

# Crop Profile for Residential and Industrial Pests in North Carolina

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## General Production Information

According to the 2000 U.S. Census, North Carolina has more than 3.1 million residences (primarily owned, equally divided between urban and rural areas. Between April 2000 and July 2003, municipalities across North Carolina collectively experienced an 8% population growth. Ten counties experienced double-digit population increases. As the state's population continues to grow, the general trend will shift to a greater number of residences in urban (or urbanized) areas. In 2002, approximately 79,824 residential building permits were issued in North Carolina. No data are readily available for the number of industrial buildings or "other" structures, such as schools, churches, hospitals, extended care facilities, etc. However, all of these sites come under scrutiny for the use of pesticides.

In some cases, the impact of the pests listed below is difficult to assess because it varies with the specific situation. In most cases, life-cycle details have been omitted because many of these pests may be constantly present, depending upon the circumstances. Chemical applications are presented here broadly because some chemicals have restrictions based on application site, e.g., some chemicals cannot be applied in food-handling establishments or only as a "crack and crevice" treatment in a food-handling establishment. The number of active ingredients and formulated products of these active ingredients and the restrictions on their uses are too numerous to present.

NOTE: Except where noted specifically, the term "all classes of pesticides" encompasses all currently used classes of pesticides with the exception of chlorinated hydrocarbons (and related compounds) and most organophosphates.

## Worker Activities

Pest Management Professionals (PMPs) employ a wide variety of application methods, which reduce their actual exposure to the various chemicals. In 2001, the National Pest Management Association

sponsored a survey of pest management companies on their use of pesticides and pesticide application techniques. Among the most commonly employed methods were: a) Injection into Wall; b) Broadcast; c) Spot (defined by USEPA as not exceeding 2 square feet); and d) Crack and Crevice. These methods do not include the use of insecticidal baits, which are typically applied as granules (mostly outdoors), pre-packaged containerized baits, and gels. Outdoors, pest control companies also employ broadcast applications (“perimeter treatments”) with liquids along with the use of baits against a variety of non-wood-destroying pests. For wood-damaging pests such as termites, post-construction liquid treatments usually involve trenching and treating soil along foundation walls, drilling and drilling the soil beneath concrete slabs, and drilling and treating hollow masonry voids. Containerized cellulosic baits are also used and provide minimal exposure for the applicator.

Based on information collected from the pest control industry, the majority of a technician’s time is actually spent on non-application related activities including (but not limited to): a) driving to/from a site; b) inspection of the site to determine any existing problems; and c) “administrative details” such as paperwork, discussions with the customer, etc. Overall, the actual time spent applying<sup>1</sup> pesticides for common household pests is approximately 2 to 2.5 hours of an average 8-hour work day. Technicians have similar non-application responsibilities but have additional and extensive time spent preparing a site, specifically trenching the soil around the foundation (outside and potentially under the house for a crawlspace construction) and drilling concrete slabs (garages, slab foundations, etc.) and hollow block masonry. Actual application time is closer to 3 to 4 hours in an 8-hour work day. In the case of termite baits, time spent handling the pesticide depends on the actual discovery of termite activity since the baits are typically not added to the bait stations unless activity is detected. In these instances, the amount of “pesticide application” (i.e., handling and installing the actual bait matrix) may range from 0 to 1 hour within a typical 8-hour work day.

<sup>1</sup> *For the purposes of this report, "applying" includes mixing and other aspects of handling pesticide products.*

## **Insect Pests**

### **Cockroaches**

There are three major species of peridomestic cockroaches in North Carolina: the German cockroach, the American cockroach, and the smokybrown cockroach. Species of minor importance include the brown-banded cockroach and the Oriental cockroach. The German cockroach is probably the most common species, and its impact depends on the specific situation. In food-handling establishments, the presence of cockroaches may result in point deductions on a sanitation inspection. Many pesticides have

restrictions on their application/use in food-handling establishments. In residences, the most significant impact of cockroaches may be the strong correlation of cockroach infestations and incidences of asthma, particularly among children in lower economic strata. The American, smokybrown, and Oriental cockroaches may be found outdoors, primarily in the summer, if adequate moisture is available. Management strategies are:

### **Chemical control:**

- Baits (trays or stations, gels, and granular formulations) containing boric acid, fipronil, imidacloprid, hydramethylnon, and avermectin. Granular baits are used outdoors.
- "Crack and crevice" treatments with pyrethroids, inorganic chemicals and insect growth regulators (IGRs) such as pyriproxifen and hydroprone. "Natural" products such as hexahydroxyl are also available.
- Band applications indoors and outdoors primarily with pyrethroids and some pyrroles (chlorfenapyr) indoors only.
- Fogging—primarily with pyrethrins and certain pyrethroids (primarily for "clean-out" treatments)

### **Non-chemical control:**

- Sanitation.
- Exclusion (caulking).
- Trapping (using traps equipped with an attractant).
- Monitoring (using sticky traps) is used to make chemical management decisions.
- Removal from harborages by vacuuming.

## Ants

Numerous species of ants are common indoor pests. Among the most common are the Argentine and, odorous house ant, pharaoh ant, and carpenter ant. The red imported fire ant is now found throughout many areas of the state and in some instances had invaded homes, businesses and other structures such as hospitals and nursing homes.

### **Chemical control:**

- Baits (stations, gels, and granular formulations) containing boric acid, fipronil, hydramethylnon, and avermectin. Granular baits are used outdoors.
- "Crack and crevice" treatments with, pyrethroids, and inorganic chemicals and IGRs.
- Band applications indoors and outdoors primarily with pyrethroids (indoors/outdoors), fipronil (outdoors only) and chlorfenapyr (indoors only)
- Applications to the exterior of the structure (pyrethroids and fipronil).

- Direct nest treatments (drenches) usually outdoors, primarily with pyrethroids and fipronil.

### **Non-chemical control (in support of chemical control methods):**

- Sanitation (both indoors and outdoors).
- Exclusion (caulking).

### **Stored Product Pests**

The most common pests of stored products include the Indianmeal moth, flour beetle, cigarette beetle, and drugstore beetle.

### **Chemical control:**

- "Crack and crevice" and standard baseboard (band) applications of common pesticides.
- For industrial or bulk storage facilities, IGRs (methoprene) are commonly used as sprays or fogs. With the loss of methyl bromide, fumigations have relied primarily on aluminum or magnesium phosphide. More recently, sulfuryl fluoride (Profume®, Dow AgroSciences) had received registration for several stored grains.

### **Non-chemical control:**

- Sanitation—cleaning up spilled material; inspection of incoming product.
- "FIFO" ("First In, First Out") or stock rotation (for commercial food-handling establishments).
- Exclusion (proper product storage).
- Pheromone traps (primarily for monitoring).

### **Flies**

Most common flies species include blowflies, house flies, fruit flies, and drain flies. Problems are likely to be most significant in food-handling facilities.

### **Chemical control:**

- Space sprays (aerosol foggers), primarily with synergized pyrethrins (primarily house flies and similar "filth" flies).
- Surface sprays (fly-landing areas), primarily with synergized pyrethrins, but also with a number of pyrethroids and some IGRs (primarily house flies and similar "filth" flies).
- Baits: the most commonly used fly bait contains acephate, although imidacloprid (MaxForce®, Bayer Environmental Sciences) was becoming more widely used by pest management

professionals. Bait applied as a granular or dissolved in water and painted/sprayed onto surfaces (primarily for house flies and similar “filth” flies)

### **Non-chemical control:**

- Sanitation.
  1. Frequent emptying of refuse containers (trash, recycle and dumpsters/compactors) and cleaning of container areas.
  2. Removing attractive sources both indoors and outdoors (e.g., cleaning drains, discarding decaying material).
  3. Exclusion (positive-pressure ventilation, screening and air curtains for food-handling establishments).
- Trapping: black light, sticky and bait traps are effective for monitoring and, in some cases, management.

## **Fleas**

Most residential flea problems are caused by the cat flea.

### **Chemical control:**

- Interior: applications to carpets and furniture of a mixture of an adulticide such as pyrethrins, pyrethroids and inorganics such as boric acid (carpeting only), and some mixed with an IGR (pyriproxifen and methoprene).
- Exterior: perimeter treatments around house and some targeted applications in pens and other pet-frequented areas.
- Referral of customer to veterinarian-recommended pet-applied flea control products).

### **Non-chemical control:**

- Indoors: frequent vacuuming of carpets and furniture to remove larval food sources and adults (larvae are difficult to remove by vacuuming); light traps.
- Outdoors: entomogenous nematodes, weed control (to reduce site suitability for fleas).

## **General Nuisance Pests**

This group includes periodic pests, such as spiders, millipedes, and silverfish.

### **Chemical control:**

- Indoors: "crack and crevice" treatments with a wide range of pesticides, primarily inorganic chemicals (boric acid and silica gel) and pyrethroids; similar applications along baseboard.
- Outdoors: general sprays along the crawlspace, along the exterior perimeter, and to the exterior of the structure.

### **Non-chemical control:**

- Mechanical: removing or crushing pests and webbing (spiders). Recommendation of inorganic mulches near foundations to reduce attraction of nuisance pests.
- Exclusion: caulking.

## Termites

The most common termites in North Carolina are subterranean termites, *Reticulitermes* spp. Drywood termites occur in coastal areas and, on rare occasions, in furniture brought from Arizona, California, Florida, Hawaii, and other states. Infestations of the Formosan termite [*Coptotermes formosanus*] in western North Carolina (Rutherford County) are currently being addressed with a survey/monitoring/control program, but this species is not considered a significant pest at this time. Management strategies are:

### **Chemical control:**

#### **In-ground**

Chemical control still relies heavily on the use of large-volume applications to the soil and to foundation voids in the vicinity of an infestation. The two most commonly used termiticides are the non-repellants: fipronil (a phenyl pyrazole) and imidacloprid (a chloronicotinyl), followed the pyrethroids such as permethrin and bifenthrin. A third non-repellent, chlorfenapyr (*Phantom*) is also available. The only remaining organophosphate, chlorpyrifos, is in its final year of use restricted to preconstruction treatments only.

There are currently five bait products available. Three bait products have the greatest market share and contain the chitin synthesis inhibitors (CSIs): noviflumuron (*Recruit IV*, Dow AgroSciences), and diflubenzuron (*Exterra* and *Advance*). Two other bait product contain the stomach poisons hydramethylnon (*Subterfuge*, BASF) and sulfluramid (*Firstline*, FMC). Three of these baits (*Recruit*, *Exterra* and *Firstline*) also have aboveground forms that can be attached to structural members (wood, drywall, etc.). A sixth bait product containing the CSI lufenuron is expected to be on the market within the next year. In some cases, pest management professionals are using a combination approach of a "spot" treatment of the soil in the vicinity of an infestation and the installation of a baiting system.

The other chemical alternative available in North Carolina is the use of *Impasse* (Syngenta) a polymer

sheet “sandwich” containing a middle layer impregnated with the pyrethroid lamda-cyhalothrin. The barrier is installed “pre-construction”, i.e., prior to pouring of foundation slabs.

## Wood Treatments

- Building codes currently require the use of pressure-treated lumber (usually 0.4 parts per million copper-chromium-arsenate or CCA) for any wood in direct contact with soil or masonry. The use of CCA as a wood preservative was discontinued effective December 31, 2003. Substitutes such as ACQ (containing quaternary ammonium and copper oxide) and copper azole are currently in use.
- Borate insecticides (*Timbor* and *Bora-Care*) can also be used for treating structural wood members. In North Carolina, such treatments were primarily remedial (i.e., post-construction). The use of Boracare for pre-construction treatments in North Carolina was approved in 2004.
- Gallery injection with various registered termiticides as liquids or foams. This can include a new foam formulation of imidacloprid and the biopesticide *Metarrhizium anisopliae*.

## Non-chemical control:

- Sanitation
  1. Removing cellulose debris in crawlspaces and around the foundation. North Carolina rules require the removal of cellulose debris of a size removable with an ordinary garden rake. This approach is suitable only as a supplement to other control methods.
  2. Correcting/preventing conditions conducive to termites (such as moisture problems in/ around foundations and on the structure).

Note: As with other sanitation practices employed in Integrated Pest Management (IPM), these practices are suitable as supplements to other control measures and are not considered "stand-alone" control measures.

- Mechanical—removing termite shelter tubes from the foundation. This is limited to accessible tubes and affords no protection against activity occurring in voids.
- Exclusion (primarily during construction).
  1. Installing solid caps on foundations (not a standalone procedure)
  2. Stainless steel mesh (*Termimesh*®) around foundations (in limited use in the United States; approved for use in North Carolina).
  3. Sand barriers—tests have shown that a layer of sand with uniform size particles placed along the foundation (or under a slab) could stop termite movement through the soil. The particles are usually too large for the termites to move with their mandibles ("teeth"), yet too small for the termites to crawl between. There is some question about the effectiveness of these products against our native termites (*Reticulitermes* spp.). Sand barriers are not approved as standalone treatments in North Carolina.
  4. Stone—Granitgard® consists of finely graded stone particles that are laid beneath the

concrete floors of new buildings or around foundation footers. Research has shown that termites cannot penetrate this material because the particles are too large and heavy for them to shift, too hard for them to dissolve with their saliva, and too closely packed to tunnel through. This product is mined in Australia. Granitgard is not approved for use as a standalone treatment in North Carolina.

### **Wood-boring Beetles**

Most common wood-boring beetles are the powderpost beetles and the old house borer. These problems are most common in crawlspaces (joists, girders, and bands) and in log houses.

#### **Chemical control:**

- Surface-application and/or injection of pesticides, particularly permethrin, cypermethrin, fipronil, chlorfenapyr, and the borates. Use of pressure-treated or dipped logs/lumber.
- Fumigation with sulfuryl fluoride.

#### **Non-chemical control:**

Tactics that help reduce the moisture content of wood below 15% to make it less suitable for larval development—improved foundation drainage and ventilation in crawlspaces; waterproofing logs. None of these methods is adequate to prevent an infestation.

### **Current Insecticide Recommendations for Residential and Industrial Areas in North Carolina**

Current North Carolina Cooperative Extension Service recommendations for insecticide use in residential and industrial areas (including information on formulations and precautions/limitations) are provided in the following tables from the *North Carolina Agricultural Chemicals Manual*:

Table 5-15A-C: Industrial and Household Pests

<http://ipm.ncsu.edu/agchem/chptr5/523.pdf>

Table 5-20: Insect Control for Wood and Wood Products

<http://ipm.ncsu.edu/agchem/chptr5/539.pdf>

Table 5-22: Control of Household Pests

<http://ipm.ncsu.edu/agchem/chptr5/542.pdf>

## On-Line Resources

Insect Notes - Residential, Structural and Community Pests  
(<http://www.ces.ncsu.edu/depts/ent/notes/Urban/index.htm>)

North Carolina Pest News  
([http://ipm.ncsu.edu/current\\_ipm/pest\\_news.html](http://ipm.ncsu.edu/current_ipm/pest_news.html))

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