to your local household hazardous waste collection program. In California, it's illegal to dispose of partially used containers of pesticides (or any hazardous waste) in the trash, in spite of what the label says. It is legal to dispose of empty (no free-flowing liquid) pesticide containers in the trash if they are 5 gallons or less in capacity.
- *Never* dispose of pesticide-tainted water in any indoor or outdoor drain. Though **indoor** drains flow to treatment plants, pesticides can pass right through the plants and enter local waterways. Water used to rinse out a sprayer or applicator should be applied like the pesticide. In most communities, **outdoor** drains flow directly to local waterways.
- *Never* use or give away any pesticide that is no longer available in the marketplace such as chlordane, DDT, and chlorpyrifos (Dursban).
- For more information on pesticide disposal, call 1-800-CLEANUP or visit: www.1800CLEANUP.org.

GROWING A HEALTHY GARDEN TO MANAGE PESTS NATURALLY



A healthy garden filled with a wide variety of flowering plants will be more resistant to significant pest damage. A healthy, diverse garden will also attract beneficial creatures, such as dragonflies, ladybugs, lacewings, syrphid flies, and “miniwasps,” which feed on pests.

ATTRACTING AND KEEPING BENEFICIAL INSECTS

- Become familiar with what beneficial insects look like in their various forms of development. Many people kill ladybugs in their larval form without realizing it. Other bugs suffer the same fate. Go to www.ipm.ucdavis.edu/PMG/NE/index.html to see what these garden predators look like as “babies” and adults!
- **Reduce or eliminate the use of broad-spectrum pesticides in your garden.** Bees and other beneficial insects are often far more sensitive to pesticides than the pests you might be trying to kill. Once pesticides eliminate the beneficial insects, pests are free to multiply without a natural

check. As pest populations rise, you may be tempted to spray more frequently, but pesticides leave genetically resistant strains of pests to breed, creating an increasingly resistant pest population. The harder it becomes to kill the pest, the more you’ll need to spray and the fewer natural enemies you’ll have to help you out.

- **Provide food and water for the adult forms of beneficial insects.** Although many beneficial insects perform their pest control services only during an immature stage, the adult stage feeds on nectar and pollen. You can attract and keep a wide variety of beneficial insects in your garden by including flowering plants that are rich in pollen and nectar. The box on the back page lists a number of these “insectary” plants. Some adult beneficial insects also need water from dew, irrigation, or other sources to sustain them during dry periods.

CHOOSING THE RIGHT PLANT

One of the most important preventive steps in the pest management process is selecting appropriate plants for a particular location. Usually we choose plants for their beauty, but to minimize pest problems, consider other plant characteristics and the site where it will

grow. It’s easier to plant a compatible species for your site than to try to alter the growing conditions.

- Understand the soil conditions in your yard. Soil conditions must match the requirements of your plants. For example, some plants are well adapted to salty or compacted soil or soil with poor drainage.
- Know the sun and shade characteristics of your garden. Consider times of day and different seasons.
- Know that watering requirements differ depending upon the soil and plant type.
- Select pest- and disease-resistant plants.
- Don’t plant invasive species (some are available as garden plants), and remove those growing on your property (see “Don’t Plant a Pest!” brochure from Cal-IPC; www.cal-ipc.org).
- Plant a diversity of species. Include native plants and plants from other Mediterranean climates. This ensures that a single pest problem will not devastate your entire landscape.
- To attract and keep beneficial insects, include “insectary” plants in your landscape (see box on back).
- You can get help in choosing the right plants from California Certified Nursery Professionals, University of California Cooperative Extension Master Gardeners, Horticultural

CHOOSING THE RIGHT PLANT, CONT.

Consultants, ISA Certified Arborists (see the Yellow Pages index), California Invasive Plant Council, or local gardening clubs. Also, see the books recommended on the back side of this fact sheet.

PLANTING AND CARING FOR YOUR PLANTS

Start your plants out right by choosing healthy specimens and planting them properly. Keep your plants healthy by correctly watering, pruning, and fertilizing them (if needed).

- Before you buy a plant, ask to examine the roots. Do not buy plants with roots that are kinked or circling the container. Also check the “root crown,” the region where the roots meet the stem or trunk. Don’t buy the plant if that area is soft, rotten, or deformed.
- Don’t pile soil around the plant any higher than the root crown. Don’t plant in a depression that will allow water to wash soil down around the

stem or trunk and cover the root crown. A continually moist root crown can cause rot.

- Since a young plant doesn’t have an extensive root system, it can dry out quickly. Water thoroughly and keep the soil moist, but don’t drown the plant.
- Cover bare soil with mulch. Mulch conserves soil moisture so plants don’t dry out as quickly. A four-inch layer of mulch will prevent most annual weeds from growing, and any weeds that do sprout can be pulled out more easily.
- Use a mulch of leaves, bark, or composted manure and/or garden waste to provide organic matter to the soil and a slow, steady flow of nutrients to plants.
- Use slow-release chemical fertilizers only if soil testing indicates a specific deficiency.
- Different plants require different kinds of pruning (if they need it at all). Learn how and when to prune your plants, and do so judiciously. Severe pruning can damage the plant and encourage pests and diseases.

RECOMMENDED READING

- *The Best of Fine Gardening: Healthy Soil* by the editors of *Fine Gardening* magazine, published 1995 by Taunton Press, Newtown, CT; (800) 888-8286.
- *California Master Gardeners’ Handbook* published 2002 by the University of California Division of Agriculture and Natural Resources, Berkeley, CA.
- *Natural Enemies Handbook* by Mary Louise Flint and Steve H. Dreistadt, published 1998 by University of California Division of Agriculture and Natural Resources, Berkeley, CA.
- *Sunset Western Garden Book*, Sunset Publishing, 2001.

INSECTARY PLANTS

The flowers on these and many other plants have nectar and pollen that are accessible to beneficial insects.

Aster (*Aster*)
Baby blue eyes (*Nemophila menziesii*)
Calendula (*Calendula*)
Calif. lilac (*Ceanothus*)
Calif. poppy (*Eschscholzia californica*)
Chervil (*Anthriscus cerefolium*)
Chrysanthemum (*Chrysanthemum*)
Coriander (*Coriander sativum*)
Cosmos (*Cosmos*)
Coyote brush (*Baccharis pilularis*)
Dill (*Anethum graveolens*)
Elderberry (*Sambucus mexicana*)
Fleabane (*Erigeron*)
Holly-leaved cherry (*Prunus ilicifolia*)
Monkey flower (*Mimulus*)
Native buckwheat (*Eriogonum*)
Pincushion flower (*Scabiosa*)
Rosemary (*Rosmarinus officinalis*)
Rudbeckia (*Rudbeckia*)
Sunflower (*Helianthus*)
Sweet alyssum* (*Lobularia maritima*)
Tidy-tips (*Layia platyglossa*)
Toyon (*Heteromeles arbutifolia*)
Yarrow (*Achillea*)
Zinnia (*Zinnia*)

*Do not plant on or near coastal bluffs.
Can be invasive.

FINDING A COMPANY THAT CAN PREVENT PEST PROBLEMS

If you have a pest problem, you may be able to solve it yourself with the help of the resources listed at the end of this fact sheet. However, if you want or need to hire a professional pest control service, look for a company that offers less-toxic pest control or Integrated Pest Management (IPM). IPM focuses on long-term prevention of pests and their damage through a combination of techniques such as habitat modification, biological control, and physical control. Pesticides are used only if truly necessary and are selected to be effective against a specific pest while minimizing risks to you, your family and pets, wildlife, beneficial insects, and our environment. IPM is a common sense preventative approach and is less toxic than conventional spraying. IPM methods are based on extensive scientific research.

Studies have demonstrated that using less-toxic pest management or IPM saves money compared to conventional pest control. Because the initial costs are typically higher, companies that haven't adopted less-toxic approaches

DOING YOUR PART

For any pest control to work, you must do your part. If the pest control company makes recommendations about cleanup, home repairs, or other steps you should take to help prevent pest problems, make sure you follow their instructions.

may believe they cost more. However, less-toxic pest management pays for itself in the long term because it treats the underlying problem (why you have pests); conventional controls typically treat just the symptoms.

ASK BEFORE YOU HIRE

When you first contact a company, tell them that you are concerned about the use of pesticides and would like them to use only less-toxic pest control methods. Some companies may try to convince you that chemical sprays are safe and more effective. Be persistent. Find out to what extent a company you're considering uses non-chemical approaches to pest control and how it would approach your particular problem. Here's what to look for:

APPROACH

- **Ask if they are willing to do pest control without sprays.** Their response will help you determine their philosophical approach to pest control.
- **Discuss various methods and determine if the company provides**

less-toxic options, such as those discussed below. A company that offers less-toxic pest control or IPM should use conventional chemicals for only a fraction of their jobs.

- **Inspection** — Ask how the company will find out how the pests are entering, where they are hiding, what's attracting them, and what they are eating. A less-toxic approach will begin with a thorough inspection to determine *why* you have a pest problem, as well as the extent of the problem. The key to effective pest control is detailed information about the pest. It is very difficult to control a pest if the company doesn't know specifically what species it is. The company should also ask you whether anyone living in the house is pregnant, less than one year old, chemically sensitive, asthmatic or elderly, and whether you have pets.
- **Habitat modifications** — Ask what the company will do to prevent a re-infestation of the pest. Since pests need food, water, and shelter to survive, eliminating or reducing one of these via habitat modification (for example, by caulking cracks, screening holes, and replacing door thresholds) will reduce the pest population.
- **Other physical controls** — Physical controls may be used to trap or kill the pest, not just modify its habitat. Physical controls include vacuuming up pests or using traps or barriers.

APPROACH, CONT.

- **Biological controls** — Some companies will use other organisms, such as beneficial nematodes or lacewings, to control certain pests.
- **Horticultural controls** — Horticultural controls involve how the yard and garden are cared for. For example, plants produce less top growth if fed a slow-release or organic fertilizer — making them less attractive to certain pests. Good horticultural practices are important, since a healthy lawn and garden will naturally resist or outgrow most pest damage.

CHEMICAL CONTROLS

Less-toxic chemical controls

- **Ask how the company makes decisions about when, where, and what (if any) pesticides to use.** A less-toxic pest control service will not spray routinely and, if it sprays at all, will only spray where the pest is a problem. Chemical sprays should not be used to prevent infestations.
- **Look for a company that chooses less-toxic chemicals such as borates or boric acid, diatomaceous earth (DE), insecticidal soaps, horticultural oils, and those contained in bait stations.** A capable provider of less-toxic pest management or IPM will select the most effective, least toxic chemical to complete the

job and will use it only in the areas where the pests are a problem.

Conventional chemicals

- **Ask for copies of labels and “material safety data sheets” (or “MSDS”) for any pesticide a company plans to use in your home or yard.**
- **Ask if the company uses chemical pesticides only as a last resort.** If the pesticide applicator is going to spray, look for someone who will spray selectively to reach the target pest and won’t spray the whole yard or the entire perimeter of your home.
- **Ask to see a copy of the “service ticket” they will use.** Check to make sure the following will be on it: target pest, name of any pesticides used and their EPA registration number (for non-food-grade products), how much pesticide was applied and where and when it was applied.
- If the company must use a chemical spray, **ask it to post the areas to be treated with warning signs or flags — prior to the treatment and for 72 hours afterwards.**
- **Monitoring** — Discuss the actions the company will take if pests re-occur. Monitoring is important: when less-toxic pest controls are used, insects will die back gradually instead of all at once as they do with conventional pesticides. The company should place monitors around the home and check them regularly

to make sure the control is working and to change it if necessary.

- **References** — Interview several companies. Ask for and contact references.
- **Licensing and training** — Make sure the company and on-site technicians are registered and licensed.
- **Claims** — Be cautious if a company claims it uses “safe pesticides” or “safe chemicals.” Pesticides can be applied safely, but no pesticide (even a less-toxic one) is entirely safe. “Odorless” does not mean safe. **Be cautious of claims that a company can control “ALL insects.”** If they claim to control all insects, you can be sure they are using a broad-spectrum pesticide that will kill even beneficial insects such as ladybugs, honeybees, and butterflies.
- **Contracts** — Be cautious of the **monthly service contract.** A less-toxic approach should ALWAYS include regular monitoring of pest populations but NEVER calendar applications of pesticide — whether or not you have a pest problem. Do not authorize any pest treatment without reading and signing a detailed written contract.
- **Records and reporting** — Ask the company to provide you with regular reports, including an inspection report with a specific pest identification and monitoring reports.

LEARN MORE ABOUT PESTICIDES AND SAFER ALTERNATIVES

Books

The Gardener's Guide to Common-Sense Pest Control, William Olkowski, Taunton Press, 1995.

The Organic Gardener's Handbook of Natural Insect and Disease Control, Barbara Ellis, Rodale Press, 1996.

Organic Pest and Disease Control: How to Grow a Healthy, Problem Free Garden, Barbara Ellis, Houghton Mifflin Co., 1997.

Controlling Pests and Diseases, Patricia S. Michalak, Rodale Press, 1994.



MAIL ORDER HOUSES

Peaceful Valley Farm Supply
<http://groworganic.com>
(888) 784-1722 (toll free)

Gardens Alive
www.gardens-alive.com
(812) 537-8650

Extremely Green Gardening Company
www.extremelygreen.com
(781) 878-5397

Harmony Farm Supply
www.harmonyfarm.com
(707) 823-9125



WEBSITES/ORGANIZATIONS

American Rose Society
<http://www.ars.org/>

Audubon At Home "You Have a Choice"
(415) 388-2524 (215) 355-9588
www.audubon.org/bird/athome/alternatives.html

Beyond Pesticides
(202) 543-5450
www.beyondpesticides.org

Bio-Integral Resource Center
(510) 524-2567
www.birc.org

California Invasive Plant Council (Cal-IPC)
www.cal-ipc.org

California Native Plant Society
www.cnps.org



WEBSITES/ORGANIZATIONS, CONT.

Common Ground Organic Garden Supply and Education Center
(650) 493-6072
www.commongroundinpaloalto.org

Department of Pesticide Regulation (CA)
www.cdpr.ca.gov

Environmental Working Group
www.foodnews.org

Master Gardeners
To see if a Master Gardener's office is located in your community, check in the County Government section of your phone book under University of California Cooperative Extension; or, look under "Bug ID" in the Our Water – Our World website (see below).

Northwest Coalition for Alternatives to Pesticides
(541) 344-5044
www.pesticide.org

Office of Environmental Health Hazard Assessment
www.oehha.ca.gov/pesticides.html

Our Water – Our World
www.ourwaterourworld.org

Pesticide Action Network
(415) 981-6205
www.panna.org or www.pesticideinfo.org

State Water Resources Control Board (CA)
www.waterboards.ca.gov

University of California
www.ipm.ucdavis.edu or www.ipm.ucdavis.edu/WATER/U/index.html

U.S.EPA
www.epa.gov/pesticides



www.ourwaterourworld.org