THE UNIVERSITY OF ARIZONA
Cooperative Extension

TERMITE MANAGEMENT FOR HOMEOWNERS

Termites are considered Arizona's number one urban pest. As a homeowner, you may encounter termites at sometime or other. If you find termites in your home, it's important not to panic. These small animals take a very long time, often years before structural damage is present in the home. Therefore, the information provided here is to enable you to make intelligent decisions regarding termite management options. It's important to contact several pest management professional (PMP's) for estimates. If you already have a pest control service you may want to contact them for an estimate. Attempting to control termites on your own is not recommended.

Termites are small animals found primarily in the tropical regions of the world, where they play a role in the recycling wood and other cellulose-based materials. Termites are in a group of insects, which alone comprise the order Isoptera (iso-ptera = "equal-winged"). They are so named because the primary reproductive adults usually referred to as "swarmers", have two pairs of equal length wings. There are currently approximately 2,761 named termite species in 282 genera worldwide. About 45 species occur in the continental United States with nearly 30 causing damage to wood and wood products. At least seventeen species of termites occur in Arizona, but only three species are considered to be of any significant economical importance.

Scientists have placed all the termites into 3 broad categories based on their habitat: dampwood, drywood and subterranean. In Arizona, dampwood and drywood termites are not wide spread problems but can be under certain conditions. Subterranean termites on the other hand are considered one of our major urban pests.

Biology: Termites live in true social groups with a division of labor between the different castes of individuals. Within these castes are a complex life cycle with the development of individuals that look and behave differently from other members of the group. The different castes are separated into adult reproductives, workers and soldiers. In order to get a better understanding of the termite life cycle, I will describe the process beginning with a primary reproductive or king and queen, also know as alates (Fig 1). These adults can vary in color from light tan to reddish brown to nearly black. Adults range in size from ½ to 1 inch plus with wings attached. The eyes are fully developed, with mandibles (jaws) typically visible, and membranous wings. Paired antennae are often bead-like or moniliform.

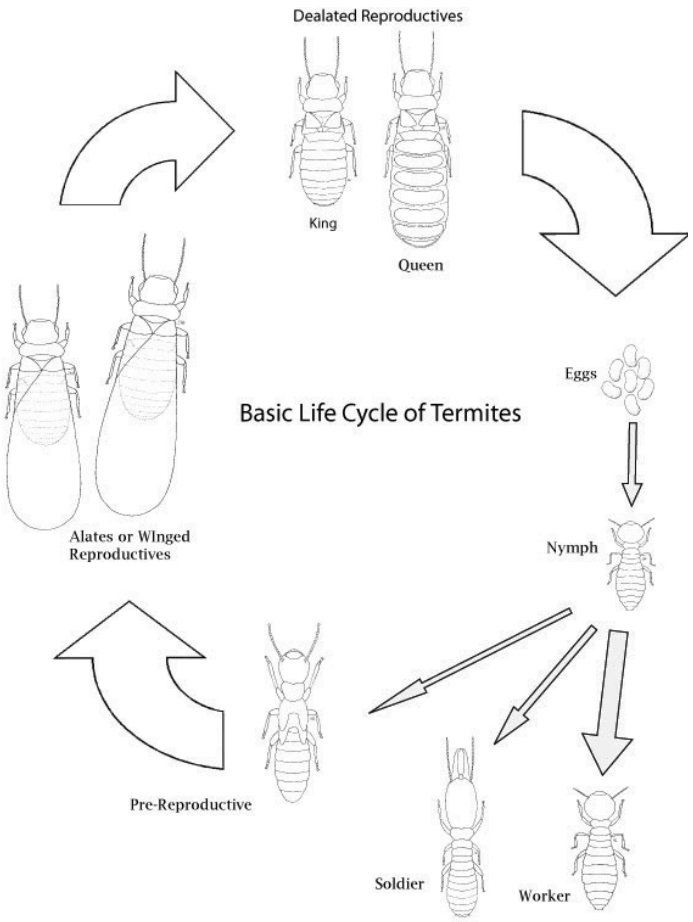

Figure 1. Basic Termite Life Cycle

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During certain times of the year, the alates leave the colony in a series of dispersal flights or swarms. During this time, adults may be attracted to lights, where pairing begins. As the alates, both males and females, land on the ground, the wings are shed and they start searching for a suitable place to initiate a colony. The males are attracted to the females by a scent or pheromone, and follow the female. Together they dig into the wood or moist soil depending on the species and form a chamber, where mating takes place and the queen begins to lay eggs. Of the millions of alates that swarm every year, only a small percent, usually less than 1%, survive to produce a colony.

The worker caste, the one most homeowners see, are responsible for performing the labor within the colony. They care for the eggs and young; construct the colony tunnels along with repairing the damaged ones; forage for food; along with helping other termites when they molt or grow; and groom, clean, and provide food for other nestmates, as well as for one another. They help soldiers in defending the colony if an attack occurs from ants or foreign termites. As for the soldier caste, there main function is to defend the colony against other termites and ants. In general, it does this by using its large opposing jaws or mandibles.

Identification is the key to any termite management strategy and thus it's important to obtain samples of soldier termites and when at all possible winged adults. Winged ants are often mistaken for winged termites, but several characteristics can be seen with the naked eye that will help differentiate the two insects (Fig. 2). Ants have two pairs of transparent wings of unequal size, while termites have four equal-sized wings that generally fold over the back. In addition, the region of the body behind the wings is "pinched" in ants but completely straight in termites. Termites are sometimes referred to as "white ants" because they look like ants but they are found in a mud tube. These white termites should be collected and used for identification

Types of Termites

As previously mentioned, in Arizona we have 3 categories of termites of which 2 can be considered pests, drywood termites and subterranean termites. Drywood termites, as the name implies, are capable of infesting drywood that is not in contact with the ground. Because they do not construct earthen mud tubes, like subterranean termites, they are usually very easy to identify; infestations however, are harder to detect. A good sign of drywood termite infestation is the presence of hard, dry fecal pellets that usually form piles (Fig. 3). Under a microscope the pellets have pronounced dimples, like dried corn kernels. Drywood termites are larger than subterranean termites approximately ½ inch; they construct larger galleries, and in a large number of cases are found around door and windowsills. There are two important species of drywood termites in Arizona: *Incisitermes minor* (Hagen), and *Marginitermes hubbardi* (Banks). Other species that occur are not considered pests. *Incisitermes minor* is the most common of the drywood termites and probably the most destructive. This species attacks all types of dry sound wood. They occasionally are found in furniture and other wood products in areas that normally would not have this species. Soldiers have large jaws, with the basal segment of the antenna slightly enlarged. The adult bodies are two-toned in color, with a brown head and thorax and a brownish-black abdomen. Adults have been observed to fly on bright sunny days in June to August, unlike the subterranean termites, they are not timed to coincide with the rain. (For more details see the U of AZ "Drywood Termites").

Subterranean termites derive their name from the fact that they live in contact with soil as a source of moisture. For these termites to move into a wood source above ground, they construct tubes made of soil, soft fecal matter and wood chips. There are 3 species of subterranean termites in Arizona that are likely to cause structural damage. A destructive termite found in the desert southwest is the arid-land subterranean termite, *Reticulitermes tibialis*. Arid

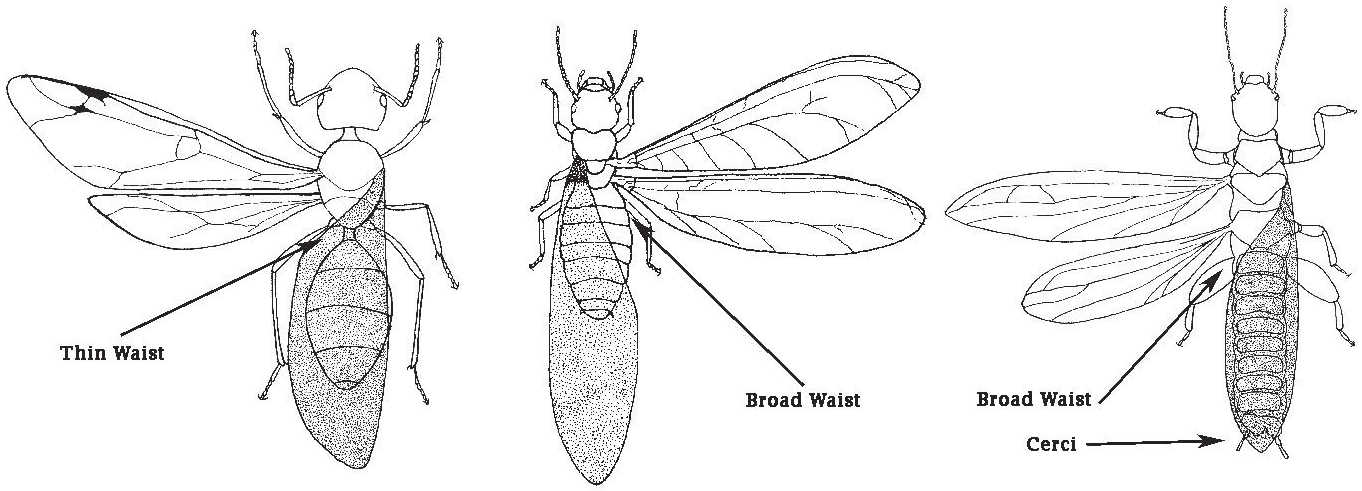

Figure 2. Comparison Between Reproductive Ant, Termite, and Web Spinner



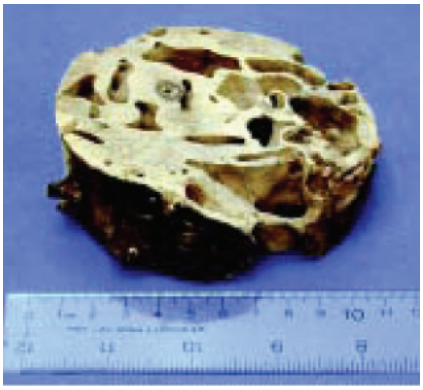

Figure 3. Drywood fecal pellets and damage

land termites naturally occur in the deserts where they attack creosote and greasewood bushes. Thus, when homes are built in these settings, the natural food source has been removed; they may begin to attack the structure. The timing of the winged reproductive swarms depends on the elevation in Arizona. Below 4,000 feet, the arid land termite swarms between January and March. Above 4,000 feet, they swarm in June and July. The adults are about ½ inch long with wings and 3/8 inch long without wings. They are dark brown to black, with dark leg areas and almost colorless wings. If you come across an infestation and can collect a soldier(s), it still may be difficult to identify, because it looks very close to the desert termite *Heterotermes aureus*. In fact, the soldier mandibles need to be dissected and examined for selected characteristics. In general, the soldiers are 3/8 inch long with mandibles (jaws) that are nearly straight. The most common and by far the most destructive are the desert subterranean termite, *Heterotermes aureus* (Snyder). Despite its limited distribution in the U.S. to mostly the arid southwest, it has been known to attack various types of wood, including cactus ribs, desert trees (both dead and occasionally living) and human structures such as utility poles, posts and structural timbers. Winged adult flights take place generally after a rain during the monsoon season from July to September. The head and body of the winged adults are pale yellowish brown, approximately 3/8 inch long without wings and ½ inch long with wings. Identification to species level is usually accomplished using either soldiers or adults. However, *H. aureus* is difficult to separate from *Reticulitermes* sp. using only a soldier for identification. When soldiers are compared to *Reticulitermes sp*, the mandibles (jaws) are 3/8 inch long, more slender and nearly straight.

The tube-building termite *Gnathamitermes perplexus* are thought to be "true" desert termites because they attack a variety of desert plants and materials such as fences, cow-chips, dead grass or weeds. They construct wide thin plaster-like earthen coatings on palms trees or wooden fences where they feed by scraping dead wood off the exterior. As a homeowner you might have observed dead grass or a twig covered with the thin layer of mud, that if disturbed, the termites *G. perplexus* scurry to go underground. In general, these termites are not pests and should not be treated for unless they are found inside a structure. Adults are ¾ inch long including the wings, and are brown in color. They are diurnal (morning/night) fliers and usually fly after a summer rainstorm. Soldiers have mandibles (jaws) that are curved inward with an obvious inner tooth. This tooth is used to distinguish the damaging species of termites from the desert species. (For more information see the U of AZ "Arizona Termites of Economic Importance").

Detection/Inspection for the presence of termites in many cases can be difficult. Even though termites are made up of numerous individuals, they are quite secretive and spend most of their time either in the soil or inside wood. Thus, how does a homeowner tell if their home is infested with termites? Using a good flashlight, examine the foundation wall at the soil line, cracks in concrete floors and places where pipes and ducts come up through the concrete slab for tubes where termites could enter. A good indicator is a mud tube on the outside stem wall (Fig. 4). Termite galleries of both dry-wood and subterranean termites infesting interior wood can be detected by tapping the wood every few inches with a screwdriver. Damaged wood should sound hollow and the screwdriver may even break through into some extensive galleries. When possible, determine all the entry points and the type of termites by collecting live ones for identification. Collect and place in alcohol for identification. Now that you have a good indication of an infestation, you should consider getting a professional inspection (there will be a fee for this service). Check with friends, neighbors, the Better Business Bureau and even the Structural Pest Control Commission for information/recommendations. Even if you do not have termites, an annual inspection by a Pest Management Professional is recommended.

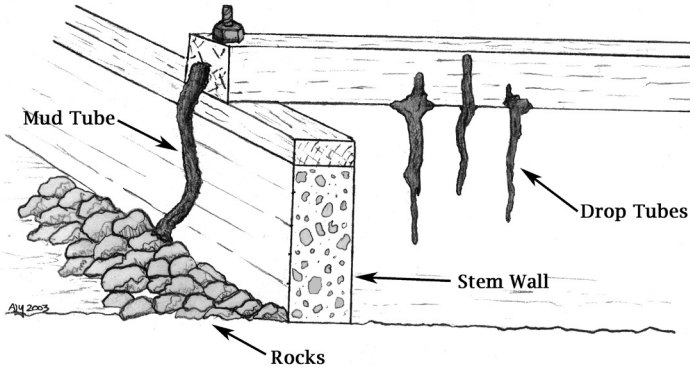

Figure 4. Access tube made of mud

Figure 5. Pre-treatment application

Construction practices

Construction practices used by builders can be critical in keeping termites from invading your home. A consultation with your builder, your pest management professional and your lending institution is important for meeting all local requirements. Arizona laws do not require any termite prevention treatment, but almost all lending institutions require a termiticide treatment as part of the construction loan. A liquid termiticide application applied to the soil substrate before the concrete is poured is called a termite pretreat (Fig. 5). This application is recommended for all structures particularly in the low desert areas.

Pre-Construction - What you do before building your home may save you a lot of headaches afterward. Contact your builder and work with him or her to agree upon a plan to prevent termites from invading your home. Ideally, the time to protect a house against termites is before it's built. Here are some things to consider:

- Remove all cellulose materials like stumps, roots and wood scraps from within 25 ft of the structure,
- When possible treat the soil with a termiticide below the footer before it's poured,
- Make sure there is adequate drainage away from the house,
- If ABC (Aggregate Base Concrete) fill is called for in the specifications, insist on leveling and packing this gravel based material as firm as possible,
- Make sure the soil is level and adequately compacted within the concrete frame,
- Concrete must be poured within 24 hours of the termiticide application, but the shorter the time interval between the treatment and the concrete being poured the better,
- Avoid all non-treated wood to soil contact, particularly in high moisture areas,
- Exterior woodwork should be located a minimum of six inches above the grade or soil line,
- Install screened vents on all crawl spaces and attics to eliminate the accumulation of moisture and
- Make sure that the "final grade" is completed, if possible after all the initial landscaping is finished.

Barriers

Physical barriers nationwide are becoming more popular because in general they have no chemicals associated with them that could contaminate the environment. To date, they have had limited application in Arizona.

Listed below are some examples of physical barriers.

Copper Termite Shields are installed primarily on top of the foundation or stem wall as a physical barrier to prevent termite access. The installation and cost of materials can be expensive.

Stainless Steel Mesh products such as Termi-Mesh ® is a stainless steel mesh (0.66 x 0.45 mm) that can be laid down within the stem walls of the foundation of the structure or wrapped around pipe protrusions. The termites do not have the ability to penetrate through the steel mesh. The product is sold in Australia, Hawaii and other parts of the U.S., but to date it has not been used in Arizona.

Impasse® (Syngenta Crop Science) is a product containing polymer plastic sheeting that has the pyrethroid insecticide lambda cyhalothrin locked in between the 2 layers of plastic. The plastic sheeting is laid out in large sections within the stem walls. All seams and protrusions such as pipes are heat sealed to prevent termite access before the concrete is poured. Over time, in the event of a small hole occurring within the plastic sheeting, the chemical should prevent the termites from reaching the structure. Impasse® has been installed in 2 homes in Arizona as of 2002.

Sand Research results have demonstrated that a 4 to 6 inch layer of very uniform particle size (approx. 16 grid) sand under the foundational concrete can deter termites from penetrating the structure. This particular size sand prevents the termites from moving it or using it to build tunnels. However, if the particle size is inconsistent, or if the soil shifts

or opening appears in the sand barrier, this will enable the termites to enter the structure. It is not recommended as a stand-alone product for termite protection.

Pretreat protection against drywood termites may involve the use of chemically treated lumber for the first floor framing, but this can be expensive and apparently not often done. Redwood, cypress, cedar and very pitchy pine are reported to have some resistance but are not immune to termite attack.

Chemical

Pre-Construction Liquid chemical barriers are the standard in the pest control industry. In most cases, lending institutions require a pretreat application of a chemical or a termiticide. Pretreat termiticide applications consists of a 2-step process. The initial step consists of a termiticide application to the soil within the foundation "footprint" before the concrete is poured. The second step requires an application along the stem wall after all the construction is finished. This "final grade" consists of the application of the termiticide in a trench, 6 inches out from the stem wall and 6 to 12 inches down. Termiticides are considered either, repellent and non-repellent. A repellent termiticides cause the termites to sense a treated area and avoid it. It appears that termites are not deterred from tunneling in non-repellent termiticide but eventually die from exposure to the termiticide. The objective of any chemical treatment is to protect the structure. For more details on the cost of liquid termiticide treatments see U of AZ "Liquid Termiticide Costs". A list of currently registered termiticides is located at the end of this article, however you should check with local authorities because this list is subject to change.

Post-Construction: As structures age, it is critical to inspect them for the presence of termite activity particularly along the stem wall where the soil line meets the foundation. This should be done about twice a year, once in the spring, especially when we have had a wet winter and again near the end of the monsoon season, when termites are most active.

Some practical considerations:

- Correct faulty grades by insuring that standing or running water slopes away from the house and stem wall.
- Correct stucco below grade, by removing the outer covering of an outside stucco wall that extends below the soil line. The distance between the soil line and the stucco should be 4 inches; this will enable termite inspection of the outer stem wall.
- Reduce soil moisture within 1 foot of the stem wall; this can be done by correcting water drainage to slope away from the house and by planting shrubs and trees at least 18" from the stem wall.
- Make sure all main irrigation pipes are more than 18" away from the stem wall.
- Minimize soil disturbance adjacent to the stem wall to keep the termiticide barrier intact, if you disturb it contact your Pest Management Professional.
- If you home is less than 5 years old it should have received a "final grade " termiticide treatment, if the house is older there is a good chance that the final grade treatment has degraded, so inspect the stem wall at least twice a year.

Chemical Barriers

Conventional Liquid Barrier The standard in the pest management industry for termite control has been conventional liquid termiticides. The process consists of trenching and rodding a structure. The procedure prescribes digging a 6" wide trench 6" deep around the structure. All areas that butt up against the structure like a patio are down drilled. Down drilling consist of drilling 1/4" holes through the concrete approximately 12" apart so the termiticide can be injected into the holes. Once all the trenches are dug and holes made the liquid termiticide is applied based on labeled instructions and maximum rates (Fig. 6). Arizona state laws require full-labeled rates must be applied. The termiticide is applied to the trenches at the required 4 gallons of finished product per 10 linear feet (Fig 7). Finished product is what comes out of the hose once the concentrated chemical and carrier in this case water is mixed together. In addition, the finished product is applied through the drill holes based on label requirements. Upon completion of the treatment, the trenches are backfilled with the extracted soil being mixed with the chemical in the trench. Drilled holes are plugged and sealed over. If treatment is necessary inside the structure, this is done by down drilling usually adjacent to the infestation or possibly into the wall voids. Because of the nature of termites and the difficulty in conducting a through visual inspection, termites could return. A good treatment should result in an absence of termites visually after 3 months.

Supplemental Barriers: These barriers are used in conjunction with liquid termiticides.

Foam Selected termiticides can be applied by mixing them with a foaming agent and applied using a small compressed air tank. This mixture under pressure forms shaving cream type foam that expands into drilled voids, both under slabs and in walls. Dry wall foams are generally light, dryer and maintain direct contact within the void. Wet foams require more gallonage and utilized for sub-slab injections to ensure adequate saturation of the soil.

Dust Occasionally, the application of dusts to wall voids and other spaces are made where liquids or foams are impractical.

Direct Wood Treatment Products containing disodium octaborate tetrahydrate (borates) were developed to treat the termite's food supply. These products are painted or sprayed on bare wood, where they are absorbed depositing small-crystallized boric acid within the wood. If either subterranean or drywood termites feed on the treated wood they are

killed. Applications of direct wood treatments are usually made during the wood-framing portion of construction and usually to the 2-4 feet above the sill plate.

Alternative Approach-Baits

As previously stated, for the past few decades, liquid termiticides have been the industry standard in termite control. However, within the last 10 years, an alternative approach to termite control has been introduced - baiting. In general, the baiting concept consists of placing a food source (i.e. wood) in plastic monitoring station at regular intervals in the ground around a structure. Once termites find the food source and consume or "hit" the wood, the food source is switched out with bait, containing an insecticide. Once fed on by the termites they die.

The baits contain extremely small amounts of insecticide formulated to be consumed by the termites. Baits fall into 2 categories: 1) Insect growth regulators (IGR) such as hexaflumuron or diflubenzuron, or 2) slow-acting metabolic inhibitors and neurotoxins such as hydramethylon or sulfuramid. The IGR's are slow acting growth regulators that disrupt the termites' ability to shed its skin or molting process and eventually kills the affected termites. The slow-acting metabolic inhibitors impact the termite's ability to feed and breath. Baits take into account that a part of termite behavior is to frequently exchange food and body secretions for their normal survival. This exchange of food is called trophallaxis. During trophallaxis the transfer of microorganisms in the midgut aids in the break down of cellulose for new members of the colony. The termite queen secretes specific chemicals that are used to regulate communications within the colony. These chemical secretions eventually pass throughout all members of a colony. Thus, the reason why baits are used for termite control is because this exchange of food/secretions allows slow-acting baits to be transferred throughout the colony. Eventually, the whole colony will be affected resulting in reduced termite activities to the point that the colony can't survive. Regardless which type of bait is used, the homeowner must be patient with the baiting process.

Exterra® Termite Interception and Baiting System is a relatively new termite bait system by Ensystex (1-888-398-3772). As with almost all baits, the use of Exterra® is a multi-step process (Fig 8). The initial step is the placement of monitoring stations in the ground around the perimeter of the structure. Usually within 30 to 60 days, the stations are inspected and if "hit" by termites, the bait Labyrinth® (active ingredient diflubenzuron) is placed within the station. The bait is mixed with water to form a paste and placed inside the station. Every 30-60 days, the stations are reinspection and the bait replenished based on the amount of termite consumption. When termite activity in the station has stopped, the station is refurbished and the cycle of inspection and baiting begins again. The bait in Labyrinth® is a chitin synthesis inhibitor that causes termites to die while attempting to shed their skin or molt. One advantage of the Exterra® system is that stations can be monitored or refilled with bait without disturbing termites in the station. In addition, because the wood intercepts are located pressed against the walls of the station in slots that do not have to be moved to be inspected.

Figure 6. Application of termiticide into patio


Figure 7.Trenching

Firstline® Termite Defense System is manufactured by FMC Corporation located in Princeton, NJ (1-800-321-1FMC). This system also uses a multi-step process of monitors and baits but in addition can incorporate a spot treatment of liquid termiticides into the control process (Fig. 9). FirstLine GT® ("GT" ground treatment) utilizes stations placed only in the ground where termite activity is known or suspected. The placement of monitors usually does not involve the installment of baits at fixed intervals around the entire perimeter of the building as is required by other systems. The bait a slow-acting ingredient (sulfuramid) is impregnated into corrugated cardboard. In Arizona monitoring is recommended very 30 days.

The Sentricon® Colony Elimination System was developed by DowAgSciences (Indianapolis, IN; 800-888-5511) and is sold only through authorized operators (AO) Pest Management Professionals (PMP's) (Fig 10). This product probably has the highest recognition in the market place. The active ingredient is called Recruit® and it contains hexaflumuron or neuflumuron, both which are slow-acting ingredients that disrupt the termites ability to shed its skin. The Sentricon System® requires a 2-step process: (1) Installation and initial monitoring to determine termite activity, and (2) once wood consumption and termites are found, the technician replaces the wood monitors with the bait matrix, with subsequent monitoring monthly to provide on-

Figure 8. The Exterra® Monitor as seen from above, the Exterra® Monitor, the Exterra® Monitor with bait tube

Figure 9. The Firstline® Monitor as seen from above, the Firstline® Monitor, the Firstline® Monitor with bait

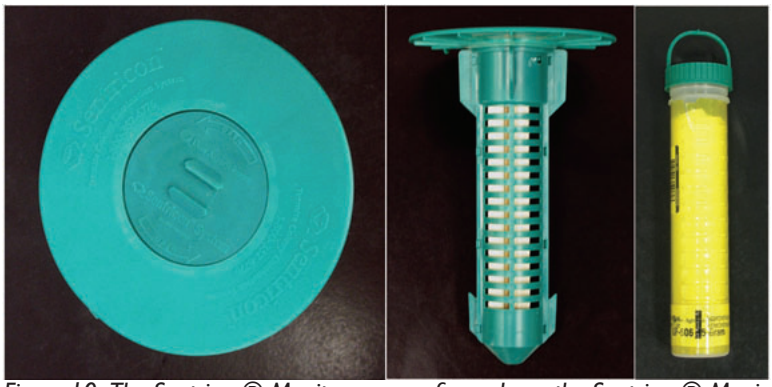

Figure 10. The Sentricon® Monitor as seen from above, the Sentricon® Monitor, the Sentricon® bait tube

going protection. The above ground delivery system, Recruit AG®, (Above Ground) is the termite bait for use specifically inside the house for control of subterranean termites. The manufacturer requires that Recruit AG® be used only in conjunction with the Sentricon Colony Elimination System® and is not available as a separate program.

In addition, the **Subterfuge®** Termite Bait, manufactured by BASF Corporation (Research Triangle Park, N.C.) is available in Arizona but has limited research results in the desert SW. This system is similar to FirstLine® and has the active ingredient hydramethylnon. **Outpost®**Termite Detections System manufactured by Bayer Environmental Sciences (Kansas City, MO) is also available but has limited research results in Arizona. This system has the same active ingredient diflubenzuron as Exterra, but the bait is placed into the ground from the day of installation.

Some advantages in using baits: baits provide an alternative to liquid chemical barriers in particularly difficult and impossible situations, they have less negative health and environmental impacts because generally they use less toxicant and they impact whole colony(s), with the potential to eliminate or suppress the colony. The disadvantages are they require more specific training of service technicians; they are not sold to homeowners; they can take much longer to get the infestation under control and the systems rely on the termites to "find" the bait.

As for liquid termiticides they have several advantages: The overall costs can be slightly less provided the application is done correctly and at maximum labeled rates; labeled rates are coming down in percent active ingredient, and control usually can be achieved in less than 3 months. The disadvantages are difficulty in getting a complete and through treatment; inaccessibility because of construction problems, and degradation of products particularly in Arizona with very hot dry conditions.

Deciding on Baits or Termiticide Barriers

If you have termites, as a homeowner you need to decide the best management strategy options that are available to you. You can choice to do nothing and hope they go away, you can treat them yourself, which is not a recommended option because of all the different chemicals, construction types and equipment problems or you can decide on a bait or liquid termiticide treatment. Therefore, several considerations are presented for both the baits and liquid termiticides. Good candidates for termite baits are structures with hard-to-treat construction or repeat retreatment histories. In may of these cases construction features, such as cold air returns in the slab or inaccessible crawl spaces, can make treatment with conventional soil treatment methods almost impossible. With baits, gaining access is not a problem since foraging termites are as likely to encounter bait stations around the foundation exterior. If you're a homeowner who does not want your ceramic tile or wood floors drilled, furniture moved or carpeting pulled back, you also a good candidate for baits. Baiting requires fewer disruptions than does liquid barrier treatment. Installation and subsequent monitoring of bait stations generally does not require entrance in to structure. In addition, you can avoid the drilling along with the dust associated with conventional treatment.

If you're a homeowner who does not want to use of pesticides in and around the home, you're a good candidate for a baiting system. Chemically sensitive and concerned homeowners may find the concept of baiting more practical particularly related to health issues. With baits, the total amount of pesticide applied is relatively small in comparison to the number of gallons used in a soil barrier treatment. Homeowners living in attached housing (condo's, attached residences) where the entire structure cannot be treated with liquid termiticides are good candidates for baiting systems. Often all the people living in attached housing complexes may not be able to afford the termite baiting procedure.

Homeowners on limited budgets are generally better candidates for traditional termiticide barriers. The average liquid termite treatment is usually about $500-1800 and with an annual renewable service agreement (warranty) costing $80-200 in case the termites return. A baiting program usually ends up costing more than a standard liquid treatment (averaging about $1,500) because baiting programs require multiple visits to the property for routine monitoring of bait stations. Also, the annual renewal fee for baiting typically will be as much as two to three times higher than for termiticide barrier treatment. Usually property owners with termites having multiple entry points or those involved in a real estate transaction are good candidates for liquid termiticide barriers. They may not be able to wait six months to up to a year (sometimes longer) for baits to suppress or eliminate the infestation.

In some cases, houses may require treatment with both baits and standard liquid termiticide barriers. With comprehensive baiting programs such as Sentricon® and Extrerra®, liquid applications can be made as partial or spot treatments to infested areas, rather than to the entire structure. Other bait products (e.g., FirstLine®) may suggest that spot-treatment of active tunnels, feeding galleries, and localized areas in the soil is needed to get the termites under control before establishing a baiting program. Such products are typically used in conjunction with the standard liquid barrier treatments.

In summary, termites can be a problem for homeowners but they can be managed and they can be brought under control.

Table 1: 2003/2004 Termiticide Comparisons

Product Name	DRAGNET® SFR	PRELUDE®	TALSTAR® TC	PREVAIL® FT	DEMON® TC	PREMISE® 75	PREMISE® 0.5 SC	TERMIDOR®
Manufacturer	FMC	Syngenta	FMC	FMC	Syngenta	Bayer	Bayer	BASF
Active Ingredient	Permethrin	Permethrin	Bifenthrin	Cypermethrin	Cypermethrin	Imidacloprid	Imidacloprid	Fipronil
Chemical Class	Pyrethroid	Pyrethroid	Pyrethroid	Pyrethroid	Pyrethroid	Chloronicotinyl	Chloronicotinyl	Phenyl Pyrazole
Signal Word	Caution	Caution	Warning	Caution	Warning	Caution	Caution	Caution/ Liquid Warning/ Solid
Dilution Rate	1.25 gal/ 94.75 0.5%	2-4 gal/98 0.5-1.0%	1 qt/99.75 0.06%	1 gal/96 0.25%	1-2 gal/100 0.25-0.5%	4-8 WSB/100 0.05-0.1%	110-220 oz/ 100 gallons 0.05-0.1%	0.6-1.2gal/ 100 .06-.125%
2003 Efficacy Low Rate								
USDA CS AZ	18+	16+	15+	5	9	11	No data	9+
CS MS	8	5	9	6	14	5+		9+
CS FL	10	13	17	14+	14+	11		9+
CS SC	11	7	16+	4	12	9		9+
University								
HI -% pen/yrs	10%/3 yrs	No data	38%/ 3 yrs	42%/ 3 yrs	No data	.05%-40%/ 1yr	No data	No data
AZ -% rem/yrs	88%/1 yr	No data	77%/ 1 yr	21%/ 1 yr	No data	49%/ 1 yr	No data	No data
TX -%rem/yrs	0.84%/6 yrs	0.74%/ 6yrs	0.72%/ 6yrs	0.28%/ 6yrs	0.15%/ 6 yrs	Data withheld	No data	No data
NE -% rem/yrs	5%/3 yrs	No data	27%/ 3 yrs	2%/ 3 yrs	No data	No data	No data	No data
Mean of soil Tested								
Extra Labeling	Pest Control, Outside, Carpets Lawns & Orn. Fly Control	Pest Control, Outside, Carpets Lawns & Orn. Fly Control	Pest Control Outside	Pest Control Outside, Inside	Pest Control Outside		Carpenter Ants	Ants
Odor	Faint	Slight Aromatic	Faint to Moderate	Slight soapy	Faint, Variable	Faint	Faint	No Odor
Comments	Repellent	Repellent	Repellent	Repellent	Repellent	Non-repellent	Non-repellent	Non-repellent

Where trade names are used, no endorsement is intended, nor criticism implied of similar products not named.

For further information about the products mentioned in this publication, contact the manufacturer, your local termite control professional, state regulatory agency responsible for pesticide usage, or the university cooperative extension office in your area.

CAUTION! Pesticide recommendations in this publication are registered for use in Arizona, USA ONLY! The use of some products may not be legal in your state or country. Please check with your local county agent or regulatory official before using any pesticide mentioned in this publication.

Of course, ALWAYS READ AND FOLLOW LABEL DIRECTIONS FOR SAFE USE OF ANY PESTICIDE!

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