

Integrated Pest Management Methods for the Home

The first step in proper management is to identify the pest population and to understand a specific pest's life cycle stage for proper treatment. Active monitoring and persistent prevention methods are the most resilient and sustainable IPM methods you can employ. Pesticides must be used in accordance with federal, state, and local regulations. Applicators must have proper credentials to apply pesticides and should always wear personal protective equipment (PPE) as required by the pesticide label during applications.

Pest Identified	Preventative Practices	Mechanical, Biological, & Chemical	Further Tips & Info
<p>Ants (<i>Solenopsis</i> species; general harvester ants)</p>  <p>Bugguide.net © 2016 Salvador Vitanza</p>	<p>Inspect locations where there is food, plant/organic material, or standing water. Keep locations sanitary;</p> <p>If there are trails, follow them to the entry point, and obstruct their entrance from the outside;</p> <p>Store trash far enough from the house;</p> <p>Repair water fixtures that may be leaking (faucet, shower head, hose bib, etc.);</p> <p>Ensure that there are no cracks or crevices that ants can travel through in your exterior foundation wall, or along structural elements like pipe and wiring.</p> <p>Vacuuming or mopping ant trails/colonies with a soapy solution may be an effective insecticide.</p> <p>Certain plant based oils, such as peppermint, rosemary, orange, clove, and thyme, may work as effective pesticides.</p> <p>Liquid borate products may have more of an impact on the colony.</p>		<p>Got Ants (collaboration between public agencies, educational institutions, and pest professionals): http://www.gotantsgetserious.org/</p>

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Carpenter ants (*Camponotus modoc*)



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Trim woody plants away from structures, remove plant materials away from foundation (mulch), keep firewood off the ground and away from building to prevent access points;

Seal and insulate potential entryways (gaps made from utility lines, piping, etc.);

Minimize/do not allow dirt-wood contact for anything structural – it may promote decay. Remove and replace any wood that is decayed or damaged and correct what caused problems;

Ensure attic and subfloor spaces are well ventilated;

Set out nontoxic baits like sugar milk, diced crickets, or mealworms;

Set diatomaceous earth in areas where there are insects;

Use desiccant dusts because they have a lower toxicity to humans;

Insecticides containing pyrethroids, such as permethrin or cyfluthrin, disodium octaborate tetrahydrate or desiccants are effective controls.

University of California's Integrated Pest Management Program:
<http://ipm.ucanr.edu/PMG/PESTNOTES>

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Aphids (Aphididae family)



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Aphids are most likely to frequent immature plants or parts of the plant that are new, so inspect rosettes and chutes. They also prefer the underside of leaves;

Remove infestations in gardens before introducing more plants. Check transplants for pests before installing;

High level nitrogen fertilizers may attract ants, so only fertilize using the nitrogen amount needed. Time-based and organic fertilizers tend to work better;

Quarantine plants that are infested and remove them immediately to prevent further spreading;

Aphids secrete a nectar fluid that attracts ants, so preventing either pest is mutually beneficial for controlling both;

Cover young plants and seedlings in beds or in a greenhouse with row cover, or another appropriate cloth;

Reflective mulches around plants also deter aphids while also providing more solar radiation for photosynthesis;

Prune infected leaves and dispose of them - don't compost. Taking off infestations with a high pressure water stream can work;

Oil-based herbicide solution (neem, canola, horticultural oil, etc.) will suffocate the aphids and are a safer alternative to synthetic sprays. Based off your solution, the label on the bottle will determine the oil-water ratio and specify whether it's a foliar spray;

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<p>Aphids (continued)</p>	<p>Insecticides containing malathion, permethrin, and acephate should not be applied to food crops. They should be limited because they also kill other natural enemies to aphids, or potentially beneficial insects. Repeated application of these materials may also cause aphids to biologically resist them. Imidacloprid insecticide can negatively impact pollinators;</p> <p>Lady beetle, lacewing flies, and soldier beetles feed on aphids and make an effective control.</p>	
<p>Bed bugs (<i>Cimex</i> species)</p>  <p>Bugguide.net © 2016 Barbara Thurlow</p>	<p>Put bedding and clothing in the dryer at high temperatures for 30 minutes to kill bed bugs (just washing will generally not kill bed bugs);</p> <p>Heat infested articles (e.g., furniture, luggage, other items that can't go in a clothes dryer) and/or areas (i.e., a room in a house or apartment, or a whole house) to at least 120 °F for 90 minutes to ensure that eggs are killed;</p> <p>Cold treatments (below 0 °F for at least 4 days) can eliminate some infestations;</p> <p>Use mattress, box spring, and pillow encasements to trap bed bugs and help detect infestations;</p> <p>Use monitoring devices to ensure that the bed bugs have been truly eradicated;</p> <p>Diatomaceous earth suffocates pests with exoskeletons and can do the same for bed bugs.</p>	<p>University of California's Integrated Pest Management Program: http://ipm.ucanr.edu/PMG/PESTNOTES</p>

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Deer and house mice (*Mus musculus* and *Peromyscus* species)



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Habitat modification, exclusion, and sanitation are effective in eliminating rodent problems;

Seal up entry holes greater than or equal to ¼". Seal floor drains with hardware cloth with mesh smaller than ½". Install heavy-gauge kick plates at the base of any doors that have evidence of rodent gnawing;

Clean clutter and debris, keep storage off of the floor to routinely monitor potential populations;

Remove mulch from building foundations to reduce harborage, including plant materials directly proximate to buildings;

Move trash disposals away from entrances and make sure they have tight-fitting lids;

Prevent water accumulation in or near the building - clean gutters, fix indoor leaks, improve drainage;

Use traps along common rodent runways with the trigger side of the trap facing the wall. Peanut butter, sunflower seeds, oatmeal wrapped with string are effective baits. Mice are neophobic, so allow the traps to sit for a week;

To prevent diseases spread by mice, such as the hanta virus, disinfect affected areas with a mixture of one part bleach to 9 parts water;

Rodenticides should be tried last and should be used to reduce nontarget exposure.

University of California's Integrated Pest Management Program:

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Center for Disease Control

<https://www.cdc.gov/hantavirus>

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<p>Furniture beetle (<i>Anobium punctatum</i>)</p>  <p>Bugguide.net © 2011 Mike Quinn</p>	<p>For wood-boring beetles, prevention is the best management strategy through every phase of the production and manufacturing timber companies. For sanitation, remove and destroy dead limbs around buildings or where wood products are stored.</p> <p>Thoroughly inspect building materials during project construction, firewood, or wooden furniture when moving indoors to confirm that there are no wood-boring beetles. For firewood, bring inside only what you will use in a day. Painting or varnishing wood will help prevent beetles from reproducing. Remove, replace, and destroy infested wood immediately.</p> <p>The safest pesticides contain sodium borate; it must penetrate the wood to kill larvae, so do not apply to finished wood. Moist wood increases the solution's penetration depth.</p> <p>For powderpost and deathwatch beetle infestations, some professional pest control operator offer whole building fumigation. Fumigation does not prevent reinfestation, but result have shown that fumigation is a useful control for both adults and larvae.</p>	<p>University of California's Integrated Pest Management Program: http://ipm.ucanr.edu/PMG/PESTNOTES</p>
<p>Honey bees (<i>Apis</i> species)</p>  <p>Bugguide.net © 2016 Kala King</p>	<p>Removing clusters is much easier than removing colonies. You can prevent colonies from establishing by trapping clusters that are beginning to forage to establish comb. Before trapping and potentially eradicating them, consider that bees are being threatened by colony collapse disorder (CCD) and can be removed to another location that won't cause a nuisance. Trapping them in hardware cloth/screen (6 or more holes per inch), or something they can't escape from, will eventually cause the cluster to die out because they can't forage.</p>	<p>University of California's Integrated Pest Management Program: http://ipm.ucanr.edu/PMG/PESTNOTES</p>

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	<p>Once a comb is present, bees' acute sense of smell will attract them to its current or previous location. If the comb was inside a building, cavities the same size or larger than the diameter of a pencil shall be filled/caulked.</p>	
<p>Invasive plant species</p>  <p>Cheat grass © USDA/USFS</p>	<p>See the County's Invasive Weed Management ID page to further access treatment.</p>	<p>Visit the Arboretum at Flagstaff, the San Francisco Peaks Weed Management Area, or the Coconino National Forest headquarters to further identify.</p> <p>University of Arizona Cooperative Extension – Coconino County: https://extension.arizona.edu/sites/extension.arizona.edu/files/resources/best-practices.pdf</p>
<p>Mosquitoes (Culix tarsalis)</p> 	<p>Keep your yard clean and clear of debris;</p> <p>Dump or cover any standing water. If you have water that cannot be dumped, such as a pool or pond, treat it with the proper chemicals;</p> <p>When opening doors and windows during the summer season, make sure your screens are intact and in proper working order;</p> <p>Apply insect repellent or wear long sleeved shirts and pants if you plan to spend time outdoors. If applying insect repellent, be sure to follow the direction on the package.</p>	<p>Arizona Department of Health Services: http://www.azdhs.gov/preparedness/epidemiology-disease-control/mosquito-borne/index.php</p>

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Scale (Coccidae Family)



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Growing plants in healthy conditions (proper irrigation, etc.) will minimize the risk of a scale outbreak;

Remove problem plant species or plants that tend to get infected more than others in the garden;

Conserving natural predators (ex: controlling pest-tending ants) may bring gradual control of certain species of scale. Examine the scale to see if they are dead or parasitized, because their natural predators may be working to your benefit and will negate the need for insecticide;

In summary, ant control and habitat manipulation are keystone IPM methods. Grow flora that attract natural enemies;

Prune off heavily infested portions of the plant, if it's limited. Many gardeners try not to prune more than 20% of a plant's vegetation in order not to stress it. Opening tree canopies by pruning or thinning in the hottest period of summer can reduce populations of black scale, citricola scale, cottony cushion scale, and possible other scale species through exposure to heat and parasites;

Double-sided tape can be a foliar application to remove scale. During spring before crawlers begin to emerge, circumscribe branches with the double-sided tape and change at weekly intervals. Scale crawlers get stuck on the tape and are yellow-orange in color;

Predatory bugs: lady beetle - species of Chilocorus, Hyperaspis, and Rhyzobius; parasitic wasps - species of aphytis, coccophagus, encarsia, and metaphycus

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<p>Scale (continued)</p>	<p>Well-timed spray of horticultural oil during plant dormancy is an effective abatement strategy. Do not spray oystershell or olive scales during dormant season because susceptible stages of these species are not present during winter;</p> <p>A solution of rubbing alcohol and water may be applied to kill scale. Insecticidal soap, neem oil, and canola oil are low toxicity pesticides with minimal adverse environmental impacts.</p>	
<p>Tent caterpillars (<i>Malacosoma</i> species)</p>  <p>Bugguide.net © 2016 Evan Dankowicz</p>	<p>Populations of tent caterpillars tend to be concentrated in individual trees scattered throughout the orchard. Treatment is only occasionally required and can be limited to small areas of the orchard;</p> <p><i>Bacillus thuringiensis</i> sprays and pruning out infestations are organically acceptable management methods;</p> <p>On small trees, cut out and destroy infested twigs;</p> <p>Spray programs for other insects generally reduce populations. If insecticide treatments are required, localized treatments on individual trees and branches are generally all that is necessary. Treat when small caterpillars are first observed. The addition of a wetting agent to increase penetration of the webbing by the insecticide enhances control.</p>	<p>University of California's Integrated Pest Management Program: http://ipm.ucanr.edu/PMG/PESTNOTES</p>

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Termites



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Sand barriers: for subterranean termites are a physical deterrent because the termites cannot tunnel through it. Some integrated pest management experts have developed a machine, called a sand pump, which blows sand under the house. For sand barriers around the outside perimeter of a foundation, they recommend a sand trench in order to avoid disturbance of the sand. In addition, a cap made of masonry or other materials may be recommended to protect the barrier from gardening, animals, etc. Tamping of sand can be done to increase impermeability to termite attack;

Masonry caps: In place of using termite shields on a hollow-block foundation, you can fill the block with concrete or put a few courses of solid or concrete-filled brick. The same approach can be used with support piers in the crawlspace.

Metal shields: For use on foundation walls, these shields should be made of non-corroding metal and have no cracks or gaps along the seams where sections are attached.

Termite mesh: Fine metal mesh is used to prevent termites from entering the structure and accessing untreated wood. They cannot pass through the mesh openings, and they cannot chew it.

See County's termite control document on website:
<http://www.coconino.az.gov/DocumentCenter/View/5477>

References:

United States Environmental Protection Agency – “Introduction to Integrated Pest Management”

Center for Disease Control and Prevention – “What is Integrated Pest Management?”

Arizona Pest Management Center, University of Arizona – “Handbook on Pests of Community Environments in the Desert Southwest United States”