



**GOOD NIGHT, SLEEP TIGHT, DON'T  
LET THE BED BUGS BITE!**



*Cimex lectularius*

Dawn H. Gouge  
University of Arizona

Marc L. Lame  
Indiana University

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- During the early 20th century, bed bugs were rated among the top three pests in structures.
- Bed bugs all but disappeared in developed countries, particularly with the widespread use of DDT during the 1940s and 1950s.



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Bed bugs feed on the blood of human beings.

Birds and mice also.

Feed at night.

Salivary secretions can cause a person's skin to itch and become swollen.

Scratching can cause infected sores.



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## Bed Bugs Suck!!!!

Adult bed bugs  $\frac{1}{4}$  inch in length can engorge themselves in less than 15 minutes to three times their original size.

A bed bug's saliva includes an anesthetic and an anti-coagulant.



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Most bite reactions occur immediately  
A reaction may take as long as 14 days to develop.

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Attracted by warmth and CO<sub>2</sub>.

Single or clusters (disturbed feeding) of bites.

Bites can be found anywhere, especially exposed skin.



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Female bedbugs can lay over 500 eggs.

Each bed bug will molt five times and a blood meal is required each time.

Bed bugs can slow their life process until a blood meal source is found.

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1st and 2nd

2nd instar bed bug (Scale in 32nds of an inch)

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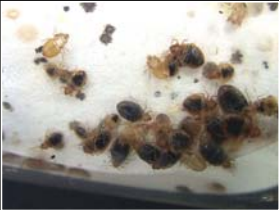
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- From egg to adult: 5 weeks to four months
- Can live up to 18 months or longer without blood meal
- Adults live about 10 months




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Adult male –  
pointed  
abdomen

Engorged female –  
rounded abdomen



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- Nocturnal, harbor in clusters
- Hide in daytime in cracks, crevices, etc.
- Travel 5-20 ft. (each way) nightly to feed
- Can remain fully active at <45° F



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Bed bugs form aggregations by cueing into fecal matter, and blood.



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### Inspection

Bed bugs, molts, blood, fecal stains, sweet smell.



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- Combine inspection with vacuum cleaning
- Use a brush, flash-light, canister vacuum with a crevice attachment







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Inspect sleeping areas around pets, and where bats or birds have entered structures





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Beds and bedding,  
Headboards,  
Luggage racks,  
Wallpaper,  
Window and door casings,  
Pictures and artwork on walls,  
Edges of carpets,  
Where ceilings and walls meet,  
Behind light switch covers and outlets,  
Clothes,  
Appliances and furniture,  
Baseboards and carpet stays.




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### Bed Bug Species

Common  
Tropical Bed Bugs,  
Bat Bugs,  
Poultry Bugs,  
Chimney swift bug and the swallow  
bug.



Most commonly encountered after  
bed bugs, is the bat bug, *Cimex*  
*adjunctus*.

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Bed bug (**common**) vs. Bat bug (**eastern**)  
*C. lectularius* L. Vs. *C. adjunctus* barber



Swallow Bug

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## Remediation

- Exclusion



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Sanitation (vacuuming, etc.),  
Hygiene (laundry, furniture steaming, etc.),  
Cultural proactive practices,  
(maintenance, monitoring, encasing, sealing, pest  
proofing, etc.),  
Residual (non-repellent) pesticides,  
Heat / freeze treatments, etc.  
“Whole structure” fumigation



Rapid  
Freeze®



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## WHO ELSE LIVES IN THIS HOUSE ?

- Cockroaches
- Flies
- Rodents
- Oh and a few people too!



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### ***Blattella germanica* (German cockroach)**

- *Salmonella* remains viable in the digestive tract of German roaches for 9 days and on the exoskeleton for 10 days.



*Proteus mirabilis*, *Pseudomonas aeruginosa*, *Salmonella* spp., *Serratia marcescens*, *Shingella*, *Enterobius vermicularis* (pinworm), *Trichuris trichura* (threadworm), *Entamoeba histolytica* (amoebic dysentery), *Giardia* sp. (paralytic polio).

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### ***Blattella germanica* (German cockroach)**

Like warm, humid places. Proliferate in human homes. Hide out in cracks and crevices close to food and water source



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Nymphs will often hatch from the ootheca while the female is still carrying it.

Egg case contains 30 to 40 eggs.



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At room temperature nymphs complete development in 60 days.

Whole life cycle in 100 days



Actively growing populations are 80% nymphs and 20 % adults.



The cockroach is omnivorous, eating table scraps, pet food, and even book bindings.

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## Cockroaches



German

American

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## TURKESTAN COCKROACH



Male

*Blatta lateralis*

Female



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**ODOROUS HOUSE ANTS**  
*Tapinoma sessile*

Odorous house ants are opportunistic.

Outdoors, ant nests are usually shallow. Nests may be found in mulch, soil, debris, logs, stumps, under stones and under plastic outdoor tarps.

Indoors, nests are usually found in wall voids, around hot-water pipes and heaters, behind paneling, under carpets or beneath the floor.

Colonies can become large and bud to form satellite colonies.

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Ants forage night and day.

They eat live and dead insects but are also attracted to sweet foods.



They harvest honeydew from aphids and mealybugs. Ants tend aphids and mealybugs to collect the honeydew they excrete.



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### *Monomorium pharaonis* (Pharaoh ant)

- Tiny, inconspicuous ant, associated with many different pathogens.
  - *Pseudomonas aeruginosa*, *Staphylococcus* spp., *Salmonella* spp., *Clostridium* spp., *Bordetella bronchiseptica*.



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Nesting occurs in inaccessible warm (80 to 86°F), humid (80%) areas near food and/or water, such as in wall voids.

Large colonies vary from a few dozen to several thousand or even several hundred thousand individuals.

Approximately 38 days are required for development of workers from egg to adult.



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U. S. common among children 3 to 12 years of age.

6 to 12 million have infestations / y.

The most common symptoms are itching and sleeplessness.



Scratching leads to secondary bacterial skin infection.

Head lice: embarrassment; unnecessary days lost from school; pesticide exposure; millions of dollars spent on remedies.

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Adults are 2 to 3 mm long, color varies.

The female lives up to 3 to 4 weeks and lays 10 eggs, a day.

Eggs are attached to the hair shaft close to the scalp.

Nits are camouflaged with pigment to match the hair color of the infested person.

Most easily seen at the posterior hairline.

Empty nit casings are easier to see, white against darker hair.



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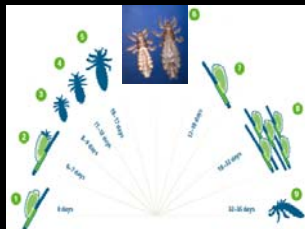
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The eggs are incubated by body heat and hatch in 10 to 14 days.

Once the eggs hatch, nymphs leave the shell casing, grow for about 9 to 12 days, and mate, and then females lay eggs.

If not treated, this cycle may repeat itself every 3 weeks.



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Lice feed by injecting small amounts of saliva and taking tiny amounts of blood from the scalp every few hours.

This saliva may create an itchy irritation.

With a first case of head lice, itching may not develop for 4 to 6 weeks, because it takes time to develop a sensitivity to louse saliva.



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Head lice usually survive for less than 2 days away from the scalp at normal room temperature.

Their eggs cannot hatch at an ambient temperature lower than that near the scalp.

Launder and dry on a high heat, 130°F.



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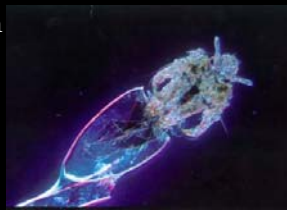
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A louse can crawl 6 to 30 cm per minute.

Nits are easier to spot, especially at the nape of the neck or behind the ears, within 1 cm of the scalp.

Nits found more than 1 cm from the scalp are unlikely to be viable.



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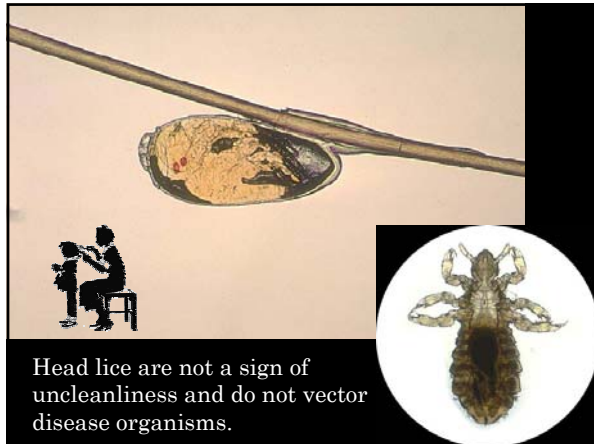
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## SCORPIONS

Nocturnal, preferring  
Cracks and crevices.

Scorpions are  
predatory and feed  
mainly on crickets and  
cockroaches, etc. Stings are painful but  
rarely deadly.

Children, sick, and hypertensive adults,  
are vulnerable.



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- Scorpions are nocturnal or diurnal.
- The venom of scorpions is used for both  
prey capture, defense and to subdue  
mates.
- Scorpions can control  
the venom flow, so  
some sting incidents  
are venomless or only  
mild envenomations.



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- Modify surrounding areas of structures  
and pest proof buildings
- Use a  
blacklight to  
physically  
collect and  
remove  
scorpions



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## SPIDERS



- Liquid food intake
- Webs are used to capture prey and many other purposes
- All are beneficial, few are hazardous




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## Widow Spiders

The true black widow spider *Latrodectus mactans*, is the most venomous spider in North America.

The venom is 15 times as toxic as the venom of the prairie rattlesnake.

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## Widow Spiders

Mature in 70-90 days

Mating in spring

Incubation: 14-30 days

No. of Eggs: 250-700/sac

Birth Interval: 4 to 9 egg sacs/summer

Lifespan: up to 3 years




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## WIDOW



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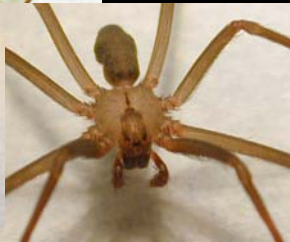
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## RECLUSE SPIDERS

THE NEXT SLIDE IS A  
LITTLE GRUESOME



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### More than 11 species in the US

Egg laying primarily occurs from May through July

The female lays about 50 eggs that are encased in an off-white silken sac that is about 2/3-inch diameter.

Each female may produce several egg sacs over a period of several months. Spiderlings emerge from the egg sac in about a month or less.



Their development is slow and is influenced by weather conditions and food availability.

It takes an average of one year to reach the adult stage.

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Adult spiders often live one to two years.

They survive long periods of time (about 6 months) without food or water.

The web is the spider's daytime retreat, and it often is constructed in an undisturbed corner. This spider roams at night searching for insect prey.

Spiders often scavenge on dead insects. Mature males also roam in search of females.



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Recluse spiders generally occupy dark, undisturbed sites.

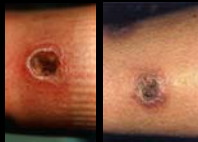
Populations can be dense.

Indoors, they may be found in attics, basements, crawl spaces, cellars, closets, and ductwork or registers.

They may be found in outbuildings such as barns, storage sheds, and garages.

Outdoors, spiders may be found underneath logs, loose stones in rock piles, and stacks of lumber.

Recluse spiders are not aggressive, and normally bites only when crushed, handled or disturbed.



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## SAC SPIDERS

Clubionidae:  
*Cheiracanthium* spp.  
*Trachelas* spp.

*Cheiracanthium* spp. overwinter as juveniles and molt into the adult stage during late spring.



In summer, the female lays eggs in a loose mass and covers them with a thin, white silk sac. She conceals the egg sac under leaves, stones, etc. outdoors. However, indoors, she keeps it in a silken retreat in crevices and upper corners. The female guards the egg sac until the eggs hatch.

*T. tranquillus* lays eggs in the fall, and the spiderlings probably emerge from the egg sac in the spring.

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## HOBO SPIDERS

*Tegenaria agrestis*, indigenous to western Europe introduced into the northwestern United States.



The spiders' ability to produce necrotic lesions and systemic illness was demonstrated in the laboratory in 1986 (see Vest (1987).

They rarely climb vertical surfaces and are uncommon above basements or ground level.

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## SPIDER MANAGEMENT

- Remove clutter in and around buildings
- Seal all openings
- Replace outdoor lights with yellow lights
- Vacuum, vacuum, vacuum!

Spiders are resistant to many insecticides.

- WebAway
- Crack and crevice treatment with DE




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There are many more accidental deaths, all preventable.



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So why do bees sting?



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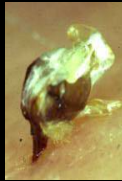
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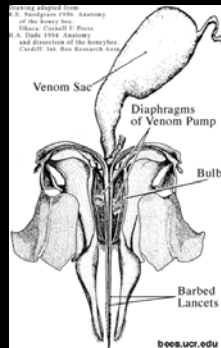
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## Bee Stings



- Scrape them off
- Apply salt




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## Are all stings equal?

- An Africanized bee is no more venomous than a domestic European honey bee. But a larger % of the hive population is defensive.
- AHB can be distinguished from EHB only by measurements or DNA analysis

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Colonies can live indefinitely, typically 1-5 years and the bees are active year round in Arizona.




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Favorite places are also abandoned buildings, trailers, or uninhabited out buildings.



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Resting swarms may hang around for 2-3 days before moving on.  
They are generally not aggressive.



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Keep the sting area clean, watch for signs of allergic reactions:

- Difficulty in breathing or swallowing.
- Fainting or turning pale (low blood pressure).
- Large swellings away from the sting site, often eyes, lips, neck, hands or feet (angioedema).
- Red spots or rash, usually itches (urticaria).

If either of the first two symptoms, **911**

If either of the second two symptoms, seek medical care quickly.

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#### Differences Between Hives and Swarms

##### Hives

- **Permanent:**  
Present weeks +
- Usually in holes, walls, trees
- Most bees not visible
- Usually much flight activity
- If exposed, comb seen
- Often defensive
- Bees with yellow/orange pollen on legs arriving



##### Swarms

- **Temporary:**  
Present 1-4 days
- Always **exposed & open**
- **Visible cluster** of bees
- Usually quiet, little flight
- Comb not present
- Very rarely defensive
- Pollen-laden bees not seen



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#### Removal of a Swarm

Go to scene, suit up, get equipment ready

Place plastic sheet under swarm and tub with a gallon of 2% dish detergent in water directly below swarm

**CALMLY, SLOWLY, and GENTLY** spray a mist of 2% dish detergent in water on all outer parts of the swarm

Take your time, you want the bees to think it is raining, not a threat.

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### Detergents for Killing Swarms

Any supermarket detergent will do –  
Ivory, Dawn, Palmolive, Joy, – these are  
just ones I know, most any will work  
Make approximately 2% solution (1/3 cup  
per gallon) in sprayer; swirl to mix, but  
don't make lots of suds  
1-2 gallons should do



M-Pede is actually registered for  
this use, but any detergent is  
effective

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### OTC Insecticide Labeled for Bees

& Hornet Killer :

**A bad plan!!!**

Bald-Faced Hornets

Yellow Jackets



Tetramethrin and permethrin

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Female

Male



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Mosquito Management Strategies

- **Habitat Modification**
- **Mosquito Abatement Districts**
- **Biological Control**
- **Insecticide Control**

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## Insect Repellents

Effective but can cause skin sensitivity to develop, E.g. *Off*.

Limited protection time, E.g. *Skin So Soft Bug Guard*.

Limited protection time.

Lavender oil Not suitable for children under 2.

Eucalyptus oil Effective and safe, E.g. *Off Botanicals*.

Picaridin Effective and safe, E.g. *Cutter Advanced*.

Soybean oil Effective and safe, E.g. *Bite Blocker for Kids*.

Permethrin For use on clothing only.



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## Filth Flies The Most Important Indicators

- Blow flies
- Flesh flies
- House flies
- Drain flies
- Lots of other flies



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### • **Calliphoridae**

- Blow flies
- Arrive within minutes
- Eggs in clusters around body openings



### • **Sarcophagidae**

- Flesh flies
- Larviposit
- Migrate up to 30 ft as pre-pupae



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**Moth Flies**



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**Rabies / Plague**



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**Feral Cats and Dogs**



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### Cats and Dogs Need to be Loved and Cared for at Home

- Round worms
- Hook worms
- Tape worms
- *Giardia*
- *Toxoplasma*
- *Cryptosporidium*
- Various Enteric Bacteria
- Fleas and ticks
- *Tinea*



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### Rodents



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### Birds

Psittacosis

Bird flu



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## Subterranean Termites




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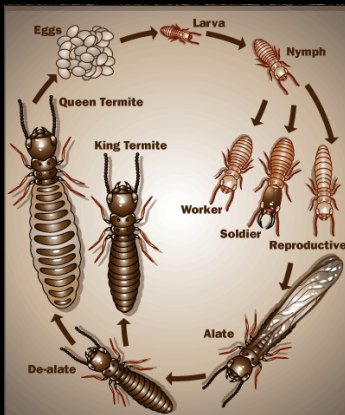
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## Species

Western subterranean –  
*Reticulitermes hesperus*



Eastern subterranean –  
*Reticulitermes flavipes*



Formosan subterranean –  
*Coptotermes formosanus*

Desert subterranean –  
*Heterotermes aureus*

Arid-Land subterranean –  
*Reticulitermes tibialis*




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## Signs

- Mud tubes
- Swarmers
- Wood damage



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## Problematic Construction Practices

1. Wood to soil contact
2. Form boards, tub trap boxes, and spacers not removed after construction.
3. Wooden debris left inside CMUs.
4. Wood refuse buried under the slab.
5. Stucco below grade. Stucco, brick veneer or EFIS below grade.

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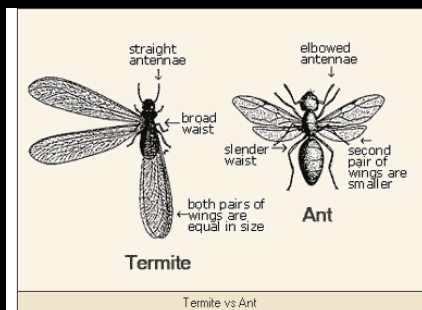
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## Know the Difference Between Ants and Termites



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**The worst pest =  
*Homo sapiens***



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**Thank you  
Sweet Dreams**

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mlame@indiana.edu



*Do Not  
Disturb*



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