

Make the Connection:

Health & Environment

Volume 3
Home Remedies for Pest Control

Pesticides: Avoidable Risk, or Necessary Evil?

Introduction

Pesticides represent one of the single most important hazards in the home. Around 1,400 pesticides, herbicides, and fungicides are ingredients in consumer products. Combined with other toxic substances such as hydrocarbon solvents, pesticides are present in more than 34,000 different product formulations. These products account for more than 150,000 reported injuries every year. However, that figure doesn't include the number of injuries and illnesses where the link to pesticides is unrecognized.

Pesticides: A Result Of Military Chemical Warfare Research

Pesticides have been used throughout the ages, but until WWII the formulations were fairly simple (though many were still quite toxic). Current day pesticides were actually borne out of research conducted on chemical warfare during WWII. Researchers were attempting to find chemical agents that killed their target by poisoning the nervous system. They were quite successful in their quest, with the result being several classes of compounds called 'organophosphates,' 'carbamates' and 'organochlorines,' and While the formulations used to kill insects, by attacking their nervous systems, are much weaker than the original formulations, they are still potent neurotoxins that don't care whether you are a bug, a dog, or a human. Organophosphates are still available to the public—homeowners will find them in products labeled as 'Chlorpyrifos' (Dursban), 'Malathion,' and 'Diazinon.' Carbamates are also still widely available, the most common product available being 'Carbaryl' (Sevin dust). Organochlorines have mostly been phased out because of their persistence in the environment. The pesticide DDT, once widely used in many applications, is perhaps the most famous of the organochlorines.

During the Vietnam war, pesticide researchers searched for chemicals that could rapidly kill plants. There are few people who are not aware of the product the military called 'Agent Orange,' or the destruction it caused in jungles and human lives alike. One of the chemicals used in Agent Orange, 2,4-D, is still widely used on lawns and gardens. Though 2,4-D is not the chemical that is considered to have caused the ill effects seen with Agent Orange (the offending agent, supposedly, was a chemical called 2,4,5-T, which is no longer manufactured), it is still a toxic compound that is being investigated in its ability to cause cancer. The link has not yet been proven, but several

studies have suggested that 2,4-D may be more toxic than once believed. Home owners are taking a potentially great risk using this product around their home.

A Multi-Billion Dollar Industry

Pesticide manufacturers have created 8+ billion dollar industry in the U.S. alone. That equates to more than 1.5 billion pounds of pesticides. Of that amount, farmers use more than 1 billion pounds, leaving the remainder to be spread throughout our neighborhoods, schools, workplaces, shopping centers and homes. That amounts to about 500 million pounds of pesticide, or more than two pounds for every man, woman and child residing in the U.S. In all, homeowners spend about half a billion dollars annually to rid their home of bugs and weeds.

A Persistent Problem

The problem with chemical pesticides is that they don't go away right after they have been applied. Instead, they can remain present in soils, and even in the home, for months. This kind of persistence means that once the product is applied, the potential for exposure continues. As long as there is a potential for exposure, there is a potential for injury. In many cases, symptoms of injury do not develop until days or weeks after the product is applied, which is why authorities believe that the number of reported pesticide injuries does not represent the true scope of the problem.

Another problem with pesticides is that the industry grows larger every year as pests become more and more resistant to pesticides. Since the life span of a bug or a weed is so short, in just a few generations they can go through genetic mutations that will protect them from their predators—in this case, humans with a can of bug or weed spray. The more frequently pesticides are used, the more rapidly the mutations occur. Eventually, the arsenal of poisons we had will no longer be as effective, and new poisons must be developed. The more chemical pesticides that are developed, the farther away from nature we get, making it even harder for natural pest management to occur. Thus, the need for more chemical pesticides increases, and the cycle is repeated.

Breaking the Cycle of Chemical Dependency

We have to remember, bugs do serve a purpose in the ecosystem, even if we don't appreciate the role they play. When the balance of bugs is disturbed, the ecosystem is disturbed, and the natural process of ecosystem management is destroyed. Long before humans started inhabiting the fields and woods, bugs and weeds were present. In fact, weed free lawns and bug free gardens are not natural, never have been and never will

be. Lush green lawns are more the creation of Madison Avenue ad agencies than nature.

True, there are situations where weeds and insects may pose a threat to humans. Poisonous and allergenic plants and insects can injure, even kill people. In this case, perhaps the judicious use of low-toxicity chemical pesticides may be warranted—especially since the non-toxic alternative of hand digging weeds is not a safe way to remove plants that harbor contact poisons.

But these are exceptions. In the vast majority of cases where pesticides are used, human health is not being threatened by the offending bug or weed. Bugs and weeds may be unsightly, or a nuisance, but is it really worth using toxic chemicals to get rid of them, especially when non-toxic and very low toxicity (not to mention cheaper) alternatives are available?

Safe Substitutes for Pesticides in Home and Garden

Against pests in the home, the best offense is a good defense. The first step is to make the house—especially the kitchen—unattractive to insects by cleaning up food spills immediately, keeping hard-to-reach areas reasonably clean, and removing clutter that can hide pests. The refrigerator is a good place to store foods, such a flour, that attract pests.

- ◇ Water attracts pests, so leaky faucets and pipes should be promptly repaired. Doors and windows should be well screened.
- ◇ Clothes should be regularly cleaned and aired, and properly stored in paper or cardboard boxes sealed against moths.
- ◇ Cockroaches love piles of paper, such as old newspapers and cardboard, so make it a habit to recycle paper goods regularly.
- ◇ Termites love the combination of wood and moisture, so make sure any wooden part of your home structure is at least eighteen inches off the ground. Never store scrap wood or firewood against the house.

A number of non-toxic substances, found mostly in the kitchen pantry, can be used to repel insects. Generally, they are highly fragrant or volatile herbs or spices. Powdered red chill pepper, peppermint, bay leaves, cloves, citrus oil, lavender, rosemary, tobacco, peppercorns, and cedar oil can repel various types of insects.

Insects can be trapped and killed without resorting to dangerous chemicals: generally a poison of very low toxicity to humans is mixed with a food that insects find attractive, and spread in the infested area. Examples are: oatmeal (attractive) and plaster-

of-Paris (poisonous); cocoa powder & flour (attractive) and borax (poisonous). Old-fashioned flypaper -- not a hanging strip of insecticide -- is an effective trap.

For gardens: In hardware stores, look for new brands of safer insecticides that use soap-and water solution to get rid of aphids, or pyrethrum for a number of applications. As more and more people understand the hazards of chemicals in the home, market pressure will encourage the introduction of safer products. There are also many formulations that you can make yourself. You will find these home made solutions later in this booklet.

If you must use pesticides, several naturally derived pesticides exist which, in some cases, are less toxic to humans than the organophosphates, carbamates, or organochlorines now widely used. Nicotine is the most toxic alternative, poisonous both to humans and to mammals, birds and fish. It is not available commercially for home gardeners because of its hazards, but you can make your own nicotine solution at home. Although nicotine is poisonous, and can be absorbed rapidly through the skin, it is not persistent in the environment and is thus safer in the long run.

Pyrethrum, derived naturally from chrysanthemums, is of relatively low toxicity to humans, especially when used outdoors, and only slightly toxic to aquatic life, so it may be the best choice for home gardens. But be aware that it is a very potent allergen, so people with allergies to ragweed and other flowering plants should be extremely careful when using pyrethrum based pesticides.

Sabadilla controls lice, leafhoppers, squash bugs, striped cucumber beetles, and chinch bugs. It has low toxicity to wildlife, but it may be toxic to bees. Bees are very beneficial insects in the garden, so care must be taken to protect them.

For lawns: Herbicides are most often used to kill "unsightly" weeds in gardens and yards, and by lawn care companies to maintain the perfect appearance of turf around homes and on lawns and golf courses. Basically, the safe alternative to herbicides is simple: pull weeds by hand. There is one herbicide product made from the by-product of corn syrup production that is supposedly very effective against crabgrass. Such products are not widely available, and may need to be ordered from specialty catalogs. See Appendix 3 for resources.

HOME REMEDIES FOR PEST CONTROL

To control pests in and around the home, try the solutions outlined under the heading for each individual pest. Pests in the home are listed first, then pests found outdoors. Exhaust all alternatives before turning to toxic chemical pesticides, and carefully weigh the risks of pesticides versus the benefits of pest control before using chemical pesticides.

Ants

In the house:

- ☑ Keep counters, floors and pet feeding areas clean. Remove and clean up whatever the ants are after. Be especially aware of rotting fruit or spilled sugar containing products such as honey or syrup.
- ☑ Follow the ant trail and find out how they're getting in. Wipe up ants & ant trails with soapy water.
- ☑ Caulk openings where they enter the house. Petroleum jelly in the cracks or duct tape can be a quick, temporary fix. Non-toxic household glue is also effective in plugging holes, and dries clear so it isn't annoying to look at.
- ☑ Apply diatomaceous earth or silica gel into cracks. Apply a fine dusting to entry points that can't be caulked.
- ☑ Apply boric acid dust into cracks where ants emerge. It is a poison, so be sure it is inaccessible to pets and children.
- ☑ Wash counters with vinegar to repel tiny ants
- ☑ Make a spray repellent for use indoors. See Recipe #14 in Appendix 1.
- ☑ Mix baking soda with powdered sugar and apply to infested areas.
- ☑ Wash kitchen surfaces with diluted vinegar and sprinkle mix of bone meal, chili powder, and powdered charcoal in and around suspected points of entry.
- ☑ Identify entry point and pour a line of any of the following: cinnamon, cream of tartar, red pepper, salt, dried mint, sage, or cucumber peelings.
- ☑ Mix 1 T. sugar, 1 T. borax, 2 T. water. Soak cotton balls in mixture and place at point of entry. Keep out of reach of children and pets.
- ☑ Thoroughly Mix 3 T. apple jelly and 1 T. boric acid crystals. Cut soda straws into 2-3 inch lengths. Fill soda straws with mixture (disposable syringe—without needle—works well). Place in areas where ants have been observed. Keep out of reach of children and pets.

Indoor Plants—Insects seem to always find stressed and weakened plants. Plants become stressed if there is water in the saucer all the time or if plants are over-fertilized.

- ☑ Wrap double sided tape around base of indoor plants and trees. Can also use under cabinets and other locations. Check and replace as needed.

In the yard—Ants are generally beneficial in the garden (e.g. they attack termites and eat flea eggs), so limit your control efforts to problem areas. Be aware that ants will protect aphids from their natural enemies and carry aphids to other plants.

- ☑ To prevent ants from climbing, apply a sticky, adhesive material (like Tanglefoot) to a band of nursery tape, tin foil, or plastic wrap wrapped around the base of the plant (band should be 12" wide for trees; as wide as possible for bushes), several inches above the ground.
- ☑ Border gardens with bone meal.
- ☑ Find nest and pour boiling water over it.
- ☑ Sprinkle dry instant grits in and around nest and points of entry into house.

- ☑ Make a repellent for use outdoors. See Recipe #15 in Appendix 1. Spray around points of entry.
- ☑ Place ant baits in problem areas. To make a bait: Mix 1 T. active yeast, 2 T. molasses, and 1 T. sugar. Divide mixture over several small squares of paper and place along trail or at points of entry; can also place entire batch in or around the nest. Ants eat the bait then die because they can't expel the gases that form in their bodies.

Cockroaches

- ☑ Close openings into house (e.g. gaps around pipes and electrical work, door molding, cracks in walls, etc.) with caulking, screening, weather-stripping.
- ☑ Seal all food containers.
- ☑ Clean dishes nightly, or, if you don't, be sure they're sitting in a basin of soapy water.
- ☑ Do not leave pet food out overnight.
- ☑ Apply boric acid dust into cracks and places where roaches hide, like under the refrigerator. Apply only in out-of-the-way places where pets and children can't touch it. Roaches will avoid piles of boric acid, so use a fine dusting. This is a proven, less-toxic roach control product.
- ☑ Apply fine dusting of diatomaceous earth or silica gel to roach walkways. These dusts dehydrate and repel roaches.
- ☑ Make a cockroach bait. See Recipes 16 and 19 in Appendix 1.
- ☑ Place bay leaves in the pantry, cupboards and on shelves to repel cockroaches.
- ☑ Use non-toxic roach traps (like Roach Motels & Cedilla;) to monitor the change in the population.

- ☑ Make a spray repellent. See Recipe 14 in appendix 1. Place in spray bottle. Safe to use throughout house.
- ☑ For severe infestations, place a layer of boric acid in space between wall joists and wall board. Can be done during construction for lasting protection.
- ☑ Combine equal amounts of baking soda and powdered sugar. Apply to infested areas.

Fleas

Flea eggs can remain dormant for up to 9 months, so flea control can be an ongoing ordeal.

- ☑ Steep eucalyptus, rosemary, pennyroyal, garlic, or bayberry in water. Spray on pets. This isn't 100% effective, but it may help keep fleas off pets. People can transport fleas from the yard into the house on clothing. Using this spray on clothing may help repel fleas when working or playing in the yard. Helps repel mosquitoes too.
- ☑ To keep the flea population to a minimum follow these steps:
 - 1) wash pet regularly. Non-scented dish-washing liquid works fine. Soak animal, lather well, then leave shampoo on for at least 5 minutes. This is at least as effective as flea shampoo (ever see fleas "come back to life" after using a flea shampoo? The 'safe' flea shampoos are so weak that their effectiveness is no greater than the soap alone, and thus not worth the additional cost or exposure).
 - 2) vacuum carpets often, and discard bag outside the house or fleas will jump back out again. Leaving the bag in the sun for a day will kill the fleas in the bag. You can sprinkle borax or boric acid on the carpet then vacuum it up so that it will help kill the fleas in the bag.

- 3) wash the pet's bedding frequently. Sprinkle with silica gel between washings.
- 4) sprinkle borax liberally over carpet and beat in with a straw broom. The borax that settles at the base of the carpet will help kill flea eggs that may have fallen there. Vacuum carpet to remove surface residue.
- 5) Use lighted non-toxic flea traps at night. The fleas are attracted to the warmth of the light, but when they hop toward it they land on sticky paper instead.
- 6) for extremely severe infestations, use a product that contains methoprene (pre-cor) to reduce the infestation to manageable levels.

👉 DO NOT USE PRODUCTS 👉
 👉 CONTAINING
 CHLORPYRIFOS 👉 👉 (DURSBAN)
 OR MALATHION 👉

Be sure to air the house thoroughly after using a chemical pesticide product and before allowing children and pets back into treated areas. Continue to use steps 1-5 to manage population.

Clothes Moths

- ☑ Destroy all stages of clothes moths by cleaning garments before storing.
- ☑ Hang clothes in the sunlight and beat them to dislodge moth larvae and eggs, before storing.
- ☑ Store clothes in sealed bags.
- ☑ Vacuum closets thoroughly.

DO NOT USE MOTHBALLS. Instead try one of the following alternatives:

- 1) Mix ½ Lb. rosemary, ½ Lb. mint, ¼ Lb. thyme, ¼ Lb ginseng, and 2 T. cloves. Place in cheesecloth bags to be used as sachet.

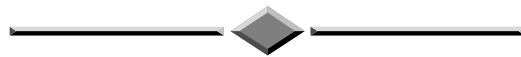
- 2) Make sachets of any of the following: dried lemon peels, dried lavender, bay leaves, whole cloves, dried rosemary and mint, or whole peppercorns.

Pantry Moths

- ☑ Place herbs that have insect-repellent qualities on pantry shelves or even in stored grain. U.S. Dept. of Agriculture has found this to be effective. Try: bay leaves, coriander, dill, cinnamon, lemon peel, black pepper.
- ☑ Vacuum and wash down pantry shelves to kill eggs.
- ☑ Dust shelves and cracks with a dehydrating dust.
- ☑ Store grains and flours in pest-tight containers (e.g. a glass jar with a rubber seal and a metal spring clamp; zip-lock type bags are not adequate). Freezing newly purchased bulk grains for a week will guarantee no new moths.
- ☑ If moths persist, try non-toxic, sticky, meal moth traps with pheromones.

Silverfish

- ☑ Silverfish feed on paper, glue, starch and some fabrics. They like warm and damp areas. Their presence can be an early indication of wood rot.
- ☑ Dry out damp areas.
- ☑ Vacuum to eliminate any food source in carpets and cracks. Follow advice under Roaches above.



Garden and Outdoor Pests

In general, it is easier to figure out how to control the pest if you know what it is. Bring a sample of the bug and the damage it is causing (in a sealed container) to a nursery, or to your County Agricultural Extension Office. Remember, some

insects are beneficial so be judicious in selecting bug control methods.

- ☑ Introduce frogs, toads, lizards and non-poisonous snakes into your yard.
- ☑ For small infestations, hand-pick or spray with full-force spray of water.
- ☑ Use a homemade plant spray: See Recipe 11 in Appendix 1.
- ☑ Use a homemade bug trap. See Recipe 17 in Appendix 1.
- ☑ To protect local beneficial insects like green lacewings and lady bugs, avoid using conventional pesticides. To attract and keep beneficial insects, grow a variety of flowering plants for year-round blooming. They need nectar, too.
- ☑ Less-toxic products to consider first: dehydrating dusts (e.g. diatomaceous earth and silica gel); horticultural oil sprays (dormant oil in winter; and summer or supreme oils for the rest of the year); insecticidal soaps; biological pesticides (e.g. *Bacillus thuringiensis*).
- ☑ For severe infestations, use the least toxic insecticide (e.g. pyrethrin) available to get the job done.

Aphids

- ☑ Aphids almost always arrive before their predators. Don't panic. While you're waiting...Crush dense colonies at plant tips.
- ☑ Spray off with a strong stream of water.
- ☑ Spray with insecticidal soap. See Recipe 11 in Appendix 1. Try solution on a few leaves first—oil may harm vegetable plants in the cabbage family. Works on mites too.
- ☑ Introduce green lacewings to your garden. They stick around longer than imported lady bugs. Green lacewings love perennial bunch grasses growing in the shade. They appreciate

a source of nectar and pollen in the winter (e.g. fennel and calendulas).

- ☑ Control aphids by controlling ants if ants are seen in aphid-infested areas. See ants.
- ☑ Don't fertilize plants with high nitrogen fertilizer in early spring. Aphids love the fast, new growth. Use a slow-release fertilizer like fish emulsion.

Caterpillars

- ☑ Hand pick, if possible. (It has been reported that tomato hornworms glow at night under a "black light.")
- ☑ Apply products containing *Bacillus thuringiensis* (B.t.) an effective and popular product. Must be applied to the leaves when the caterpillars are eating. Safe to mammals and other insects, but will kill butterfly caterpillars, too, so be sure to target only the pest caterpillar-infested plants.

Flies

Successful fly control requires eliminating fly breeding areas rather than trying to control adult flies after they emerge. Keep kitchen garbage containers tightly closed. Clean regularly. Sprinkle dry soap or kitty litter into bottom of container. Rinse out your recyclable containers.

Check your yard for: garbage cans with loose lids, fruit rotting under trees, pet waste not collected daily, compost piles that are not turned at least once a week and where decomposing food is not covered with dirt or black plastic.

- ☑ Use bug trap. See Recipe 17 in Appendix 1.
- ☑ Screen windows and doors.
- ☑ Use fly swatters, flypaper (streamers), traps with pheromones (sex attractant) or meat-baited traps.
- ☑ Place tansy (a plant) near kitchen door or wherever flies tend to cluster.

- ☑ Use oil of cloves as a repellent.

Mosquitoes

- ☑ Screen windows and doors.
- ☑ Remove all standing water near your house (tires, wading pools, bird baths, vases, barrels). Critical step!
- ☑ Stock ornamental ponds with mosquitofish (about 2 ½" in size)
- ☑ Use *Bacillus thuringiensis israelensis* (a non-toxic, biological control) in ponds. Kills the larvae in the water.
- ☑ Encourage mosquito predators: birds, frogs, turtles, ants, spiders, dragonflies, bats, praying mantids.
- ☑ Repellents: Rub pennyroyal on the skin; eat garlic; steep garlic in hot water to make a strong garlic scented liquid. Strain and spray on exposed areas; use citronella oil based insect repellents. Burn citronella candles or oil at outside gatherings. While not proven, some people find that mosquitoes find them less attractive if they take B vitamins.
- ☑ Don't wear any strong smelling products like lotions, deodorants, hair spray, sun tan oils. They attract mosquitoes.
- ☑ The more-toxic mosquito repellent should be applied to clothing, not to skin. (Test fabric first to see if it will stain.) Do not use products containing DEET on children.
- ☑ Yellow porch lights don't attract flying insects.

Snails and Slugs

- ☑ Minimize breeding spots-shady, cool, moist spots in the garden like an ivy patch, agapanthus, lilies, ice plant, wood pile, empty flower pots, etc.
- ☑ Hand pick-safest and surest method. Snails are active at night. With a flashlight, check

traps (see below) 2 hours. after sunset or in early morning. Kill snails by smashing or drowning in soapy water. (Dead snails will attract flies if not covered with dirt or collected in a bag).

- ☑ Use copper barriers (see below) to protect plants.

If infestation is severe, judicious use of a metal-dehyde snail bait may be needed. Be sure that pets can't get at it, e.g. place bait inside flattened tin cans (that snails can enter but your pet can't "nose" into) in the garden section with the most snail damage. The bait can attract and poison dogs. It is also toxic to birds, so place bait carefully.

Traps:

- ☑ Propped up, overturned clay pots, boards, or black plastic sheeting.
- ☑ Sink shallow pans, filled with stale beer, in the ground, with the rim even with ground level. Remove dead snails regularly. Yeast in the beer attracts snails.

Barrier:

- ☑ Copper stripping (2" +) mounted around raised planting beds keeps snails and slugs out of the protected area. (Snails won't cross copper.) Be sure to capture all snails already in the area. Bend sharp edges under to protect children and pets.

Termites

- ☑ If you suspect you have termites, have the type identified.

Prevention:

- ☑ Subterranean termites need water, so keep water away from the perimeter of the house.
- ☑ Keep area under and around the house free of decaying wood. Wood (house frame or firewood pile) should not be in direct contact with soil.

- ☑ Build with borate-treated wood.
- ☑ Watch for and destroy any termite-built earthen tubes (pencil width) in basement and foundation area. These are a sure sign you have subterranean termites.

Treatment: Hire a professional who uses some of the following less-toxic techniques:

- Sand barrier around the house.
- Heat or cold treatment for drywood termites.
- Silica gel (dust) applied in attic.
- Use of less-toxic pesticides like pyrethroids, borax, and methoprene.
- Use of termite baits
- Use of natural predators such as a certain species of nematode.

Wasps and Yellow Jackets

- ☑ Use non-toxic wasp traps (basically yellow jacket plastic boxes wasps can't get out of).
- ☑ Trap wasps by suspending a piece of raw meat ½ inch over soapy water in a 5-gal. bucket.
- ☑ If you find a wasp nest, contact your County Agricultural Extension Agent for information on how to destroy it safely.
- ☑ Attract natural predators to your yard. Non-poisonous snakes, particularly black snakes, feast on yellow jackets and wasps, and are an effective means of pest control.

FUNGUS & WEED CONTROL AND FERTILIZERS

Fungus Control

Choose plant varieties that are tolerant of or resistant to the fungi in your area. Roses are the most susceptible to fungi.

Plant roses in full sun, at least 3 ft. apart for good air circulation. Avoid overwatering. Remove and carefully dispose of dead or diseased leaves and flowers. Do not add them to the compost pile.

To control powdery mildew on roses, make your own rose spray. See Recipe 18 in Appendix 1. Spray both sides of rose leaves in the morning, weekly.

Spray leaves at the first sign of powdery mildew with an antitranspirant (e.g. Wilt-Pruf or Cloud Cover) as a preventative (not registered as fungicide, but has been reported to be effective).

Or use sulfur-based fungicides, the least toxic of the conventional fungicides. They generally have low toxicity to humans (but sulfur has been known to cause a skin rash when used by persons wearing short-sleeves in hot weather, so cover up).



Weed Control

Pull weeds out with roots, or cut off weeds just below the surface with a hoe, minimizing soil disturbance (Note: Soil disturbance stimulates dormant weed seeds.) Kill weeds before they begin to flower and produce seeds!

To kill the roots and seeds of weeds and the insects in a selected area, cover area for 4-6 weeks in the summer with clear plastic sheeting (1 mil thickness is fine), seal with soil at edges. Wet soil thoroughly before laying plastic. Remove plastic before planting. (Clear plastic heats sub-surface soil better than black.)

Cover areas of garden you want weed free with woven black garden fabric before you plant. You can spread bark over it and it won't disintegrate like black plastic. Garden fabric lets water drain through while preventing weeds from growing.

Cover bare areas of garden with 5" of mulch. The mulch made from eucalyptus contains a chemical that prevents seeds from germinating.

Or, cover bare areas with living groundcover like grass, vetch, annual rye grass, or crimson clover to crowd out weeds. Improves the soil also.

In lawns, sprinkle grass seed in bare areas after weeding to prevent weeds from returning. Be sure to use a high quality grass seed that guarantees a minimum seed purity of 99% or better (i.e. less than 1% weed seeds).

Mow your grass to 2", no shorter. This discourages weed growth if you mow weekly. It also encourages dense growth of grass shoots which crowds weeds.

Use commercially available soap solution/weed killers. Look for products labeled 'Organic' to ensure that they are safe for your family and pets.

To control crabgrass in your lawn, look for a product that is made from corn by-products. There are several brands on the market, but may not be available locally. See resources in Appendix 2 for mail order suppliers.

Weeds can develop resistance to chemical herbicides (weed killers), so the more you use them, the more you have to use in the future (and that costs money!). If you must use herbicides, limit use and paint or squirt product directly on individual weeds. Give herbicides enough time to work. Don't overapply. Control runoff of herbicides. Do not apply weed killers if rain is forecast. Runoff goes directly into our creeks. Herbi-

cides may be toxic to the wildlife in and around our creeks.

Moss

Soap-based moss killers are available. Lime also kills moss.

FERTILIZERS

Soil Additives

Start a back-yard compost pile or a Fertilizer worm bin!! Compost adds valuable nutrients to the soil and improves its consistency. And composting is the best way to dispose of kitchen and yard waste. Why throw away a valuable resource?

Use organic soil amendments such as peat moss, blood meal, bone meal, horn and hoof meal, fish emulsion, and manure.

Consult books on organic gardening practices for more details on how to maintain your lawn and garden with non-toxic fertilizers.

APPENDIX 1: RECIPES FOR HOMEMADE PEST CONTROL PRODUCTS

Recipe 1: All-purpose

Take an empty spray bottle and fill about $\frac{3}{4}$ of the way with water, then add a few drops of Ivory liquid soap, some hot peppers or hot pepper sauce and some garlic. This works well, but needs to be reapplied after a storm and every couple of weeks.

Recipe 2: All-purpose

Grind together three hot peppers, three large onions and one whole bunch of garlic. Cover mash with water and place in a covered container. Let container stand over night. Strain mixture through cheesecloth or a fine strainer and add enough water to make a gallon of spray.

Recipe 3: All-purpose

Mix 2 $\frac{1}{2}$ tablespoons of a mild dish washing detergent plus the same amount of a vegetable cooking oil with one gallon of water. This can be sprayed on all plants. Remember to spray both the top and the underside of the leaves.

Recipe 4: All-purpose

Finely chop 10 to 15 garlic cloves and soak in 1 pint of mineral oil for 24 hours. Strain and spray as is, or add a few drops of soap for extra stickiness.

Recipe 5: All-purpose

Blend $\frac{1}{2}$ cup of hot peppers with 2 cups of water. Strain and spray.

Recipe 6: All-purpose

Combine 1 to 2 cups of rubbing alcohol with 1 quart of cold water. Place in sprayer and seal tightly or the alcohol will evaporate. Test spray on one or two leaves and let stand overnight to see if damage occurs to plant.

Recipe 7: Orange Trees And Rosebush Spray

Soak mashed up tomato leaves in water and apply as spray onto leaves and branches.

Recipe 8: Red Spider Mites, Spiders, Cabbage Worms And Weeds

An ounce of table salt to a gallon of water has been shown to stop these pests. Use a tablespoon of salt to two gallons of water for the worms. Straight salt, especially in non-garden areas can stop weeds.

Recipe 9: Snail Bait

Setting out a tray of beer or any other yeasty, fermented liquid will attract snails from all around your garden.

Recipe 10: Species Specific Spray

Collect $\frac{1}{2}$ cup of a specific pest and mash well. Mix this with two cups of water and strain. Mix $\frac{1}{4}$ cup of this "bug juice" with 2 cups of water and a few drops of soap and spray.

Recipe 11: Plant Spray

Mix 1 T. dishwashing liquid to 1 Cup vegetable oil (add food color to prevent use in cooking). Add 1-2 teaspoons of oil to 1 cup water and spray on plants.

Recipe 12: Grub Control Mixture

Mix 1 Cup each of Listerine,TM liquid dish detergent, and water. Add 2 Cups lemon juice (i.e. bottled from concentrate). Spray on and around plants.

Recipe 13: Heavy Duty Insect Mixture/Nicotine Mix

Pour 1 cup boiling water over a good pinch of chewing tobacco. Let set overnight. Strain mixture and add to one recipe of Grub Control Mixture (recipe 12). Spray on plants. The nicotine in tobacco is a very potent insecticide. Wear gloves when using and DO NOT GET MIXTURE ON SKIN.

Recipe 14: Ant Repellent

1 clove garlic, 1 onion, 1 T. cayenne pepper, 1 qt. boiling water. Steep for one hour, add 1 T. liquid soap. Place in spray bottle and spray in areas where ants have been observed.

Recipe 15: Garden Ant Repellant

Mix 10½ oz water, 3 oz hot pepper sauce, and 2½ oz Dr. Bronner's liquid peppermint soap (or equivalent, available at health food stores).

Recipe 16: Cockroach Bait I

Mix by stirring and sifting 1 ounce Trisodium Phosphate (TSP), 6 ounces borax, 4 ounces sugar, and 8 ounces flour. Spread on floor of infested area. Repeat after 4 days and again after 2 weeks.

Recipe 17: Homemade Bug Trap

Materials: 1 2-Liter plastic bottle, string, 1 banana peel, 1 Cup sugar, 1 Cup vinegar. Slice banana peel into strips and insert them into bottle. In a separate container combine sugar and vinegar. Pour this mixture into the bottle, then fill it to within two inches of the neck with water. Tie the string around the neck of the bottle and suspend in garden or tie to lower branches of fruit trees. Attracts fruit flies, black flies, and yellow jackets, and other sweet loving bugs.

Recipe 18: Rose Spray

spray both sides of rose leaves with a solution of: 2 T. mild liquid soap, 2/3 tsp. baking soda in 1 gal. Water.

Recipe 19: Cockroach Bait II

Combine 2 Cups powdered rodent chow (grind in blender), ¾ cup sugar, and ¼ cup boric acid. Add enough water to make a thick paste. Add green food coloring. Roll into balls about 1 inch in diameter. Place bait balls in locations used by roaches, but out of reach of children and pets. Make new batch every 3 months.

APPENDIX 2: Beneficial Species

Many pesticides indiscriminately kill beneficial species as well as pests. Turning to non-toxic pest control methods allows you to learn to identify beneficial species and appreciate their natural ability to control pests. Below are some examples:

Beneficial Species	Pest managed	Beneficial Species	Pest managed
Damsel Bug	<ul style="list-style-type: none"> • Aphids • Leaf hoppers • Mites • Psyllids 	Toads & Frogs	<ul style="list-style-type: none"> • Flying insects • Snails • Slugs
Lady Bug	<ul style="list-style-type: none"> • Aphids • Aphid larvae • Rootworms • Weevils 	Bigeyed Bugs	<ul style="list-style-type: none"> • Insect eggs • Leaf hoppers • Caterpillars • Mexican Bean Beetle
Parasitic Wasp	<ul style="list-style-type: none"> • Aphids • Gypsy moths • Caterpillars • Cutworms 	Assasin Bug	<ul style="list-style-type: none"> • Potato Beetle • Leaf hoppers • Mites • Psyllids
Lacewing	<ul style="list-style-type: none"> • Aphids • White Flies 	Praying Mantis	<ul style="list-style-type: none"> • Tomato hornworm • Flies
Spiders	<ul style="list-style-type: none"> • Fleas • Treehoppers • Flies • Carrot weevil 	Birds & Bats	<ul style="list-style-type: none"> • Grubs • Caterpillars • Mosquitos • Flying insects

APPENDIX 3: Resources for Further information

Hotlines and Resource Centers:

Bio-Integral Resource Center: (510) 524-2567.

Food & Water (a non-profit advocacy group): 1-800-eat-safe

American Pie (a non-profit advocacy group): 1-800-320-APIE

Pennsylvania Resource Council (PRC): 610-353-1555

Grass Roots the Organic Way (GROW): 610-353-2838

Clean Water Action: 215-629-4022

The Bio-Dynamic Farming and Gardening Association, Inc.: 1-800-516-7797

Catalog Sources:

A.M. Leonard
P.O. Box 816
Piqua, OH 45356
Phone: 1-800-543-8955

ARBICO Environmentals
P.O. Box 4247
Tucson, AZ 85738

Emmanuel Farms
P.O. Box 540684

Gardener's Supply Co.
128 Intervale Rd., Dept. PR97
Burlington, VT 05401

Gardens Alive!
5100 Schenley Place
Lawrenceburg, IN 47025
Phone: 812-537-8650

The Green Spot
93 Priest Road
Nottingham, NH 03290

Harmony Farm Supply
3244 Gravenstein Hwy., No. E
Sebastopol, CA 95472

Johnny's Selected Seeds
310 Foss Hill Rd.
Albion, ME 04910

Natural Insect Control
RR2, Stevensville
ON Canada L0S 1S0

No Pest
Box 1162
Old Saybrook, CT 06475

Peaceful Valley Farm Supply
P.O. Box 2209
Grass Valley, CA 95945

Planet Natural
P.O. Box 3146
Bozeman, MT 59772
Phone: 1-800-289-6656

Other Resources:

Organic Gardening Magazine published by Rodale Press. Hands down the best resource out there for learning more about less-toxic pest control and gardening methods. Rodale press also publishes numerous books on the subject.

APPENDIX 4: Shopping List of Safer Alternatives

Take this list to the store with you.

Insect control

- Ant and Cockroach baits (e.g. Combat or Antrol)
- Bacillus thuringiensis (B.t.) (e.g. Dipel and Ringer Vegetable Insect Attack for caterpillars)
- Bacillus thuringiensis israelensis (B.t.i.) (e.g. Ringer Mosquito Attack Rings for mosquitoes)
- Beer
- Beneficial insects (Green Lacewings, Lady bugs, Encarsia wasps, Praying Mantids (don't expect mantids to eat a lot of pests; buy them as pets or use as an educational tool for your children)
- Boric acid (dust) Should not be accessible to children or pets. It is a poison. However, the powder is not considered to be extremely toxic to humans. Should be easy to find in hardware and drug stores. (e.g. Roach Prufe).
- Caulking, screening, weather-stripping
- Citronella candles or oil. Try hardware stores, or import stores.
- Copper stripping (e.g. Snail Barr)
- Diatomaceous earth "DE" is a dust composed of the fossilized remains of one-celled algae. It kills insects by scratching their protective outer wax coating, and then dehydrating them. DE must be kept dry to be effective. Wear a dust mask (find in paint supply stores) while applying (as you should with any fine dust). Use horticultural or food-grade, not swimming-pool grade; and should contain amorphous silica, not crystalline silica.
- Double sided tape
- Fly swatters, non-toxic flypaper strips, fly traps
- Garment bags
- Herbal insect repellants (bay leaves, coriander, dill, cinnamon, lemon peel, black pepper corns)
- Horticultural oils (superior, supreme, summer oils; and dormant oil in the winter.)
- Insecticidal soap (potassium salts of fatty acids; e.g. Safer Inc./Ringer or Orthogonics-find in nurseries and hardware stores.)
- Kitty litter

- Meal moth traps (with pheromones)
- Pyrethrin If you must use a chemical pesticide, this is one of the safest ones, but it is still quite toxic so handle it with care. Look for it without other chemicals (e.g. Safer/Ringer products); or with the "synergist" piperonyl butoxide (PBO-a chemical commonly mixed with pyrethrin to prevent it from breaking down so quickly) and inerts (e.g. Schultz Instant Insecticide or Ortho Rose and Flower Insect Killer).
- Roach traps (e.g. Roach Motels)
- Sealed food containers
- Silica gel
- A fine dehydrating dust (a dust that can absorb moisture). Kills insects by drying them out. Wear a dust mask while applying. Used by some pest control operators. Not yet widely available in retail outlets locally. Watch for, and ask for, silica gel products (e.g. Fairfield American Corp.'s Drione and Roxide International's Revenge Home Exterminator (both combine silica gel with pyrethrin))
- Sticky ant barrier for trees (e.g. Tanglefoot)
- Trisodium Phosphate
- Wasp traps

Fungus and Weed Control

- Antitranspirants (e.g. Wilt-Pruf; Cloud Cover)
- Clear plastic sheeting
- Garden fabric
- Hoe
- Lime
- Soap solution weed killers (e.g. Safer's Sharpshooter)
- Sulfur-based fungicides

Soil Additives

- Organic soil amendments: blood meal, bone meal, horn and hoof meal, seaweed.
- Fish emulsion
- Manure
- Materials to make a compost bin (e.g. chicken wire)
- Peat moss

