

# RELATIONSHIPS between URBAN LANDSCAPES and HOUSEHOLD PESTS

**David J. Shetlar**

Department of Entomology, Ohio State University, 1991 Kenny Road,  
Columbus, Ohio 43210-1000

**Abstract** The primary sources of pests that affect humans and invade their buildings are usually found in the surrounding landscapes. Pest management professionals and landscape managers need to be more aware of the sources of these pests and develop standard practices that reduce these sources. Of primary concern, for a multitude of pests, are human activities, usually aesthetic concerns and interests that increase availability of water in the landscape, such as irrigation and water features; that create nesting and shelter sites, such as mulch, landscape timbers, or stone and brick work; that provide food sources, such as honeydew producers; and that attract insects at night, such as lights.

**Key Words** Landscape pests household pests turfgrass ornamentals arthropods

## INTRODUCTION

The business operations of traditional pest management professionals (PMP) and landscape managers (turf and ornamental plant maintenance) have much in common. They are both considered “service industries” that are employee-intensive and have considerable contact with a wide diversity of clientele (home owners, apartment complexes, commercial sites, etc.). In the past, PMPs considered their domain to be the interiors of structures, whereas the landscape managers considered their domain to be the trees, shrubs, and turf that comprise the exterior environment. Some national companies and a few regional ones have tried to combine PMP and landscape operations, but these attempts often fail. The need to separate operations within the same company is likely due to the training needs for each kind of business. Landscape technicians are often not expected to make on-site decisions, they merely apply (spray or spread) what is scheduled for a particular time period. While some PMP operations ask their technicians to perform similar “programmed applications,” most operations are more successful when on-site decisions are made, and treatments, whether traditional pesticide applications or use of cultural/mechanical techniques, are at the discretion of the technician. Obviously, allowing for on-site decisions is more in line with Urban Integrated Pest Management (IPM) thinking.

While adopting more of the IPM philosophy, PMPs have also begun to make significant changes in their approaches to using pesticides – if pesticides are to be used, can they be used in a manner so as to avoid exposure of humans? This has been achieved largely by developing baits, mainly for termites and ants - the primary household and structural pests. Since most termites (subterranean) and the majority of ants actually live in the soil or other outside areas, baits and exterior perimeter treatments have been steadily increasing and are successful. Perimeter treatments are also gaining favor for reducing problems with occasional invaders such as spiders, mites, ground beetles, millipedes, etc. As more PMPs gain experience with outside treatments, they are also becoming aware that homes and buildings are simply parts of a larger landscape. We now know that many of the problems associated with pests inside a building are directly influenced by the outside landscape – the traditional domain of landscape managers.

On the other hand, landscape managers have heard that home owners (their clients) are concerned about pests that live and breed in the landscape. Always on the lookout for additional

services, landscape maintenance firms are considering what they can do in the landscape to reduce indoor pest problems.

In essence, the two major service industries, pest control and landscape maintenance, are converging to address the influence of landscapes on interior and exterior pest problems. Because of this new emphasis, I will attempt to review what is known and what has been speculated about populations of pests associated with urban landscapes.

## BASIC ECOLOGY

All living things have essential needs that have to be met for their survival and population expansion. While there are many ways of defining these needs, most ecologists group them as three primary needs – habitat, food, and water. Food and water are relatively easy to understand, but habitat is a bit more nebulous. Habitat primarily includes the living space where the animal or plant lives (nests), breeds, finds cover, and locates food and water.

By understanding that all pests have these essential needs, the pest manager should ask: “Where is this pest living, breeding, finding food, and obtaining water?” Furthermore, it is important to recognize that these needs may change during the course of a season. As an example, acrobat ants may not be much of a household invader problem when there are numerous honeydew-producing aphids and scales on landscape plants. During periods of heat and drought, these sugar producers usually decline, thereby forcing the ants to forage into new areas in search of additional sugar sources. This is the time when acrobat ants become major invaders. Likewise, it is often pointed out that carpenter ants commonly switch their preferences for different types of baits: sugar-, oil-, or protein-based. This switching can usually be related to the types of food that are common in the landscape. When honeydew producers are active, carpenter ants will feed primarily on sugars. When major insect populations erupt, especially gnats, moths, or beetles that are attracted to lights, carpenter ants will feed on these insects at night. Earwig, millipede and sowbug invasions regularly occur when summer heat and drought dries out the soil and mulch. Spider invasions are relatively uncommon in spring and summer, but they regularly occur during the fall when male spiders are searching for mates.

## The CAST of CHARACTERS

The large diversity of arthropods and other animals that inhabit urban landscapes can include direct and chronic pests (e.g., termites) or indirect, periodic pests (e.g., social wasps, earwigs, etc.). The list is extremely large and beyond the scope of this presentation, so a representative example of major pests groups will be discussed in order to illustrate the complicated interactions between urban landscapes and pest outbreaks.

### Predators

A large guild of predatory insects, spiders, centipedes, and similar animals, occurs in urban landscapes. In most cases, these organisms are considered beneficial, but they can also become nuisance pests when they invade human living spaces. Many predators vary their behavior during the season. Social wasps such as yellowjackets and paper wasps (*Polistes*) are predaceous while the colony is rearing brood, but they switch to high-carbohydrate foods when new queens and drones are produced in late summer.

**Ground Beetles, Soldier Beetles, and Earwigs.** These insects typically are predators although the adults of soldier beetles may feed on pollen and earwigs may feed on plant material in periods of prey scarcity. All seem to reproduce and build populations when excessive amounts of mulch are used in the landscape. Mulch appears to increase soil moisture, which is critical for egg development, and encourages population outbreaks of other insects that serve as food.

Earwigs generally overwinter as adult females that have dug or found cavities in soil, under stones, landscape timbers, or mulch (Lamb and Wellington, 1975). In late winter to early spring, these females lay a batch of eggs that are cleaned and protected until hatching. At hatching, the female opens the chamber to the outside and the nymphs are allowed to forage for food. The nymphs usually return to the protection of the brood chamber. By early June, most of the nymphs have matured and they begin foraging well above the ground, often in trees or up the sides of buildings. When dry conditions arrive, many of the earwigs may attempt to enter a building that provides cool and moist conditions.

Ground beetle adults and larvae as well as soldier beetle larvae are generalist predators that do well when landscape habitats encourage the build-up of soft-bodied insects (white grubs, cutworms and other caterpillars, Collembola, fly larvae), snails, slugs, and earthworms. These prey are often associated with decaying plant material (senescent plants and leaves, grass clippings, mulch). Adult ground beetles are constantly on the move and commonly invade structures that are not well-sealed. Ground beetle and soldier beetle larvae often invade structures during periods of drought or when winter conditions arrive.

**Spiders.** There are hundreds of different species of spiders that can be found in urban landscapes, and most are considered to be beneficial predators (Hedges and Lacey, 1995). While a few spiders thrive in buildings (cellar spiders, Pholcidae; brown spiders, Loxoscelidae; spitting spiders, Scytodidae), most are occasional invaders that do not survive unless they have ready access to water or a continual meal of insects (in windows or around lights). Many spiders build various kinds of webs with which they capture their prey; orb weavers, cobweb and funnel-web makers, are common in most landscapes. If one evaluates a landscape carefully, it becomes readily apparent that these web makers are quite adept at selecting sites where potential prey are found – around landscape lighting, near water spigots, in narrow spaces where air currents (that carry flying insects) are funneled.

Other spiders actively stalk their prey and these get into buildings as part of their searching activity. Many of these stalkers are also attracted to lights at night, including windows. Wolf (Lycosidae), lynx (Oxyopidae), jumping (Salticidae), and sac spiders (Clubionidae) are very common active predators that end up in buildings. Besides prey, most of the stalking spiders need suitable habitat for hiding or placing egg sacs. For many of these spiders, landscape timbers, stones, firewood piles and thick layers of loose mulch are more than suitable habitat for hiding and protecting egg sacs. The above spiders as well as other species commonly have annual life cycles in which males and females become sexually active in late summer into the fall. At this time, male spiders (even ones that normally reside in a web) set off in search of females. These males regularly end up inside of buildings.

**Wasps.** The wasps that frequent urban landscapes can generally be divided into solitary and social (Wegner, 1997). The solitary wasps are usually specialized predators that include muddaubs that provision their nests with spiders; cicada killers that prey on annual cicadas; digger wasps that may prey on stink bugs to horse flies; aphid wasps and relatives that build nests in hollow-stemmed plants and provision their burrows with aphids, leafhoppers, and planthoppers. In many parts of the world, these solitary wasps are understood to be beneficial, and special nesting sites are provided for them. In some Oriental countries, bundles of bamboo of various diameters are hung around the landscape to encourage nesting of some of these predators. On the other hand, some pugnacious wasps, like the cicada killer, are undesirable in landscapes and may be discouraged by landscaping that is designed to keep bare ground areas to a minimum.

Considerable research is needed on the impact of landscapes on social wasp populations. Landscapes that have ground covers and heavy mulch layers often produce voids that are attrac-

tive to founding queens in the spring. These cavities may be the result of vole or mole activity, mulch thrown onto existing plants that produces a tent-like cavity, holes made by plant stakes, and voids produced by stacked landscape timbers or stones. Aerial nesting yellow hornets and bald faced hornets often prefer dense trees and shrubs. Virtually all of these social wasps construct their nests with a papier-mache like material. The nest material is a combination of wood fibers, usually obtained from unfinished fences, landscape timbers, dead tree branches, and saliva. Therefore, neighborhoods designed with a “rustic look” are more likely to provide the raw materials for these wasps. These social wasps also generally feed on soft-bodied insects, especially caterpillars, sawflies, and filth flies (house, blue bottle, flesh flies, etc.). Landscape management that emphasizes reduction of these prey insects can also have a significant impact on social wasp survival. Ordinances that require pick up of pet feces and covering or containerization of garbage help reduce flies. Trees and shrubs that are less prone to support caterpillar and sawfly populations should be emphasized for landscape use. The crabapple cultivars, Madonna, Red Jewel, and Sugar Tyme are resistant to gypsy moth, canker worms, and apple aphids (Smith-Fiola, 1995), and Norway maples rarely are attacked by the caterpillars that feed on native maples.

### Scavengers and Detritivores

Another large guild of landscape animals is generally classed as scavengers – feeding on dead or decaying plant or animal materials. Many of the scavengers associated with urban landscapes feed on decaying plant material, molds, and fungi though they will occasionally feed on soft, newly emerging plants. As with the predators, scavengers are normally considered to be beneficial unless they become an annoyance to the human residents. Many of these scavengers are also part of a larger food web, serving as prey of the predators. Millipedes, sowbugs or pillbugs (Isopoda), snails and slugs are commonly included in the scavenger group. Peridomestic (occurring around the perimeter of a building) cockroaches often feed on decaying plant materials, fungi, and decaying animal remains.

Detritivores are similar to scavengers, but this group of animals normally feed on plant materials that are long dead. In the landscape, termites are one of the major groups that feed on cellulose materials. This cellulose can come from trees with openings to their heartwood areas, tree stumps, hardwood mulch, landscape timbers, and even the thatch of grasses (lawns) (Jones, 2000). While recent evidence suggests that landscape mulch does not increase subterranean termite foraging activity (Long et al., 2001), many believe that wood-based mulches likely provide food and harborage for termites.

**Millipedes, Sowbugs or Pillbugs.** While these animals have many pairs of legs, they are very different groups. Millipedes (Diplopoda) are more closely related to centipedes (a predator group) while sowbugs or pillbugs are actually terrestrial crustaceans, distant relatives of crabs and shrimp. Both groups readily feed on decaying plant material (senescent leaves and flowers of trees, shrubs, perennials, and annuals; grass clippings; mulch) and some are specialists that feed on the fungi that colonize woody plant materials (logs, mulch). Millipede and isopod populations are stimulated by accumulations of mulch (Jordan and Jones, 2002) and excess moisture.

**Slugs and Snails.** While technically herbivores, most urban landscape snails and slugs readily dine on living as well as recently killed plant material and most species will also feed on fungi. Having observed a large population of the giant leopard slug, *Limax maximus* L., in my Ohio landscape, I went out after dark to see if I could determine what these slugs were dining on. To my amazement, several slugs were each clustered over the feces of my dog! Regular removal of the dog feces greatly reduced the slug population. Snails can often escape hot dry periods by sealing themselves within their shells with a hardened mucus plug. Slugs, however, have to seek

safety within the soil, under stones, landscape timbers, and mulch. Therefore, these landscape materials can often contribute to slug survival and build up.

***Peridomestic Cockroaches.*** Over the last two decades, studies on the smokybrown (Fleet et al., 1978) and Australian cockroach have confirmed that these pests are usually reliant on food, water, and harborage found in landscapes. These pests can feed on decaying plant material, prey on small insects, slugs, and earthworms, as well as take advantage of bird food, pet feces, and garbage. In southern states, where palms, cycads, and bird-of-paradise trees are common in the landscape, these cockroaches easily survive within the voids at the leaf bases of these plants.

### **Herbivores**

In most urban landscapes, herbivores are considered pests of the plants, not household-structural pests. Many organisms that feed on plants become direct nuisances because they seek shelter in buildings, and many more serve as food sources for other pests, especially ants. While clover mites feed on grasses and a few shrubs such as honeysuckle, they prefer to molt and lay their eggs on permanent structures such as tree trunks, sides of buildings, and the various poles, switch boxes, and lights that are associated with modern landscapes. Pine leaf-footed bugs, boxelder bugs, and hackberry psyllids are all plant-feeding insects that have the habit of invading buildings at the end of the season. Apparently, the adults of these pests mistake our buildings to be suitable habitat for overwintering, normally temperature-mediating boulders, fallen trees, or dead trees with loose bark.

Probably of more importance to pest-control operators are the numerous honeydew-producing insects that are associated with landscape plants, including turf. While most people are familiar with aphids and the sugar-rich excrement that they drip onto surrounding foliage, sidewalks, lawn furniture, and cars, many people are unaware of all the other insects that also produce honeydew. The main honeydew producers are aphids, mealybugs, soft scales, leafhoppers, treehoppers, planthoppers, and psyllids. These insects are often tended and even protected by ants. Other insects such as bees, wasps, flies, and cockroaches will feed on the sugary excrement when available.

It is the association of ants with honeydew producers that should be of major concern in urban landscapes. The association can be as intimate as acrobat ants picking up newly hatched aphid nymphs or scale crawlers and moving them to new places on host plants. These ants also may build soil or papier-mache covers, bite and kill predators, and harvest honeydew by stroking the aphids or scales with their legs and antennae! Other ants seem to merely wait around to collect the honeydew and make no attempt to protect the honeydew producers (Hölldobler and Wilson, 1990). I have even seen carpenter ants apparently culling out aphids or scales from colonies and taking them back to the nest as additional protein sources.

Many people are only aware of the honeydew producers that are obvious, such as aphids and soft scales that inhabit leaves and small branches of trees and shrubs. The less obvious honeydew producers are found in turfgrass (there are more than 30 species of mealybugs and soft scales that can infest cultivated grasses!) and on the roots of plants. Dandelions and many other taprooted perennials harbor a number of root aphid species. A service that PMPs should consider would be an assessment of the kinds of plants, both cultivated and weedy, that are found in the landscape, particularly those that are especially prone to supporting honeydew producers, such as purple-leaf plum and other *Prunus* species that harbor several soft scales and aphids; birches are commonly infested by two leaf aphids and soft scales; Norway maple is often severely infested with Norway maple leaf aphids; hibiscus is a host to numerous aphids, soft scales, and mealybugs. If plants that support honeydew producers are desired, they should be placed away from the foundation.

A few plants and galls produce secretions that are attractive to ants. These plants contain glands often called secondary nectaries because they produce nectar-like materials. Ornamental figs and peonies often have secondary nectaries. Several of the galls on oaks (e.g., horned beak gall and oak shot galls) have secondary nectaries that apparently attract ants that aggressively defend the galls from parasites that may try to attack the encased gall insects.

## **Bees**

As with the wasps, bees can also be divided into solitary and social bees. These are technically not herbivores, but they utilize plants to provide them with their primary food – nectar and pollen. The solitary bees include the carpenter bee, lesser carpenter bee, and leafcutter bee. Social bees in landscapes are primarily the bumble bee complex and honey bees. Virtually all the solitary bees nest in plant voids (pithy stems of certain plants) except for the carpenter bee. In my experience, even carpenter bees nest in specific kinds of wood, primarily cedar and fir. Honey bees require a protected enclosure such as wall voids, attics, and hollow trees. In essence, the major approaches to reduce nesting bees are to reduce cultivation of plants with pithy stems, avoid producing tree voids (improper pruning and topping), and sealing access to house voids.

## **Biting Pests**

In certain parts of North America, fleas, ticks, chiggers, mosquitoes, and other biting pests are a major concern. As with all pests, one needs to keep in mind the food, water and habitat requirements of these pests.

**Fleas, ticks and chiggers.** These parasites generally need a host animal from which they obtain their food and habitat in which to lay eggs, molt, and wait until a host can be found. Most fleas can survive on small mammals in the landscape so those that encourage squirrels, voles, mice, raccoons, skunks, and opossum are likely to also have chronic flea infestations. Many people are unaware that creating water interest (artificial ponds, streams) and building raised decks or walkways are also creating prime habitat for many mammalian pests. Bird feeders and filled pet dishes also provide food for such pests. In most situations, rodents do not like short cut, open areas of the landscape. They prefer areas with tall ground covers, thick mulch, or dense flower beds.

Most ticks require several hosts in order to complete their life cycle. The seed ticks usually need a small mammal, such as a mouse, squirrel, or vole; and nymphal ticks commonly seek out skunks, raccoons, and other larger mammals. Again providing habitat for these nuisance mammals also encourages tick problems.

Chiggers are also parasites of small mammals in their larval stage. When these larval chiggers get onto human skin, they attempt to feed, and cause skin irritation. Again, well-kept lawns and landscapes that discourage small rodent populations are a major defense against chiggers.

**Mosquitoes.** While there are several species of mosquitoes that can travel some distance from their breeding areas, many mosquito problems arise from local sources. Artificial ponds devoid of fish and other predators, summer wading pools, broken irrigation heads, air conditioner condensation hoses, and similar items can produce standing water continuously for the 10 to 14 days that mosquito larvae need to complete their development. Some mosquito species specialize in breeding inside of natural plant cavities that hold water. Trees that have been poorly pruned and have rot that creates tree holes are prime breeding sites. In southern states, the bases of many palms and other plants hold water sufficiently long to breed mosquitoes. Mosquito adults also prefer to hide during the day in shaded areas that lack air flow. Reducing thick plantings and judiciously pruning to help air flow should be considered in mosquito prone landscapes.

**Ants.** Ants are an extremely diverse group and are ubiquitous in urban landscapes. While most entomologists divide them into groups such as primary sugar feeders, insect feeders, etc., virtually all ants are creatures of opportunity. While each ant species may prefer sugars, fats, or proteins, most will take whatever foods are available. Their preferences are particularly important when trying to get ants to take baits. In the landscape, ants appear to rely mainly on the honeydew producers, and they seek areas where other insects accumulate and die (especially lights) or where other foods are available (garbage). Of course, ants require proper nesting sites, and the typical landscape provides many such sites. Mulched beds, landscape timbers, stone work, and similar features produce numerous voids that allow ants to establish and maintain colonies. Trees and shrubs that have voids naturally or acquire voids due to poor pruning or maintenance are also common in landscapes.

### SUMMARY

The primary sources of pests that affect humans and invade their buildings are usually found in the surrounding landscapes. Both PMPs and landscape managers need to be more aware of the sources of these pests and develop standard practices that reduce these sources. Of primary concerns are human activities (usually for aesthetic concerns and interests) that increase availability of water in the landscape (irrigation and water features), create nesting and shelter sites (mulch, landscape timbers, stone and brick work), and provide food sources (honeydew producers, lights that attract insects at night) for a multitude of pests.

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