

How to Bug Proof Your Home



AZ 1320
Revised 07/09



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This information has been reviewed by university faculty.

cals.arizona.edu/pubs/insects/az1320.pdf

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Revised 07/09

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Pests or Beneficial Insects?

In Arizona some 15,000 species of insects have been identified, a large percent of which (>95%) are either harmless or beneficial to humans. They live in an environment that is delicately balanced ecologically. The term “pest” is not the name of an ecological niche, but more of a misunderstanding on the part of the human species, who set out purposely to disrupt the balance of nature. For example, the termite is much maligned, but its role in nature is of the utmost importance. Termites feed primarily on dead wood and plant materials, breaking them down and recycling nutrients useful for further plant growth. However, termites are often referred to as pests due to the occasions in which they attempt to recycle our homes and buildings. Wasps, as a group of insects, are also considered an adversary and are often feared irrationally. However, the larvae of parasitic wasps are important in balancing the populations of other insects, such as caterpillars, leafhoppers, or cicadas. It is apparent that complete eradication of one insect species will cause an increase in the populations of others. Many pest insects are food sources for birds and other insect-feeding species. Therefore, a rapid decline of insect populations could be followed by a decline of many other species. Of course, not all pests are insects, many vertebrates including: gophers, rattlesnakes, spiders and pigeons are a concern for residents, though they also have a role in the ecological balance.

It is important to learn about creatures in and around our homes, and appreciate the role they play. However, we need not compromise our own interests and invite them into our home. This document is written to demonstrate how the home can be modified to exclude unwelcome visitors and make it less attractive to them. Generally, we can discourage pests from bothering us without having to remove them completely and certainly without using pesticides.

If done correctly, pest-proofing your home actually generates long-term savings in pest management costs. Far too often, the homeowner resorts to repeated pesticide applications. Costs can dramatically increase in this way, and you may become frustrated by this approach, especially when the situation or problem is not resolved. Simply excluding pests from your home by following some general measures provided in this document will give you the best approach to managing unwanted visitors in your home, school, or work-place. Many professional companies provide pest-proofing services. Generally it is money well invested!

Another benefit of pest-proofing homes and buildings is an improvement in energy efficiency of the building, resulting in a welcome reduction in utility bills.



Dr. Marc Lame Indiana University, inspecting a school building

General measures for keeping out uninvited guests

Inside

- 1. Screen all openings.** Include screens (20 mesh) on doors or windows that can be opened, and on all ventilation openings. Keep screens in good repair. This stops the entry of many pests. However, certain tiny pests, such as aphids and leafhoppers can get through standard mesh screening. The only way to deny entry to these small pests is to keep windows and doors closed.
- 2. Install door sweeps and repair thresholds at the base of all exterior entry doors.** No light should penetrate underneath exterior doors. The bottom of garage doors can be fitted with a brush or rubber seal (not vinyl as it performs poorly in cold weather). Sliding glass doors can be sealed by lining the bottom track with foam weather stripping.



Unsealed doorway

- 3. Door seals.** Be sure to inspect all seals of doors including the tops and sides. This is especially true for double doors that lack a central vertical support.



Unsealed doorway

- 4. Fill cracks.** To exclude rodents, lizards and insects look for cracks around windows, doors and in fascia boards. For small cracks, use good quality silicone sealant. Silicone lasts longer than many latex caulking materials, as it expands and contracts more effectively with changing temperatures. For larger openings, fill with a strong material that matches the structure such as wood, cement, sheet rock or mortar.



Openings under roof line

- 5. All outside doors should be self-closing.** Where this is not possible, a second screen door should be installed. This is particularly important for areas prone to scorpion activity.

- 6. Seal all utility openings.** Include entry points of pipes and wires, around outdoor faucets, gas meters and laundry vents. Cracks should be cleaned and any peeling material removed. The hole can then be filled with a suitable sealant.



Loose escutcheon plates

- 7. Repair leaky piping.** This will reduce water availability to pests. Inspect plumbing regularly, as a problem may not be apparent. Water damage can also weaken walls creating additional entryways.



Tiles in drop ceiling indicating a plumbing leak

- 8. Install wire mesh.** Use ¼-inch hardware cloth over the attic, roof, chimney and crawl space vents in order to prevent entry of birds, bats, squirrels and rodents. Wear gloves when installing hardware cloth, as the wire edges are extremely sharp. Mesh screens can also be installed around the base of portable classrooms. The crawl spaces are attractive to many pests such as widow spiders, scorpions, cats and rodents that may create further insect and health problems (e.g., fleas, ticks, etc.).

9. **Use airtight storage containers.** This is especially important when storing pet or human food! Certain small ants can gain access into ordinary jars by following the thread. If in doubt, keep the food in the refrigerator or freezer.
10. **Employ good sanitation procedures.** Vacuum up all food crumbs; do not let soiled dishes or containers sit out overnight. Clean under kitchen appliances and clean pet food dishes.

Outside

1. **General yard clean up.** Remove clutter, in particular leaves and grass clippings from around the foundation and clean out window wells and drainage guttering. Prune shrubs and tree limbs touching the house to eliminate entry points.



Natalie and Jacob Stoltman helping with the yard clean up



Vine against the wall provides pest harborage areas and access to the building

2. **Use pest resistant trash receptacles.** Lids should be self-closing with a tight seal. Dumpsters must be steam cleaned frequently.
3. **Pest-proof your compost bin.** A well-maintained compost bin will not attract pests into the area. Do not compost any meats, fish, bones, oils, fatty foods or dog/cat manures. Burying food waste into the center of the pile will reduce smells that attract pests. Ensure that each layer remains slightly damp and turn or poke holes in the pile every week or two to discourage nesting. Harvest finished compost at the bottom of the bin every three to six months. Avoid rodents and other small animals gaining access with a secure lid and stop them from burrowing in by lining the bottom and sides of the bin with hardware cloth (galvanized wire mesh). Piling rocks or bricks around the outside is also helpful.



Composting bins on stands such as these are easy to rotate

4. **Encourage birds and bats.** They are excellent predators of pests. To persuade birds to take up residence in your yard, plant trees or shrubs for nest sites, and provide a fresh water source. To encourage bats, put up houses for bats to roost during the day.
5. **Plant flowers.** This will help to encourage many beneficial insects. For example, the annual flower, alyssum, attracts flower flies and tiny parasitic wasps. As long as no one in the family is allergic to wasp stings, you can set aside an area of your yard for insect-loving plants. Wildflowers and native shrubs are an effective and attractive addition to a yard.

6. **Regular maintenance checks.** This requires a specific “walk-around” to inspect areas of previous insect activity and ensure all pest-proofing measures have remained intact.



Grate and drain covers should be removed and cleaned out periodically



Access panels should not be left open

People who choose not to tackle these activities can hire a professional landscape and/or pest management firm to do it for them. Many companies offer pest-proofing advice, and monthly monitoring, as part of their services.

Pest-proofing will reduce almost all incidents but it is extremely difficult to create a fully secure completely bug free area, nor is it really necessary. In most cases, a vacuum cleaner or broom is the best response to the occasional bug that wanders in from outdoors.

A detailed look at our more troublesome visitors

I) General Pests

A. Ants

Several ant species may be found in or around the home. They enter houses in search of food in the early



Southern fire ant nest

spring through late fall when their normal food is not readily available outside. Usually their presence is merely annoying but there are certain species that are undeniably problematic.

The southern fire ant (*Solenopsis xyloni*) is native to Arizona and is commonly found around homes. Fire ants do not usually pose a threat to healthy adults, though they can be dangerous for the young, elderly and the infirm.

In the event of a reaction to a fire ant sting, call the **Arizona Poison & Drug Info Center at 1-800-222-1222**, or 911 if the reaction is serious.

Fire ants sometimes nest indoors in wall voids. Bath traps, shower stalls, and hot water heater walls are particularly well suited areas for fire ants. Outside, fire ants take advantage of disturbed soil, like in a garden or flower bed that is watered regularly. Their nest is fine sand grains loosely distributed on soil surface with no regular structure evident. Southern fire ants love bare, exposed ground. Applying glyphosate (Round-up) around the edges of playing fields can generate significant problems. **Maintaining healthy turf is the most effective way of discouraging fire ants from around your home.**

Thief ants (*Solenopsis molesta*) are closely related to the southern fire ant. The thief ant takes its name from their habit of nesting close to, and in some cases inside the nests of other ants, from which they steal food.

Thief ant colonies may be found indoors and outdoors. Nests are large and often have tiny tunnels connecting to the nearby nests of larger ants from which they habitually steal food and brood. Outside

they can be located under rocks, around walkways and house foundations, in rotting wood and exposed soil. Indoor nests may be found in any small crevice, particularly woodwork and masonry, under floors and behind baseboards.

These ants are prevalent in households, in which they forage for foods with a high protein content such as grease, cheese, meat and hollowed out seeds for the oil content. It is important to note that due to their small size, they can easily enter packaged foods. Unlike most other ants, they do not appear to feed on sweets. They travel great distances in search of food, and once a source is located, they form a trail of ants from the food to the nest.

Carpenter ants (*Camponotus* spp.) are also problematic to humans. Although they are an important element in nature by enhancing the decay of dead wood, they are structural pests to homeowners.



Carpenter ant

The black carpenter ant (*Camponotus pennsylvanicus*) is most common in the east and *C. modoc* is a common western species. These are the two most thoroughly studied species in the United States. Species of carpenter ants in western states that are either structurally damaging or nuisance pests include: *Camponotus modoc*, *C. vicinus*, *C. herculeanus*, *C. noveboracensis*, and *C. essigi*. Other species of carpenter ant are distributed throughout the country.

Carpenter ants prefer moist softened wood and colonies are often established within buildings in areas where water leakage occurs. This may be areas such as porch pillars, around bathtubs, sinks, roof leaks, poorly flashed chimneys and poorly sealed windows and doorframes.

If an initial colony of carpenter ants is first established outside within 300 feet of a building, satellite colonies may then be formed inside the building. It is therefore important to take note of what is happening outside before they come in. Look for the initial outside nest in decayed wood, such as dead trees, stumps, logs or decorative landscape wood. Once established, the ants may eventually extend their tunneling into sound wood. If a carpenter ant colony has been identified in the yard, take steps to remove it before it migrates into the home.

When carpenter ants are spotted inside dwellings, it does not mean that a colony has also been established inside the house. They may be simply foraging for food. This is called non-seasonal foraging. Outdoor colonies typically forage during the spring and summer only.

Pyramid Ants (*Conomyrma* spp.) do not nest inside structures; instead, shallow nests are dug in soil and found in dry, open, sunny areas. There is one entrance, surrounding which is a raised circular area, usually, 2 to 4 inches (5 to 10 cm) in diameter. This is constructed of soil excavated from inside the nest chambers. Pyramid ants rarely enter or become pests in buildings, and infestations are generally the result of foraging workers entering in search of food. The ants do not possess a sting and are considered harmless.

This ant is named after the pyramid shaped projection on the top of its thorax. There are two species in Arizona; the simple pyramid ant (*C. insana*) and the bicolored pyramid ant (*C. bicolor*). When alarmed they produce an odor, like that of rotten coconut to deter predators.

Pyramid ants will feed on a variety of foods including other insects. Although they are carnivorous and predacious, they have a preference for sweets, particularly honeydew of sap-sucking insects such as aphids, mealybugs, leafhoppers and whiteflies. The ants will tend to these insects and protect them. When foraging the workers move quickly in strong, easily detected trails.

Preventing Ant Infestations

1. Practice good sanitation methods.
2. Store food in airtight containers.
3. All cracks and openings into buildings should be sealed as completely as possible. Check the seal around air conditioning units, windows, doors, pipes or other openings into the home. Repair

cracks and holes in floors, walls and ceilings. Seal openings around plumbing fixtures, furnace flues, electrical outlets, windowsills and walls, and along baseboards and ceiling moldings. Thresholds on doors should be as tight as possible and cracks in porches and stoops should be sealed.

4. Remove moisture sources. Roof leaks and plumbing leaks must be repaired.
5. Tree limbs must be clipped back and vegetation touching the roof or siding of the house removed. Also, keep shrubbery away from air vents.
6. Wood-to-ground contact should be eliminated. Firewood must be stacked away from the foundation and elevated off the ground. Soil or mulch should not be placed up against the wood siding of a home.
7. General surveillance of the yard and house is important. Inside inspect the edge of carpets and along walls and baseboards. Also, examine areas near water sources since ants will move indoors in search of water. Outside look around vegetation, along lawn and sidewalk edges and under mulch. When foraging ants are found, try to trail them back to their colony location.
8. Instruct members of the family on identifying and avoiding fire ants.
9. The best way however, to control carpenter ants is to locate and directly destroy the nest. Otherwise, the colony can quickly infest your home. A professional will be able to do this using reduced-risk pesticides upon your request.
10. Killing foraging ants is not an over-all effective management strategy. Avoid using pesticide sprays on foraging ants. Cleaning up ant trails with soap and water, along with vacuuming up foraging ants, is preferable. Focus on addressing the fundamental reason why the ants are present, and remediating those conducive conditions.

B. Booklice

Booklice (*or Psocids*) may look like lice but they are not related. Living in damp environments, they feed on mold and mildew. They are often associated with books and papers though they are also prevalent in drains, wall cavities around leaking pipes, wall voids, stored food products and floor rugs. Outside the house, *psocids* live in bird or mammal nests, vegetation, in tree bark and even in animal fur.

Although annoying, booklice rarely causes any damage to the books or papers they frequent.



Keep dog food off the floor, Sisco and Kess have their own dinner table.

Prevention

1. Maintain an environment with relative humidity below 50%. Fix leaks, apply silica gel, or use a dehumidifier where appropriate. In spaces with dirt floors such as crawlspaces or basements, a vapor barrier may be necessary to reduce the relative humidity.
2. Employ thorough sanitation measures. Remove mold or mildew with an appropriate household cleaner.
3. Use airtight food storage containers.
4. Remove clutter.
5. Store boxes up off the floor.
6. Place firewood directly on the fire and do not store it inside your home.

C. Cockroaches

Some cockroach species are known to transmit disease-causing organisms, and are most often implicated in the transmission of *Salmonella*, often the causal agent of food poisoning. German cockroaches also cause respiratory problems to individuals sensitive to the allergens they produce.

There are at least 20 different species of cockroaches in Arizona, probably about 10 are native and rarely encountered in the urban environment. Those established in urban areas include: the **American, Brown-banded, Field, German, Oriental, Surinam and Turkestan.**



American cockroach

Most cockroaches are tropical or sub-tropical in origin and generally live outdoors. However, some species have adapted well to living indoors with humans. Though it is true that they prosper in clutter, filth and grime, occasionally cockroaches infest even the most sanitary and well-organized homes and buildings.

Cockroaches are often carried into homes in infested foodstuff, particularly dried pet foods and in seasoned firewood. They also enter around loose-fitting doors and windows, where electrical lines or water and steam pipes pass through walls. If a home or building is unoccupied and sinks are not used, allowing the P-trap to dry up, will allow cockroaches



German cockroach



Turkestan cockroach

access but they will not come through the sewer lines otherwise. Cockroaches will feed on any unprotected kitchen goods contaminating food with excrement and salivary secretions. Some will also eat materials such as leather, wallpaper paste and bookbinding.

Most cockroaches are nocturnal and appear during daylight only when disturbed, or where there is a heavy infestation. They prefer warm, dark, humid shelters, and often move around the kitchen sink or drain board. They prefer to rest in cracks around, under or inside cupboards and cabinets; where pipes or electrical wiring pass along or through a wall; behind window or door frames, loose baseboards or molding strips; under tables and chairs; in upholstered furniture; in bathrooms; in radio and TV cabinets; and in motor compartments of refrigerators, washing machines and other appliances. It is important to know where cockroaches are hiding in your home because these are the locations that must be cleaned.

Prevention

1. Proper sanitation, both indoors and outdoors, effectively limits cockroach food sources. Do not leave unwashed dishes, kitchen utensils and uncovered food out overnight. Clean up all spilled liquids. Areas beneath and behind cabinets, furniture, sinks, stoves and refrigerators should be cleaned often, as should cupboards, pantry shelves and storage bins where particles of food frequently accumulate. Kitchen waste and excess refuse should be kept in cockroach-proof containers, and disposed of as frequently as possible. Dry pet food should be stored in tight containers away from the kitchen and other foods. If pets are fed indoors, leftover foods should not be allowed to remain in the feeding dish overnight. Garbage cans should be cleaned regularly, inside and out.
2. Eliminate all possible hiding areas such as paper, lumber, firewood and yard trash.
3. Seal any cracks of $\frac{1}{8}$ inch or larger in the foundation and exterior walls. Check the seal around air conditioning units, windows, doors, pipes or other openings into the home. Repair cracks and holes in floors, walls and ceilings. Seal openings around plumbing fixtures, furnace flues, electrical outlets, windowsills and walls, and along baseboards and ceiling moldings. Thresholds on doors should be as tight as possible and cracks in porches and stoops should be sealed.
4. Leaky water faucets and pipes should be repaired since most species are attracted to water sources.

5. Avoid installing lights directly above doorways, or replace light bulbs with yellow colored bulbs that are less attractive to bugs.

D. Crickets

Crickets may be considered a nuisance because of their constant chirping; however, none of our species bite or vector diseases. Several species of crickets are found in Arizona. Only two are of any concern.

The **Indian house cricket (*Grylodes supplicans*)** feeds on a wide range of food sources and can damage fabrics, leaving the surface roughened from pulling or picking the fibers loose while feeding. It is light yellowish/brown or tan in color with darker bands and spots, and about 1 inch long when mature; males have short wings which they rub together to produce their songs. They often gather around foundations and doors outside and readily come indoors through cracks or openings. They are the only type of cricket that live and produce young indoors. They typically hide during the day and come out at night to feed on crumbs, pet food, and plant debris.



Indian house cricket

The other species is the **field cricket (*Gryllus spp.*)**. It is larger than Indian house crickets (slightly more than 1 inch when mature) and usually dark brown to shiny black in color. Field crickets also enter houses and buildings. These crickets prefer to live and breed outdoors where they feed on several kinds of plants. Occasionally they invade homes in search of hiding places but do not produce young indoors.

Field crickets are known to chew on and damage woolens, cottons, silks, synthetic fabrics, furs and carpeting. Clothes with perspiration stains or food spills are particularly attractive. Outdoors, they may damage young garden plants and annual flowers.



Field cricket

Prevention

1. Follow the general measures. Use sealant and weather stripping to fill all openings, cracks, gaps, and holes in foundation, siding, windows, doors, screens, and other possible entry points.
2. Remove vegetation and debris that could serve as hiding places or breeding sites near the house.
3. Keep all doors closed at night. Make sure all doors and windows are tight fitting.
4. Maintain sanitary conditions in the kitchen, and do not leave food out overnight.
5. Check potted plants for Indian house crickets.
6. Limit the use of night lighting, which attracts crickets and draw curtains in lit rooms.

E. Earwigs

Earwigs are outdoor insects that live in damp environments and are predators, although when populations are crowded they may feed on seedlings. Contrary to general myth, earwigs do not climb inside ears. In fact, on the pestiferous scale they are ranked low in importance. Their only significance is the occasional small damage to certain flowers and some vegetables. They are not carriers of any disease and do not bite. The European earwigs are known for invading homes at certain times of the year. A high population of earwigs usually follows a wet spring.



Earwig

Prevention

1. Earwigs do not require much more than general exclusion measures such as caulking cracks, fitting doorstops, and screens etc.
2. Earwigs are more common in newly built homes within the first year, or in homes that have recently been flooded.
3. Limit outside lights, and draw curtains in lit rooms. Earwigs are attracted to lights.
4. Potted plants present a good habitat for earwigs, so raising them off the ground to allow air circulation and light penetration alters the habitat and earwigs leave.

F. House flies

The familiar gray and yellowish fly (*Musca domestica*) is attracted to both food and fecal odors. The larvae or maggots live in and feed on manure or decaying plant material. More than simply being a nuisance they are primary carriers of a variety of disease organisms, including typhoid, cholera, diarrhea, anthrax, polio, and salmonella. These diseases are spread through contact with unprotected food and contaminated fecal matter.



House flies mating

Prevention

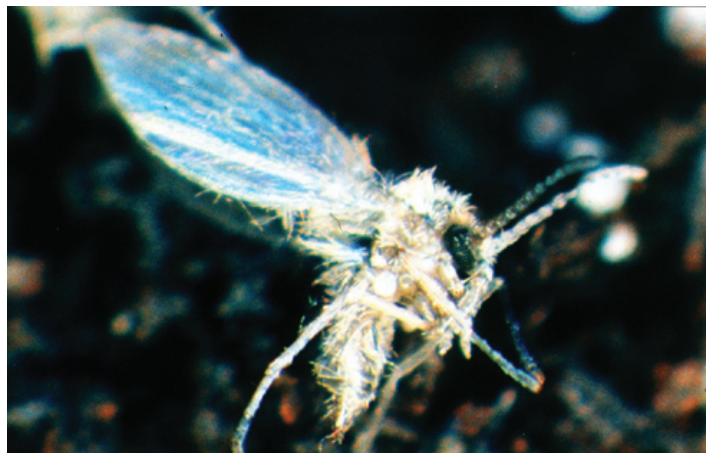
1. Follow the guidelines for general exclusion e.g. sealing cracks, fitting door sweeps, etc.
2. A moist compost bin will be a breeding site for house flies. Create dry compost by scattering it around the bin so that it will dry rapidly. Flies will not lay eggs on dry manure.
3. If dogs or horses are part of the family, clean up fecal material in timely fashion and dispose of properly. Planting flowers and bushes may attract predators and parasites that can help manage flies.
4. Employ correct sanitation methods within the home to eliminate possible breeding sites. Outside gar-

bage cans and dumpsters should have tight-fitting lids and be emptied and cleaned regularly. All garbage receptacles should be located as far from building entrances as possible.

G. Moth flies

Moth flies are named because their furry wings and feathery antennae make them look like miniature moths; however, they are actually a unique group of small flies. They are also known as drain flies, filter flies and sewage flies, named after the breeding sites in which they reside.

These breeding sites consist of rich organic decaying material. In the urban environment, they are commonly found in clogged roof gutters, under potted plants, in garbage cans, around septic tanks, in moist compost, and poorly cleaned drains, particularly in outflow pipes of toilets and sinks.



Moth fly

Prevention

1. Unused sewage pipes **must** be cleaned and capped off.
2. Clogged sink overflows must be cleaned. Use an enzymatic drain cleaner followed by very hot water, and if necessary by manual cleaning with a stiff brush. Bacterial or enzymatic cleaners are effective. DF 5000 Gel™ contains live, beneficial bacteria that destroy organic material inside the drains, removing the habitat in which the moth flies breed.
3. Water leaks must be fixed along with any other moisture problems around the home.
4. Ensure your compost bin is a dry environment. Scatter moist compost around the bin to dry it out faster.
5. Regularly clean out roof gutters.

H. Silverfish and Firebrats

Silverfish and firebrats are sometimes known as “bristletails”. The silverfish lives and develops in damp, cool places (prefers 75 to 95 percent relative humidity), while firebrats prefer places above 90 degrees F. Adult silverfish and firebrats are ½ inch in length. They are wingless insects with two long, slender antennae, and a flat carrot-shaped body, covered with scales, that tapers down to three long “bristles” at the end. Both silverfish and firebrats move fast in a wiggling motion, resembling the swimming action of a fish.

Houses provide a perfect habitat for silverfish. Preferring moderate temperatures between 70 and 80 °F, and a relative humidity of between 75 to 95%, they collect near sinks and other plumbing fixtures in bathrooms, kitchens and basements. Silverfish are most often discovered in sinks and bathtubs, though they can be present throughout the house. Silverfish are frequently introduced with newly installed dry wall, feeding on the paper backing and occasionally large populations form within new buildings where the walls are still damp from plaster and fresh lumber.

Firebrats normally live outdoors under rocks, leaves and inside bird nests where heat and moisture are generated by the natural composting process. However, they are also known to occur in homes. Like silverfish, firebrats enjoy a humid environment, however they prefer much higher temperatures of 90°F and above. Consequently, they are discovered less, because they collect around furnaces in basements, water heaters in attics, inside fireplaces and within the insulation surrounding hot water pipes.

Silverfish and firebrats are mostly nocturnal, foraging at night. They prefer vegetable matter with a high carbohydrate and protein content. Indoors however, they will feed on almost anything, including dried meat, other insects, starch, paper, glue, sugar, molds, cereals and fabric containing cotton, linen, rayon and silk. They seldom damage fibers of animal origin such as wool or hair. These insects are hardy and can live without food for up to one year.

Silverfish and firebrats are considered pests because they consume and stain foods, fabric, books and wall-paper. Damage is manifested as yellowish stains and notched edges, although this is not usually observed. Significant damage is only found in the case of a large infestation that has been present over long periods of



Firebrat

Prevention

1. Fabric and stacked paper products should not be stored for long periods.
2. Spilled food must be cleared away.
3. Reduce water availability by repairing leaky plumbing and installing adequate extraction fans to laundry and bathroom areas.
4. Lowering the home’s relative humidity can be accomplished with dehumidifiers. Lighting a dark area is helpful as it forces the insects out of their shelter to new sites where they can be managed more easily.
5. Outdoors, mulch should not be placed right up next to the house.
6. In the case of a severe infestation, household formulations of boric acid may be helpful. Eradicating these insects can be difficult as they often reside between wall partitions, in insulation materials and in other protected places.

I. Vinegar flies

Vinegar flies are so named due to their attraction to the sour odor of fermentation and bacterial waste. They are also known as fruit or pomace flies. Vinegar flies are mainly found on wet decaying plant matter or rotting fruit.

Prevention

1. Remove any rotten fruit or other attractive vegetation.
2. Follow the guidelines for general exclusion. For example caulking cracks, fitting door sweeps and screens, etc. Consider that these small flies only require tiny entry points.

3. Create dry compost by scattering and turning the bin so that it will dry rapidly.
4. Compost, garbage cans and dumpsters should have tight-fitting lids and be cleaned regularly. All garbage receptacles should be located as far from building entrances as possible.

II) Structural Pests

Structural insects are those that attack the very structure (wood) of the house. The main pests responsible are carpenter ants (previously mentioned), termites, powderpost beetles and rodents. They can all cause damage to structural property.

A. Carpenter Ant – Refer to the general pest section

B. Carpenter Bees

Carpenter bees resemble bumble bees. They are large, $\frac{3}{4}$ to 1 inch long, heavy-bodied, blue-black to black colored with a green or purplish metallic sheen. Carpenter bees are *solitary* bees. That is, they do not live in a “hive” such as honey bees do. They do, however, tend to accumulate in certain areas.

Although, technically, they are a “wood-boring insect”, they are not really considered a true structural pest. They will not spread throughout the structure, but they will attack any outside wood that is not painted or finished. Carpenter bees get their name from their ability to drill through wood and nest in the hole. Their drilling creates a near-perfect hole, approximately $\frac{1}{2}$ inch in diameter. The hole is usually located on the underside of the wood surface; including siding, decks, overhangs, fence posts and window frames. Although the hole appears to be only an inch or two deep, it rarely ends there.



Carpenter bee

Along with the coarse frass (sawdust and insect droppings) found underneath the nest entrance, there are usually dirty-yellow streaks of fecal matter staining the wood below the hole. If you are near a nest, you will likely be *buzzed* by the male carpenter bee on guard. He is loud and aggressive, but does not have the ability to sting you. The female can sting but she is normally very docile. A single pair (male and female) occupies each nest.

Prevention

1. Try to paint everything, even the areas you don't see, such as under windowsills and under banisters and railings. Use a good exterior primer, two coats; follow up with at least one coat of finish.
2. Covering wooden components with aluminum sheathing will work only if done correctly. This means that you must eliminate any spaces where the bees will find the wood. They can squeeze through incredibly small places, so you have to be very thorough. Spaces or holes $\frac{1}{4}$ inch or larger will let these bees through.
3. You should use pressure-treated wood in any outdoor project such as decks and playhouses. Pressure-treated wood needs no paint, but can be painted.
4. Cedar does offer some protection, but even cedar is utilized if the conditions are right. California redwood is often utilized by the eastern carpenter bee, the redwood is expensive and the wood is very soft. It is suitable more for decorative use rather than a structural one.

C. Termites

In nature, termites function as decomposers that breakdown dead or live wood that accumulates in and on the soil. The beneficial products of this breakdown process are returned to the soil as humus. Termites are social insects and the makeup of the colony is very complex. In Arizona, we have primarily two different types of termites, the drywood and subterranean termites. These insects are beneficial in nature, but occasionally destructive pests of wood. Their presence in structures is seldom noticed until damage is discovered or the termites swarm within the building.

About 46 species of termites occur in the continental United States. At least 17 of these are known in Arizona, and it is possible that two or three additional species remain to be discovered within the state.



Subterranean termites

Differences between Drywood and Subterranean Termites

Subterranean

1. Nest in soil—connection with soil usually necessary.
2. Generally smaller insects; therefore, tunnels and chambers usually smaller.
3. Galleries usually run parallel to grain in the softer “spring wood”.
4. Frequently build free-standing shelter tubes or covered runways of mud and fecal material.
5. Fecal material is soft and used in constructing nest and shelter tubes.
6. Larger, rapidly-growing colonies work faster, damage often more severe.
7. Flights occur day or evening, more often associated with rain.

Drywood

1. Nest in wood—ground contact unnecessary.
2. Larger insects; tunnels and chambers usually larger.
3. Galleries often cut across grain of wood; attack both softer “spring” wood and harder “summer” wood.
4. Do not commonly build exposed shelter tubes.
5. Fecal material in form of hard, dry pellets - appearing like saw-dust in galleries or in piles outside.
6. Smaller, slower-growing colonies.
7. Work more slowly, damage generally less severe.
8. Flights more often occur evening or night, usually not closely associated with rain.



Drywood termites

Prevention

1. When choosing a new house ask questions about its construction. The most common form of house construction in Arizona is a floating slab and it is quite susceptible to termite attack. Termites enter where the slabs meet the walls and through hidden expansion joints. Monolithic slab construction contains no joints and is therefore more resistant to termite entry. However, it is not termite-proof. Some settling will occur regardless of how the slab is constructed, and overtime cracks may appear.
2. Currently most new homes are treated with a continuous chemical barrier (termiticide) beneath and next to the slab that is guaranteed to protect a home from subterranean termites for a specified amount of time.
3. Wood-to-ground contact should be eliminated, i.e. wooden porches should be separated from the building proper and wooden steps should rest on a concrete base at least 6 inches above grade. Wood partitions and posts should be installed in basements after the concrete floor is poured and should never extend into or through concrete. Keep soil or mulch away from wood siding. Remove all wood scraps and do not bury them in soil near the house foundation.
4. Keep wooden planters, trellises and raised beds away from foundations.
5. Keep firewood away from house and elevated off the ground.
6. Make sure termite barriers are applied under new additions.
7. Promptly repair leaks and faulty drainage.
8. Fill any cracks in your foundation and seal any openings particularly where utility pipes and wires enter from the outside.
9. Eliminate standing water, which pools against the foundation. Re-grade the ground so that water drains away from the house.

10. Avoid putting landscape plants or trees close to the building and make sure turf sprinklers and drip irrigation emitters are not soaking the home walls or foundation.

The homeowner should be encouraged to inspect their homes at least once or twice a year for signs of termite activity. Pay particular attention to additions such as porches, or patios, and any area where wood contacts the ground. Look for mud tubes, holes in wood with clean galleries cut across the grain, pellets or sawdust, piles of wings and swarming insects. If there are indications of an infestation, the homeowner can also request a professional inspection. Check with friends or neighbors and/or the Better Business Bureau for recommendations. You should also contact the Arizona Office of Pest Management for information regarding company licenses (602) 255-3664.

D. Wood-boring Beetles

The most common wood boring beetles can be classed in three groups: the true powderpost beetle (*lyctid*), the false powder beetle (*bostrichid*), and the deathwatch beetle (*anobiid*). Attack by these pests is characterized by small to medium sized holes (around 1/16 to 1/8 inch in diameter) in the infested wood where adult beetles have exited.

Between these three beetles, any wood in the home can be attacked and one species of bostrichid beetle known as the lead-cable borer is capable of boring through lead cable coverings, causing electrical damage.

If you live in an older home (>25 years) that contains a sub-area crawl space, it is highly recommended to have your home inspected for the presence of wood destroying organisms, which would include visible evidence of wood-boring beetles.



Powderpost beetles

Prevention

1. Look for woodworm activity in any wooden artifacts or lumber introduced into the home. If the wood is infested, holes will be present with accompanying piles of fine powder.
2. Cover wood surfaces with paint, polyurethane or water sealants. This will protect wood from moisture problems and help prevent the beetles from penetrating the wood. For aging wood, first sand down any cracks or other entrance points before covering.
3. Although expensive, installation of a central heating and air conditioning unit may help chronically infested buildings. With the advent of such systems the cases of beetle damage has dramatically reduced and significant problems are not likely even with the more serious beetles.
4. Correct lumber moisture problems commonly found in the crawl spaces. The crawl space should be well ventilated and have a vapor barrier. Plastic sheets can also be installed to keep the lumber from getting too moist.
5. Boracare® (borate and ethylene glycol) is an effective insecticide, applied to unvarnished wood by brush or a hand held pump sprayer. It is particularly appropriate for extensive use in the case of log homes. Boracare® will also help in the prevention of carpenter ants, carpenter bees, termites, fungus and wood rot.

III) Health risk pests

In the event of a reaction to a bug bite or sting, call **Arizona Poison & Drug Info Center at 1-800-222-1222, or 911 if the reaction is serious.** Try to safely collect the animal. A correct identification and punctual timing is important to avert a potentially life-threatening reaction.

A. Bed Bugs

Bed bugs feed on the blood of humans, however, the insects are **not** capable of transmitting disease organisms. They do inject saliva during feeding which can produce large itchy swellings on the skin, and these areas may become infected when scratched. In addition, bed bugs have stink glands that create odors and they also leave fecal spots and blood on bed sheets.



Bed bugs



Tubular beds provide good habitat for bed bugs

Prevention

1. Launder all bedding routinely (even comforters and bedspreads).
2. Use good quality mattress, box-springs, and pillow encasings.
3. Regularly vacuum the home including all bedding and furniture upholstery.
4. Do not buy secondhand beds, bedding or upholstered furniture.
5. Try to eliminate cracks and crevices in flooring and walls. Repair cracks in plaster, wallpaper and paint on the walls and ceilings. Replace loose wallpaper and drapes that cannot be cleaned.
6. Amorphous silica gel and diatomaceous may be used to treat wall voids and attics, **but do not use any insecticides on mattresses or bedding.**
7. During warm sunny days, all bedding can be solarized outdoors for several hours to kill the bed bugs.

8. Contract with a reputable pest management company who have experience dealing with bed bug infestations.
9. Treatment programs that include heat and cold treatments are effective.

B. Bees and Wasps

Renowned for their painful sting, these insects often produce an unreasonable amount of fear. The sting venom can cause a violent, hypersensitive histamine reaction, but only in a very small percentage of the population. Most bee and wasp species are actually quite docile and stinging usually occurs when their nest is disturbed. One exception is the yellow jacket wasp, a close relative of paper wasps that are more common in Arizona. Between August to October yellow jackets become more attracted to sweet food and meat products and can become troublesome, lingering around garbage cans and picnic tables.

Bees and wasps are actually a highly beneficial group of insects. Bees pollinate food plants and provide us with honey and wax. Wasps can be helpful in removing other unwanted insects, by preying upon them. Having digger bees, solitary bees or wasps nesting in your yard is not a problem, as these are very docile, but a honeybee hive should be removed. Contact a local pest management professional for their services. Some companies remove bees using vacuums or soap, so no synthetic pesticide treatment is necessary.



Paper wasp



Paper wasp

Africanized Bees

Do not remediate bee colonies yourself, contact a professional. They can cause life-threatening allergic reactions (anaphylaxis) in sensitive individuals. It should be assumed that all bees are Africanized when encountering wild bees in Arizona. Swarms encountered are queens and workers locating new nest sites. At this time, the swarms do not have brood to protect and are not generally aggressive. If you see a swarm around your home, it is highly likely that it will move on in a day or so without any intervention. If the swarm locates a suitable nesting site such as a hole in a block wall allowing the bees' entrance to the wall void, they may move inside the wall. It is best to call a pest management professional to manage the bees at this point before they are established and have brood to protect. Make sure to fill in the hole which allowed the bees to take up residence, or if a hive formed make sure to clean it out.

If you encounter bees buzzing around your head, do the following:

1. Stop.
2. Place your hands over your face and look through your fingers.
3. Look around for the hive.
4. Walk briskly away from the hive.



Honey bees in an irrigation box

DO NOT FLAP OR SWAT AT THE BEES, THIS IS THE WORST THING YOU CAN DO!!!!

If you are stung or the bees bump you, do the following:

1. Cover your head and face with clothing or your hands.

2. Run to a building or if out in the open run until the bees have abandoned you.

DO NOT DIVE INTO A SWIMMING POOL; THE BEES WILL WAIT FOR YOU LONGER THAN YOU CAN HOLD YOUR BREATH!!!!

Prevention

1. Discourage bees and wasps by eliminating favorable nest sites. Use an appropriate sealant to fill cracks and holes in walls and trees. Remove any trash or debris that might serve as a shelter, such as overturned clay pots. Ground-nesting insects can be discouraged by allowing the soil to dry out completely, and by mulching or planting a ground cover over large patches of bare ground.
2. Apply paint or varnish to outdoor wooden structures.
3. Consider the water sources in your yard and eliminate the unnecessary ones. Put screens over rain-spouts and water meter boxes. A few ounces of pine scented cleaner can be placed into evaporative coolers to discourage insects, and for pet water and birdbaths two tablespoons of vinegar per gallon is somewhat effective.
4. Avoid home entrance by placing insulation around doorframes and sealing window frames.
5. Cover food when eating outdoors.
6. Gather up rotting fruit dropped from trees.
7. Close garbage can lids.
8. Do not aggravate bees or wasps by swatting at them. Then can react defensively.

C. Conenose Bugs

These insects are also known as kissing bugs, assassin bugs, Mexican bedbugs, and Walapai (Hualapai) tigers. They can cause life-threatening allergic reactions (anaphylaxis) in sensitive individuals. In South America, they can successfully transmit a serious disease known as Chagas' disease. There are approximately 15 different species in the U.S., but the most troublesome and numerous are found predominantly in Arizona, New Mexico, Texas, and California. The name 'kissing bug' actually refers to a South American species that usually bites its sleeping human victims on the lips.

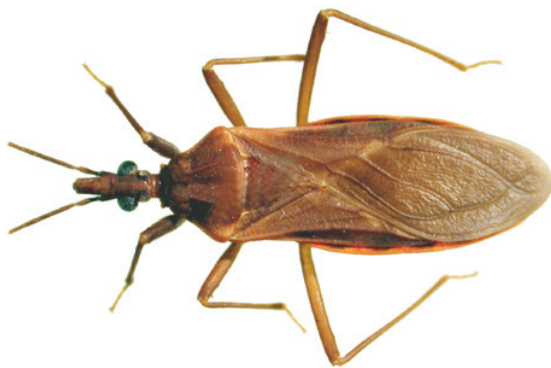
Conenose bugs are often associated with pack rats; please refer to the information below concerning the identification of pack rats*.



Conenose bug



Pack rat



Conenose bug

Pack rats, *Neotoma* spp., also referred to as “wood rats” or “trade rats”, are widely distributed over much of North America. Pack rats are apparently attracted to small, bright, shiny objects such as spoons, small pieces of jewelry, broken bits of mirrors, coins or other items, sometimes leaving sticks, nuts or other materials in trade. Pack rats are rat-sized mammals with large ears, large dark eyes and a fairly long tail that is sparsely covered with hair or, depending on the species, well furred with long hair. Their fur is soft; dorsal fur is colored cinnamon, brown, gray, yellowish gray or creamy buff; feet and ventral parts are generally much lighter in color; the tail is blackish or puff, paler on the ventral surface.

Pack rats are much larger than mice and tend to resemble the introduced Norway rat or roof rat in general size and shape. The head and body length is about 7 to 8 inches and the tail is 6-½ to 7-½ inches long. Their clean appearance, soft fur and well-haired ears help distinguish this native species from the Norway and roof rats.

Usually dens are situated on the ground. Ground dens measure 3 to 5 feet in height and diameter; tree nests are somewhat smaller. One animal may inhabit several nests, and in good feeding areas, a den may be occupied for several years or a lifetime. Pack rats live alone except when mating or rearing young.

An extension publication on the subject of conenose bugs is available at: <http://cals.arizona.edu/urbanipm/insects/conenose.html>

Prevention

1. An attempt should be made to reduce the number of kissing bugs present in and around the home. During daylight hours, the conenose bug seeks dark places to shelter. Outside, inspect beneath flowerpots, outdoor furniture and any other dark, sheltered, hiding places. Also periodically examine dark, quiet areas in the home around mid-spring to mid-fall, focusing on sleeping areas.
2. All cracks and openings into buildings should be sealed as completely as possible. Entry into the home does not require a large opening. Make sure window screens fit tightly, weather-strip outside doors and screen chimneys and vents.
3. Curtains should be drawn in lighted rooms at night.
4. For those sensitized and at risk for anaphylactic shock, take steps to avoid being bitten when asleep. Move beds at least a foot away from walls and other objects, check for bugs in and around beds before retiring, use a tucked in bed net and wrap bed legs with adhesive tape sticky side out.
5. Outside, look for rodent nests particularly **pack rat (*Neotoma* spp.)** nests around an infested home*. After removing any rodents from the nest, destroy the nest. Destroy only those nests close to the dwelling.

By leaving distant nests intact, the kissing bug has an alternative site to inhabit; this may discourage migration into the home. Remove all nest remains to ensure all kissing bugs have been eliminated. A pest management professional can be contacted to remove the rodents and their nests.

6. Stack logs, lumber, and firewood in neat piles at least six inches off the ground and away from building walls.
7. Outside lights should have yellow bug bulbs that are not attractive to insects.

D. Fleas

Fleas are small, wingless insects that feed on the blood of animals and people. Americans spend about \$9 billion a year controlling fleas, which makes flea control one of the biggest expenses for pet owners. In Arizona, the **cat flea (*Ctenocephalides felis*)** causes most problems. This flea does not normally live on humans, rather cats, dogs and wildlife. They do however bite people who handle infested animals. Flea bites cause small, red, itchy bumps, and are most often found on the ankles and lower legs of humans.

For relief from itching wash with soap and water, then apply ice.



Flea

Prevention

1. Change pet bedding regularly.
2. Bathe and brush pets regularly. Soap acts as a gentle insecticide and helps control light infestations on your pet.
3. For infestations that are more significant, consider using orally applied veterinary products for flea control (Frontline Plus® Top Spot, Revolution®, etc.).

4. Vacuum under furniture, cushions, along walls and pet bedding. Discard vacuum cleaner bags regularly. Fleas can continue to develop inside vacuum cleaner bags and re-infest the house.
5. Avoid flea collars as these are often impregnated with toxicants that are harmful to humans.
6. Exclude bats and wild birds from your home by maintaining good bug screens over air vents in your attic. Maintain chimney structures so that birds and bats cannot use them for roosting or nest sites. These pests can carry their own fleas.
7. An outbreak of human fleas in the immediate area should be taken seriously, particularly in schools. Contact professionals and ask for an IPM solution.
8. Flea populations can be monitored with a simple homemade apparatus. Place a little dish detergent into a shallow pan of water. The detergent acts as a wetting agent, which breaks water surface tension. Place the pan on the floor overnight, and position a bright light source about five inches above the liquid surface. Fleas attracted by the light, fall into the detergent solution and drown. The Happy Jack® and Pulvex (Zema®) flea trap are commercial products based on the same principle.
9. Trim lawns and weeds to create a drier, less inviting environment for flea larvae. Avoid piles of sand and gravel around the home for long periods. Avoid over watering lawns.
10. Monitor pets closely for fleas.
11. Outdoor flea populations can be effectively controlled with commercially available insect killing nematodes. These naturally safe biological control agents will kill flea larvae and pupae commonly found in pet resting areas and dog runs.

E. Lice

There are three kinds of lice that infest humans: **head lice (*Pediculus humanus capitis*)**, **body lice (*Pediculus humanus corporis*)** and **crab lice (*Phthirus pubis*)**. They can be a great source of stress to the body. Children in particular suffer with head lice and become sleep deprived, which in turn lowers their immune system.

Lice can crawl relatively quickly, however they cannot fly or jump and therefore, direct contact with an infested object or person is required to contract them. Infestations of lice are called pediculosis, which is classed as a communicable disease.

The head louse and the body louse are closely related though their behavior is quite different. The head



Head louse

louse, as its name suggests, remains on the head of a person its entire life, whilst the body louse spends most time in the seams of unwashed clothing and returns to the body only to feed. Crab lice are also known as pubic lice. They have legs adapted for grasping widely spaced hairs, such as those in the pubic and perianal regions, though they can also spread to the armpits and facial hair (eyebrows, eyelashes and beard, etc.).

All three lice require human blood and cannot live on birds, or other animals. Lice feed by pressing their mouthparts against the skin of their hosts. Head lice are the most common louse problem in the United States. Easily spread by physical contact, infestations can occur under the best sanitary conditions. Every year, 6 to 10 million people in the United States contract head lice, three-quarters of which are school children less than 12 years old. Children are more likely to engage in close contact play, share head-gear, and are more opposed to washing their hair, so are more prone to infestations than adults.

Fortunately, head lice rarely transmit infectious diseases from person to person, and they are considered more of a nuisance than a health risk problem. However the subsequent itching, that accompanies an infestation can cause lack of sleep, and scratching can result in a secondary infection requiring antibiotic therapy. In extreme cases, the infested person may experience fatigue, chills, leg cramps and rashes.

Intense itching on the back of the head or neck is an indication of an infestation. This occurs when the lice feed on the scalp. Examine individual hair shafts, concentrating in areas at the nape of the neck and behind the ears. Nits are most commonly found first, as they are much more numerous than mature lice. Look also for small, quickly crawling, and flat insects. Lice can

be difficult to find, so examinations must be thorough. The best management technique is prevention.

Prevention

1. Launder clothing and bedding routinely including pets bedding with a hot wash and tumble dry.
2. Regularly vacuum the home including all bedding and furniture upholstery.
3. Do not buy secondhand beds, bedding or upholstered furniture.
4. Do not share clothing or headgear.
5. Bathe yourself regularly and ensure other members of the household do also.
6. Use of nit combs to remove eggs, blow-drying dry hair, and brushing dry hair are all partially effective ways of mechanically killing head lice.

F. Mites

There are many different mite species, some problematic whilst others are part of our natural fauna and go unnoticed. For example, the **follicle mite (*Demodex folliculorum*)** is a microscopic mite that lives in the hair follicles or sebaceous glands of most humans. They are generally harmless and cause no irritation or discomfort.

House Dust mites (*Dermatophagoides spp.*) on the other hand are one of the principal mite problems in North America. They are found in bedding, carpets and furniture containing natural fibers. They are scavengers that feed on human skin scales and other detritus but do not bite humans. A significant number of people are allergic to them and their allergens.



House dust mite

Scabies (*Sarcoptes scabiei hominis*) mite is one of the more problematic mites that attack livestock, horses, dogs, rabbits and people. The burrowing action and bi-products they create causes an intense itch and dermatitis that may be felt for several days after the mite is no longer attached. Scratching can cause bleeding and infection of open sores. The **straw itch mite (*Pyemotes tritici*)** is another problem pest. It often causes epidemics of dermatitis during harvesting and post-harvesting operations in straw, hay or certain grains. In more severe cases sweating, fever, headache and vomiting can occur. The straw itch mite is however also highly beneficial because they feed on larvae of wheat jointworm, rice and granary weevils, angoumois grain moths and other pests.

Tropical rat mites (*Ornithonyssus bacoti*) and two mites associated with birds, the **northern fowl mite *Ornithonyssus sylviarum*** and the **tropical fowl mite *Ornithonyssus bursa*** can become significant pests under certain conditions. When their primary hosts nest in or on homes, these mites may invade the structure and their bites can cause irritation and dermatitis. The key to eliminating tropical rat mites from a home is abatement of the rodent infestation. Snap-traps are effective and more convenient than rodent baits. Poisoned rodents dying in wall voids can generate significant problems of many kinds. Also, stored food caches, fecal pellets and nesting materials must also be removed from the premises.

Mites associated with birds are very similar in size, and appearance, to tropical rat mites. Often problems develop in the spring months when birds build their nests and raise their young. Bird mite problems most commonly occur when house sparrow, rock dove, (feral pigeon), or the mourning dove build their nests on occupied dwellings. Nests are often constructed below the eaves, in attics, in angles provided by rain gutters and spouts. Nests built in trees or vegetation in direct contact with structures also permit mites access. During the period when the female and her young occupy the nest, mites remain in the nest and on the birds, and their numbers may increase substantially. But when the young fledge and the nest is abandoned, mites move inside seeking an alternative host. Sudden excessive numbers of bites is often an indication of birds leaving nests. An occasional bite is more often due to pigeons congregating on roofs as daytime resting sites.

Chiggers (*Trombicula alfreddugesi*) do not burrow into the skin, but insert their mouthparts in a skin pore or hair follicle. Their bites produce small, reddish welts that are very itchy! The parasitic larvae are

tiny in size ($1/150$ to $1/120$ inch long), usually pale red or orange, and travel rapidly. **You are not going to be able to see them.** Young chiggers attach themselves to the skin of mammals, reptiles, and birds. On people they gather where clothing fits tightly over the skin such as belt line, waistline, under bras, and under socks. They favor where the flesh is thin, or folded such as the ankles, in the armpits, back of the knees, in front of the elbow, or in the groin. Chiggers are not known to transmit any disease. Chigger larvae can penetrate most clothing, but high boots and trousers of tightly woven fabric tucked into stockings or boots help deter them. Insect repellents can be helpful see <http://cals.arizona.edu/pubs/insects/az1311.pdf>

Mowing of weeds, trimming of vegetation, and close clipping of lawns, helps to eliminate shade and moisture. This will permit sunlight and air to circulate freely and reduce chigger populations.

Diagnosis is often difficult. The mites themselves can be microscopic and scratching the irritated skin can further mask the true pathology. As a result, it is often confused with entomophobia (fear of insects) in certain people. Identification requires collecting (often by a skin scraping) and preserving the specimen immediately in alcohol before a microscopic examination can be performed.

Contact a physician for treatment of scabies, dermatitis and other skin disorders. Oral antihistamines and the application of a hydrocortisone cream to bites may help to relieve itching.

Prevention

1. Transmission is usually by direct contact with an infested person or animal. After being exposed to someone with mites, bath in hot, soapy water and scrub down with a washcloth.
2. Some mites migrate from birds and rodents. Current nests must be removed and further nesting discouraged from around the home. Chicken wire can be placed over chimneys, eaves and window mounted air conditioners. Exclude rodents by following previous recommendations on rodent prevention.
3. Trim trees and shrubs away from the building.
4. Dust and vacuum furniture, floors and beds regularly, discarding vacuum bags frequently. This is especially true for house dust mites.
5. Employ proper sanitation and storage of food products. Discard foodstuffs infested with grain and mold mites.

G. Mosquitoes

Mosquitoes are one of the most important insect pests that affect the health and well being of humans and domestic animals worldwide. If environmental conditions are favorable, vast populations can occur in Arizona. Female mosquitoes require a blood meal for egg production, and they produce a painful bite as they feed. While feeding, they can transmit a number of disease-causing organisms to humans and animals. The diseases these organisms cause include: West Nile fever, encephalitis, dengue fever, filariasis, yellow fever, and malaria. Encephalitis, dengue and West Nile virus (caused by different mosquito born viruses) are potential threats in Arizona.



Mosquito adult

There are over 40 different species of mosquitoes in Arizona. Most are only nuisance pests and do not transmit disease, while other species exist without affecting humans in anyway. The four most troublesome mosquito species for Arizona include the **Western Encephalitis Mosquito - *Culex tarsalis***, the **Yellow Fever Mosquito - *Aedes aegypti***, the **Malaria Mosquito - *Anopheles freeborni*** and the **Southern House Mosquito - *Culex quinquefasciatus***.

An extension publication on the subject of mosquitoes is available at: <http://cals.arizona.edu/urbanipm/insects/mosquitos/mosquitos.html> or: <http://cals.arizona.edu/pubs/insects/az1221.pdf>

Prevention

1. Mosquitoes need water to complete their life cycle, so remove all possible water sources. Check flowerpots, birdbaths, pet watering bowls and other containers for excess water. Store boats, canoes and other objects so that they do not collect rainwater. Keep rain gutters free of leaves and other debris that prevent water from draining. Correct drainage problems in yards and playing fields to



Flooded field

prevent rain and irrigation water from pooling for prolonged periods. Fill holes or depressions in trees with sand or mortar. Repair leaky pipes and outside faucets. Correct or report drainage problems in ditches along public or private roadways.

2. For water, or structures that cannot be removed, mosquitoes can still be eliminated from them by careful maintenance. Replace water containers for pets, birdbaths and fountains every few days. Maintain swimming pools correctly. For ponds, ***Gambusia* (mosquito-eating fish)** can be introduced.
3. Organic acids can be used to improve soil drainage. It is quite common in Arizona to have compacted soils and these products are very useful for opening up the soil to speed up water penetration.
4. ***Bacillus thuringiensis israelensis*, or Bti, and *Bacillus sphaericus* (Bs)** are common soil-inhabiting bacterium that are commercially available. This bacterium kills mosquito larvae but will not harm fish, birds, pets or other wildlife.



Mosquito larvae

5. In some areas of Arizona, bats and birds consume mosquitoes as part of their natural diet. Incorporating nesting boxes around your property will attract these natural predators to the area. However, the feeding activity of insect-eating bats and birds will not be sufficiently selective to cause complete reduction of mosquito populations, but every bit helps. Please monitor bird and bat boxes regularly as bees can invade the boxes and develop colonies.
6. Keep mosquitoes out of the home by installing and maintaining tight fitting window and door screens.
7. Some personal protection from mosquitoes can be achieved using insect repellents. An extension publication on the subject of insect and tick repellents is available at: <http://cals.arizona.edu/pubs/insects/az1311.pdf>.

Mosquitoes also transmit heartworm in dogs. Heartworm can cause severe circulatory problems and produce symptoms such as coughing, labored breathing and general loss of vitality in advanced stages. Because of the impracticality of protecting dogs from mosquito feeding, the most effective means of controlling heartworm is to prevent worms from reaching the adult stage inside the dog. Veterinarians can prescribe excellent drug treatment to protect pets from heartworm.

Because some mosquito species fly long distances from breeding sites, a community-wide effort may be needed to reduce mosquitoes to tolerable levels. Complaints in Maricopa County should be logged with Maricopa County Vector Control (602) 506-6616 as an environmental complaint, or submit a complaint online <http://www.maricopa.gov/EnvSvc/Complaints/Forms/ComplaintInput.aspx?category=39>

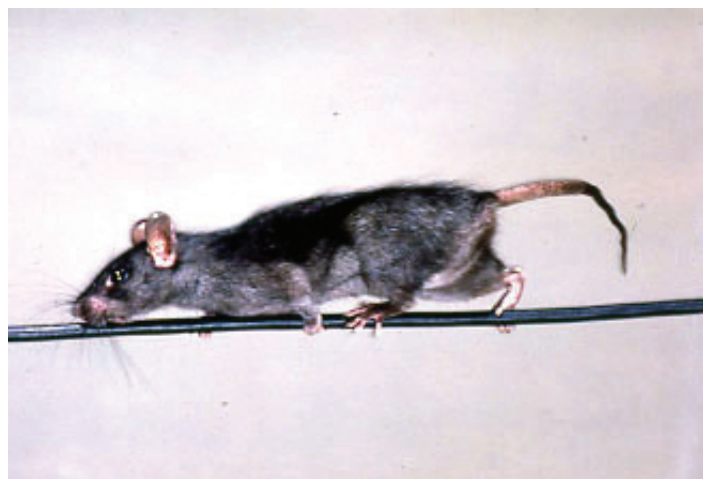
H. Rodents

House mice are the most common mammals in cities next to man and probably the most troublesome rodent in the United States. Their gnawing and nest building activities can cause structural damage. Often nests are made in large electrical appliances, where they may chew wiring as well as other insulation resulting in short-circuits or even fires. In addition, they are also health risk pests. House mice are transmitters of many diseases including the Hantavirus, a virus that can target the lungs and cause pulmonary problems.



House mice

The roof rat or black rat (*Rattus rattus*) is an Old World rodent species not native to North America that was identified in a Phoenix neighborhood in 2001. The roof rat is implicated in the transmission of a number of diseases to humans, including *murine typhus*, *leptospirosis*, *salmonellosis*, rat-bite fever, and plague. It is also capable of transmitting a number of diseases to domestic animals and is suspected in the transference of *ectoparasites* from one place to another. In addition to consuming and contaminating stored food and feedstuffs, roof rats will gnaw on wiring (posing a fire hazard), and tear up insulation to use it for nesting material. The rats will feed on the fruit and vegetative portions of many landscape and garden plants including tree bark.



Roof rat

Roof rats are nocturnal (active at night). Roof rats prefer to forage for food above ground in elevated areas indoors and outdoors. They are agile climbers and travel through trees and along vines, wires, rafters, and rooftops. They prefer to nest in secluded areas above ground in such places as attics, overhead garage storage, in the vine cover of fences or buildings, and in wood piles or other stored materials where harborage can be found. Roof rats will also burrow in the ground especially in hot, dry environments. In these areas, they may use trees, materials stored on the ground, concrete slabs and sidewalks to support shallow burrows.

Prevention

1. Seal any gaps and holes and install door sweeps. Gaps of a $\frac{1}{4}$ inch (the diameter of a pencil) permit entry of mice, gaps of a $\frac{1}{2}$ inch are large enough for rats.
2. Any previous rodent damage in your home must be repaired and protected. Use a strong material such as cement, mortar or appropriate sealants to fix gaps. Stuffing steel wool or mesh into rodent spaces only provides temporary protection. Filling cracks with a soft material like cloth will not stop the rodents from burrowing through and they will use the cloth for bedding.
3. Employ proper sanitation procedures and eliminate harborage. Use pest-resistant food storage containers.
4. Clean up the yard from clutter and ensure the compost bin is pest proof (see general measures).
5. Check for potential water sources that may be attracting rodents and have them repaired or removed.
6. Secure garbage in proper rodent-proof containers.
7. Harvest citrus and other fruit in a timely manner and pick up fallen fruit promptly.
8. Prune shrubs so that the ground below them is clearly visible. Mow, trim, or remove ground cover plants that grow over one foot in height

I. Scorpions

Generally, a healthy adult experiencing a scorpion sting will simply experience discomfort and will require no medical attention. However, they should

contact a physician or the Arizona Poison & Drug Info Center – 1-800 222-1222 for advice and assistance. However, **if a scorpion has stung a child (especially a child under the age of 7) or an elderly or infirm individual, this should be considered an emergency and call 911 immediately.**

About 40 species of scorpions occur in Arizona. Scorpions are nocturnal (night) or diurnal (day), predatory animals that feed on a variety of insects, spiders, centipedes, and other scorpions. The larger scorpion species feed on the smaller scorpions, insects, and even small vertebrates, such as small lizards, snakes, and mice.

The bark scorpion (*Centruroides sculpturatus*) is the only species in Arizona of medical importance. Around 3 inches in length, it can be distinguished from other native scorpions by the slender pincers, the presence of a tooth or tubercle at the base of the stinger and the long triangular sternum (all other Arizona species, have a five-sided, or a pentagonal sternum).



Bark scorpion female with babies

The sting of the bark scorpion, can be life threatening. When stung the victim may experience local pain, sensitivity to touch, heat, and cold, numbness, tingling and possible extremity weakness. In children, who are at highest risk, “roving eye”, hyperactivity and abdominal cramps have been reported.

The majority of stings occurring in healthy young adults may be managed at home with basic first aid measures and follow-up. First aid should include cleaning the site with soap and water, cool compress, elevating the affected limb to approximately heart level, and administering aspirin or Tylenol as needed for minor discomfort.

Scorpions are a normal and desirable component of Arizona's diverse ecosystems. They should be regarded with appreciation for their essential ecological role in regulating populations of plant-eating insects. Scorpions enter houses frequently, but are easily excluded using basic pest-proofing procedures. Scorpions are often found in newly developed areas (those less than 3 years old), where construction has disturbed scorpion territory. Homes located near normally dry riverbeds, or arroyos, or agricultural fields/orchards may experience an influx of scorpions during summer rains and after irrigation.

An extension publication on the subject of scorpions is available at: <http://cals.arizona.edu/pubs/insects/az1223.pdf>

Prevention

1. Remove loose boards, woodpiles, rocks, and debris from areas immediately surrounding homes; Wear leather gloves and exercise caution whilst moving these objects in yards.
2. When choosing a new home, look for slightly older and a more established area.
3. All members of the family should be able to recognize scorpions, and everyone should be aware of the danger they pose.
4. Storing shoes and such outside is not recommended, especially overnight. If a pair has been left outside careful turn them over and check inside for hiding scorpions.
5. Remove vegetation and debris that could serve as a hiding place or breeding site near the house.
6. Trim trees and shrubs away from wall and roof areas.
7. An infant's crib can be protected by placing the legs of the crib in clean wide mouth jars. Scorpions cannot climb the clean glass. Pull them away from walls, bark scorpions can climb vertical walls, but make little progress across ceilings.
8. If scorpions have been found in your area, it is recommended that the residents conduct a nighttime reconnaissance of the house and yard with the aid of a portable (battery-operated) camp light equipped with a black (UV) fluorescent bulb. Scorpions glow brightly under black light and are extremely conspicuous up to several yards away. Once collected we recommend that the scorpions be released back into the wild away from dwell-

ings. After all, they are fantastic creatures. **Repeated collections are a lot more effective than repeated pesticide applications.**

There are other scorpion like creatures *Pseudoscorpions*, *Solpugids*, and Whipscorpions. These creatures are rarely encountered and are beneficial components of the Arizona ecosystem. These animals should not be killed. Following the general bug-proofing guide will exclude all but the most determined pests.

J. Ticks

When a tick feeds it takes up whole blood, extracts the water (about 70-75% volume) and injects the water back into the host. For this reason, they are efficient vectors of a variety of disease causing organisms such as bacteria, spirochetes, rickettsiae, protozoa, viruses, nematodes, and toxins. A single tick bite can transmit multiple pathogens as well as creating secondary infections and allergic reactions. Ticks therefore are the most common transmitters of vector-borne disease in the U.S.

Ticks also have four stages in their life cycle, and all require blood from a vertebrate host to survive and complete their development. Like most other arachnids, adult ticks and immatures (nymphs) have four pairs of legs; the larvae (hatchlings) have three pairs. Although there are many species of ticks in Arizona, humans are likely to encounter only four. Three of these, the brown dog tick (*Rhipicephalus sanguineus*), American dog tick (*Dermacentor variabilis*), and the Rocky Mountain wood tick (*Dermacentor andersoni*) are "hard ticks", which belong to the family Ixodidae. The fourth species, the adobe tick (*Argas sanchezi*) is a "soft tick" belonging to the family Argasidae.

Rodents and deer are most often associated with ticks however, between the many species of ticks; any wildlife in the yard may be associated with ticks. The brown dog tick rarely bites humans, but is the most pestiferous species from the standpoint of the Arizona homeowner because it is a parasite of their canine pets. During their lifecycle, they frequently drop off the host then climb up walls and vegetation and re-attach themselves to a passing host. Larvae can survive as long as eight months and adults as long as 18 months without feeding.

Prevention

1. Regularly inspect pets for ticks. Remove any ticks from the dog with forceps or eyebrow tweezers. Apply gentle pressure slowly to allow the tick to loosen its mouthparts. Do not use an irritant such as alcohol or nail varnish. Afterwards wash with

soap and water and apply a dry dressing over the wound.

2. Frequently mow your grass short.
3. Remove leaf litter, brush and woodpiles around houses and at the edges of yards.
4. Clearing trees and brush to admit more sunlight into the yard reduces the amount of suitable habitat for deer, rodents, and ticks.
5. When hiking, avoid tall grass and shrubs, wear white or light-colored clothing (attached ticks are more visible) and tuck pant legs into socks.
6. Occasionally some repellent lotions can also be used.
7. Routinely check your pets for ticks and remove them immediately.

K. Venomous spiders

Spiders are predators that feed on insects and other arthropods. They are all beneficial in our environment, and most are harmless. In the United States 20,000 different species have been identified and only four are occasionally harmful to humans. In Arizona, desert recluse species, and the Western widow are the only spider bites requiring medical intervention.

In the case of a spider bite, causing significant pain or reaction contact a physician or the Arizona Poison & Drug Info Center – 1-800-222-1222 as soon as possible for advice and assistance. If possible, collect the spider to aid diagnosis and correct treatment procedures.

The recluse spiders (*Loxosceles spp.*) found here in Arizona are often mistakenly referred to as the brown recluse. The true brown recluse spider (*Loxosceles reclusa*) however does not occur in Arizona, but resides in the Midwest and northwest. The closely related Arizona species are quite similar to the brown recluse and can be distinguished only by an expert. The most common Arizona species are *Loxosceles arizonica* and *L. deserta*.

Adult brown spiders are brown in color and the body is about ½ inch long. Their legs are long and delicately covered with short, dark hairs. The leg span is about 1½ – 2 inches as adults. Distinguishing characteristics include the three pairs of eyes arranged in a semicircle on the top of the cephalothorax (combined head and abdomen) and a violin-shaped marking immediately behind the eyes. This marking also gives them the name “fiddleback” or “violin: spider.



Male recluse spider



Female recluse spider

Most recluse spiders are found living in groups. Males, females and even spiderlings are capable of venomous bites creating a disease state now known as necrotic arachnidism.

The bite itself is often unnoticed and the severity of the reaction varies greatly between individuals. In the case of necrotic arachnidism, the bitten area becomes painful, swollen and blistered within hours. This site will evolve into what has classically been described as a **bulls-eye lesion** with a dark center (dead skin) outlined by white and set on a red and inflamed background. It is several weeks before the blackened area falls away, leaving a pit of scar tissue. On rare occasions, the response involves a large amount of tissue destruction and a serious life-threatening systemic reaction. The most up-to-date treatment includes the use of a hyperbaric chamber, which eliminates ulceration of bites and applying Dapsone® to the wound site.

The common “black widow” spider specifically refers to the eastern species *Latrodectus mactans*, which **does not occur** in Arizona. Our Western widow species *Latrodectus hesperus* is however very similar in appearance to the true black widow. Females are shiny black and about 1.5 inches long. The famous characteristic mark is the reddish hourglass shape on the underside of her abdomen.



Female widow spider—dorsal view



Female widow spider—ventral view

Like the recluse spider, the initial bite itself may not be felt immediately, however, local pain does follow shortly after envenomation. The venom can cause abdominal pain similar to appendicitis as well as pain to muscles and even the soles of the feet. Other symptoms include alternating salivation and dry-mouth, paralysis of the diaphragm, profuse sweating and swollen eyelids. Most healthy people recover rapidly in two to five days but rare fatalities that occur are due to heart and lung failure. No fatalities have been reported in Arizona.

If bitten, clean the site well with soap and water. Apply a cool compress over the bite location and keep the affected limb elevated to about heart level. Aspirin or Tylenol may be taken to relieve minor symptoms.

Prevention

1. Perform routine, thorough house cleaning, particularly storage areas (closets, basements, attics, etc) and behind outside shutters. Regular dusting and clutter reduction removes hiding places. Pay particular attention to doors, windows, vents and along foundations.
2. Reduce clutter in garages, attics, and basements.
3. Reduce clutter in storage cupboards; do not place your hands where you can not see.
4. Trim weeds around the building foundation and remove firewood, building materials, and debris to discourage insects and spiders from living next to a structure. Reduction of heavy dense vegetation will help reduce spider populations.
5. Install tight-fitting window screens and door sweeps.
6. Consider installing yellow or sodium vapor light bulbs outside entrances because these lights are less attractive to insects and thus draw fewer spiders to the area.
7. Follow the guidelines for general exclusion e.g. sealing cracks, fitting door sweeps and eliminating other possible entry points to prevent spiders from moving indoors.
8. Use a vacuum to remove webs, unwanted spiders and egg sacs on a continuous basis.
9. Learn to recognize the recluse and widow spiders and instruct other members of the household.
10. Do not collect wood from woodpiles out-of-doors without wearing gloves. Place wood from outside directly on fires. Do not store indoors.
11. Recluse spiders and widow spiders can simply be vacuumed. A small amount of boric acid crystals can be applied prior to vacuuming. To be extra careful, remove the vacuumed bag and discard in an outside garbage container immediately after vacuuming.

IV) Stored Product Pests in Arizona

Stored product pests can be grouped into beetles, moths, and mites. These include granary weevil (*Sitophilus granaries*), rice weevil (*Sitophilus oryzae*), flour beetles (*Tribolium* spp.), cigarette beetle (*Lasioderma serricorne*), drugstore beetle (*Stegobium paniceum*), sawtoothed grain beetle (*Oryzaephilus surinamensis*), Indian meal moth (*Plodia interpunctella*), angoumois grain moth (*Sitotroga cerealella*) and other mites. They are not usually harmful even when consumed. Most

are introduced into our homes in infested foodstuff, but others make their own entry into homes. Additional invaders such as ants, roaches and firebrats may also feed on pantry foods. Certain ant species such as thief ants are toxic and can make people ill if ingested in significant quantities.

Stored food pests are economically important. They are responsible for the loss of millions of dollars every year in contaminated products and are also responsible for the damage of important heritage artifacts in museums. Large populations of stored product pests may develop in unused or undisturbed foods that were infested when purchased. Arizona's warm climate can allow many of these pests to reproduce quickly producing several generations per year.

The most commonly attacked products are cereal grains, spices and nuts, but all food items are susceptible. Certain non-food items such as dried flowers, stuffed furniture, and toys can conceal infestations.



Sawtoothed grain beetle



Indian meal moth

Prevention

1. Employ a regular cleaning schedule of the pantry and other storage areas. Include regular inspections with a flashlight.
2. Organize your shelves so that older food products will be used before newer ones. Reduce clutter and excess products in cabinets or storage. Also, dispose of all infested and old or outdated products.
3. Store materials that are not commonly infested such as animal bedding, paper products and canned goods away from those that are regularly infested.
4. Prevent birds and rodents accessing food items.
5. Good lighting is recommended where possible.
6. Seal cracks (especially wall penetrations) that join with other rooms.
7. Repair moisture and ventilation problems.
8. Eliminate cardboard as much as possible. Replace cardboard containers with sealable glass or plastic.

V) Fabric Pests in Arizona

Two groups of pests are responsible for destroying fabric, clothes moths and carpet beetles.

The clothes moth larva is the only feeding stage and therefore the only stage that damages fabrics. The larval stage lasts for 1 to 3 months during which time the larva eats only fibers or materials of animal origin. These include woolen rugs and clothing, hair, fur, feathers, taxidermy mounts and felt.

Clothes moth larvae prefer to feed in protected locations such as under collars, inside hems, on the backside or in cracks at the edges of woolen carpets, under furniture and inside storage containers. Rarely, if ever, will these insects be found infesting garments or items that are used or moved regularly. The larvae tend to crawl about as they feed and eat the nap from the fabric surface. If the larvae remain for a long time, deeper damage and holes may appear.

Adult clothes moths are buff colored and about 1/4 inch long. They are seldom seen; they avoid light and remain hidden. They do not feed or cause any damage.

Carpet beetles also feed on dead insects that may be trapped in inner wall spaces. They can create a considerable amount of damage if left undisturbed and

beetles leave numerous cast skins. The larvae feed on dried foods and materials of plant and animal origin within the house such as woolen rugs, blankets, clothing, furs, hides, feathers, and other animal feeds, etc.

Today clothes moths and carpet beetles are less problematic since many fabrics are synthetic and not from a natural origin. Dry-cleaning and other sanitation methods have also reduced the populations of these pests.



Cloths moth damage

Prevention

1. Vacuum frequently and be sure to dispose of the contents regularly. Special attention should be given to cracks, corners and underneath rugs and furniture.
2. Clean fabrics before storage. Periodic brushing and sunning of stored fabrics is also helpful. The larvae do not like the light and brushing will destroy or dislodge eggs, larvae, and cocoons.
3. For long-term storage, gather fabrics and place them in tightly sealed chests, boxes, or storage closets.
4. Dry clean or dispose of infested clothing, cloth, blankets, and other fabrics. Small items can be freeze-treated by placing them in the freezer for a week.
5. **Boric acid dust can be used to treat cracks, crevices and other areas after the infested materials have been removed or cleaned.**

Never use mothballs. Mothballs contain 100% of either naphthalene or paradichlorobenzene. Both of these ingredients can produce harmful effects when they enter your system through inhalation.

Summary

An enormous amount of effort and money can be saved by pest-proofing a home or building. Pest-proofing has many advantages: it is safe and sustainable, and it is VERY effective at reducing the number of pests in your home.

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This information has been reviewed by university faculty.
cals.arizona.edu/pubs/insects/az1320.pdf

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, James A. Christenson, Director, Cooperative Extension, College of Agriculture & Life Sciences, The University of Arizona.

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