



Reducing Pesticide Use in Sensitive Environments

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Integrated pest management (IPM) practices allow the management of pests with little or no use of broad spectrum pesticides, making it a good choice in and around sensitive environments.

Sensitive environments are locations where vulnerable people (children, elderly, immunocompromised) spend time and organisms (ornamental plants, beneficial insects, pets, etc.) can be found. These locations can range from schools, daycare centers, and hospitals to confined spaces such as airplanes, prison cells, dog kennels, and even our own backyards.

Pesticides are often used in and around such locations to manage pests, including rodents, insects, mites, bats, and weeds. If pesticides are applied incorrectly or are used too often, they can be harmful to human health. Carefully consider and plan any pesticide applications that involve sensitive environments to prevent exposure to sensitive individuals and the environment.

This NebGuide discusses integrated pest management (IPM), an approach that advocates monitoring, sanitation, exclusion, trapping, and, when appropriate, the use of pesticides. While we recommend IPM for pest control in sensitive environments, these pesticide reduction strategies can be used anywhere.

Pests and Pesticides

A pesticide is any substance used to prevent, repel, or control pests. Pests of sensitive environments include ants, cockroaches, spiders, flies, bed bugs, mice, and rats. Pests

also might include bacteria, viruses, and fungi (mold). Some plants may be considered pests (i.e., weeds). Pesticides used to control these different types of pests include insecticides, rodenticides, fungicides, disinfectants, and herbicides.

Traditional pest control services may use broad-spectrum pesticides sprayed in areas where people can be easily exposed to them. Sometimes pest management is scheduled regularly, regardless of pest presence. Exposure to pesticides can occur one time (acute exposure) or can occur through repeated exposure (chronic exposure) when a person comes into contact with a pesticide regularly in the same area. Table 1 provides a brief description of some common ways a person could be exposed to pesticides.

Table 1. How and where exposure to pesticides can occur.

How	Potential Exposure Locations
Direct skin-to-surface or mouth-to-surface contact with contaminated surface	Walls
Subsequent hand-to-mouth contact, resulting in ingestion	Floors
Subsequent hand-to-eye contact, resulting in absorption	Baseboards
Direct skin contact, resulting in absorption	Carpets
Breathing pesticide vapors or airborne dust	Turf, courtyards, playgrounds

Health Considerations

Exposure to pesticides has been known to cause adverse health effects. Rates of illness are higher in people who are more likely to come into contact with pesticides.

Children, the elderly, immunocompromised people, and those in confined spaces, such as prison cells, are at particular risk to pesticide toxicity due to immature or compromised organ systems resulting from age or disease, or extended pesticide exposure time due to confinement.

Acute pesticide exposure can result in coughing, shortness of breath, and other respiratory symptoms, as well as nausea, vomiting, headaches, and eye irritation. There is also mounting evidence that long-term, chronic exposure to pesticides is associated with cancer, as well as neurologic and reproductive problems.

Completely eliminating the use of pesticides is often impractical; therefore, the goal is to minimize risk by reducing the amount used and by selecting less toxic pesticide products. IPM is a practice that can significantly reduce the number of pesticides used, while maintaining control of the pest.

Integrated Pest Management

IPM is a holistic approach to pest control that includes:

- Identification: (Figure 1). Misidentification can result in treatments that are ineffective and unnecessarily expose people to pesticides.
- Monitoring: Track pest populations to make sure the pest is present in numbers that warrant treatment before applications are made. One common method is to use sticky traps installed in areas where pests, if present, are likely to be detected and traps can be safely recovered.
- Sanitation: Identify and remove conditions that attract and favor pests, such as food and water (Figure 2).



Figure 2. Good sanitation removes food and water needed for pest survival.

IPM Reference Photos



Figure 1. Correct identification of a pest is essential before attempting control.

- Exclusion: Seal cracks and crevices to keep pests out of structures (Figure 3). This is the most effective and long-lasting management tactic to keep out structure-invading pests such as spiders, millipedes, crickets, face and cluster flies, rodents, and bats.
- Mechanical control: Use nontoxic, low-risk methods, such as insect and rodent traps (Figure 4).

Apply pest-specific pesticides in the appropriate mode of action and formulation, rather than broad-spectrum pesticides to targeted sites where pests occur. Broad-spectrum pesticides might affect unintended organisms.

- Multiple strategies: Use a combination of tactics, including nontoxic approaches, which often will be most effective in a long-term program.



Figure 3. All entry points must be sealed with appropriate materials to exclude pests throughout the changing seasonal temperatures.



Figure 4. Place rodent snap traps in tamper-resistant containers to protect nontargets, such as children and pets.



Figure 5. Clutter provides hiding places for pests and should be eliminated.



Figure 6. Properly fitted door sweeps help keep pests out.



Figure 7. Unscreened windows allow flying insects easy access into buildings.



Figure 8. Repair leaking pipes to help eliminate water that pests need to survive.



Figure 9. Education is the key to a successful IPM program.

IPM Program Considerations

Choose lower-risk strategies when developing an IPM program. Consider methods that:

- minimize health risks to humans and the environment.
- minimize disruption of the natural, outdoor environment.
- are least toxic to nontarget species, especially pollinators and other beneficial insects.
- target the underlying causes of the pest infestation. prevent recurrence of the pest infestation. are safe and easy to apply.
- are cost-effective.

How to choose a pest management professional (PMP):

- “Yes” answers to the following questions indicate the PMP has developed a good IPM program. If the PMP’s idea of service is routine application of insecticide to base boards/foundation regardless of the pest and their numbers, consider hiring a different provider.
- Is the person licensed in the state?
- Does the PMP have a written description of IPM services?
- Does the description outline IPM services, including:
 - Inspection?
 - Identification of pests?
 - Continuous monitoring?
 - Identification of conducive conditions?
 - Recommendations including sanitation and exclusion?
- Does the PMP’s mission and IPM program fit your business culture?
- Will the PMP be responsive to pest complaints during non-regular service days?
- Discuss current pest problems, conducive conditions, and management recommendations. Do they seem reasonable?
- Are their IPM recommendations consistent with IPM principles?
- Will the PMP provide documentation for training taken on pest identification, IPM, and proper pesticide use?
- Does the PMP seem to be a willing and skilled educator who is able to teach clients about his/her activities?
- Will the PMP require that the facility’s IPM manager be present during all service visits? This is necessary to help educate everyone about IPM in your sensitive environment.
- Does the PMP keep written records—pest log, IPM strategies used, etc., for accounts?

How to Reduce Pesticide Use

IPM emphasizes the use of multiple tactics to successfully manage and suppress pests from an area without relying on regularly scheduled, preventive use of pesticides. By following IPM, the amount of pesticide used often can be reduced when compared to a traditional pest control approach. When used properly, IPM can also reduce expenses involved in pest control. To implement IPM in your location, start by developing a written policy and procedural guidelines for pest management. The policy and guidelines should incorporate the following IPM steps:

1. **Appoint an IPM manager.** The manager should be a knowledgeable person, such as a custodial staff member or a pest management professional (PMP), competent to conduct the IPM program.
2. **Monitor for pest problems.** The manager should routinely inspect the building for the presence of pests, and monitor pest populations using sticky traps where appropriate. Areas to monitor include entrances, windows, food storage and preparation areas, laundering sites, restrooms, mechanical rooms, loading docks, trash/recycling areas, and roof areas. The manager also should respond promptly to all pest complaints reported by residents, students, and staff.
3. **Identify the pest and nature of all pest problems.** The manager should correctly identify the pest and locate the source of the problem whenever possible. There are many resources to aid in identification, including the UNL Plant and Pest Diagnostic Lab and your local Extension office (also see Additional Resources at the end of this NebGuide).
4. **Identify and eliminate the sources of the problems.** The IPM manager should modify sensitive sites by locating and eliminating common pest-conducive conditions. Repair cracks and crevices, replace or repair door sweeps, install air conditioners to prevent the need for opening windows, install window screens, utilize traps for removal (glue trap, snap trap, etc.), and ensure sanitary conditions to eliminate problems. Additional conditions to look for include:
 - Overflowing dumpsters or dumpsters located too close to the building. Overflowing dumpsters provide food and harborage for many pests including rats, cockroaches, ants, flies, and wasps. Dumpsters placed too close to a building attract pests not only to the dumpster but into the building as well.

- Unrestrained growth of landscape vegetation, indoor vegetation, and pet infestations. Outdoor vegetation that touches buildings can provide easy access for pests. Indoor vegetation, such as potted or greenhouse plants, can also become a resource for pests (i.e., fungus gnats in moist soil) and should be managed. Additionally, pets and wildlife may harbor fleas, ticks, and mites. Infestations should be identified and managed.
 - Untidy, cluttered areas, both indoors and outdoors (Figure 5). Clutter provides harborage for many pests and makes it more difficult to inspect the area for signs of pests.
 - Pipes that are poorly maintained. Leaking pipes and/or improperly working drains provide an endless food, breeding material, and water supply for pests.
 - Gaps and cracks under entrance doors or created by broken tiles, poorly fitted appliances and cabinets, and other places where pests can hide (Figure 6). Cracks, crevices, and other gaps and holes provide pest harborage and can allow access to a structure.
 - Outdated structures and ventilation systems. Older structures often have more defects, which can lead to more pest entry and harborage. Poor ventilation can lead to moisture buildup and mold growth, and negative air pressure draws flying insects into the building.
 - Unscreened windows that allow flying pests, such as flies and wasps, to enter the building (Figure 7).
5. **Prevention is key.** Preventive measures significantly reduce the need for pesticides. Installing new downspouts and repairing ventilation systems are simple steps and often improve the overall maintenance of the building. Other measures include the following:
- Move dumpsters and food disposal containers away from the structure.
 - Repair leaking pipes and maintain open drains (Figure 8).
 - Keep food service areas thoroughly cleaned.
 - Seal cracks and crevices; install door sweeps.
 - Carefully adhere to cleaning schedules and strict cleanliness standards.
- Clean gutters and direct water flow away from the building.
 - Install window screens.
 - Use less attractive lighting by doorways
 - Keep doors and windows closed when not in use
 - Maintain a vegetative-free zone next to buildings.
 - Educate residents, students, and staff about how their actions affect pest management.
6. **If nonchemical methods fail** or are impractical, use pesticides following these guidelines:
- Use the least-toxic pesticide that is effective. Toxicity is indicated by “signal words” on the label, such as CAUTION, WARNING, and DANGER. Look for labels with a CAUTION signal word; these are generally less toxic than pesticides with WARNING or DANGER on their labels. Before using any pesticide, however, try sanitation, exclusion, trapping, and other IPM methods to control pests. Only use pesticides when nonchemical methods fail.
 - Avoid formulations that contain solvents, such as emulsifiable concentrates (ECs) or those in pressurized spray cans. Solvents are readily absorbed by the skin, and solvent vapors that are inhaled quickly move into the bloodstream. Purchase ready-to-use (RTU) pesticides so that applicators do not have to work with concentrates. RTUs are already diluted; they may cost more, but are less hazardous to work with or store than concentrates.
 - Use application methods that minimize exposure. For instance, applications to cracks and crevices reduce the chance of human contact with pesticides. Use dusts only in wall voids and other areas that are unlikely to be disturbed by people or pets. Use cockroach get baits instead of surface or pressurized sprays that may become airborne.
 - Only trained and qualified workers should handle, mix, or apply pesticides. The commercial or non-commercial applicator should be licensed by the Nebraska Department of Agriculture.
 - The pesticide applicator must read and follow all label instructions, including using the appropriate personal protective equipment (PPE). Risk to the applicator can be reduced by using PPE to protect

against exposure to pesticides. The appropriate PPE coupled with the least toxic pesticide will greatly reduce risk.

7. **Keep accurate records** to document and evaluate overall the effectiveness of your IPM program. The IPM manager and applicator should record the type and numbers of pests detected before and after undertaking any control measures, including pesticide applications. Document all measures taken to control pests. Keeping good records enables the IPM manager to assess control strategies and make adjustments over time.

FOR MORE INFORMATION

- EPA Resources on Pesticide Issues for School and Childcare: <https://www.epa.gov/safepestcontrol/resources-pesticide-issues-school-and-childcare> for resources about IPM in child care for schools and child care providers.
- EPA Managing Pests in Schools website: <https://www.epa.gov/ipm> covers IPM in schools, including common pests, how to determine if your school is using IPM, IPM programs in your area, and online resources and contacts.
- EPA IPM in Childcare website: <https://www.epa.gov/childcare/training-webinars-and-resources-child-care-providers> for resources about IPM in child care for parents and child care providers.
- National IPM in Schools website: <https://schoolipm.ifas.ufl.edu/> for information, resources, and links to all states about IPM for school administrators, parents, teachers, students, and the public.
- UNL Extension IPM in Schools website: <http://schoolipm.unl.edu/> has IPM resources for school administrators, parents, teachers, students, and the public.

8. **Educate everyone** about pesticides and IPM (Figure 9). In schools, involve and educate stakeholders, including administration, instructional and support staff, students, and parents. In other sensitive environments (e.g., hospitals, nursing homes, or prisons), educate patients, medical personnel, residents, inmates, and administrators.
9. **Notify everyone involved** whenever pesticides are to be used and advise when it is safe to re-enter a treated area. Avoid spraying pesticides when people are present. Restrict access to the treated areas until the pesticide has dried or for as long as the pesticide label recommends.

ADDITIONAL RESOURCES

- Integrated Pest Management in Sensitive Environments: A How-to Guide. 2012. Clyde Ogg and Erin Bauer, ed. Nebraska Extension. <https://cloud.3dissue.com/40620/41175/179694/IPM/index.html>
- Internet Center for Wildlife Damage Management website: <http://icwdm.org/>
- Nebraska Extension Digital Diagnostic Network: <http://digitaldiagnostics.unl.edu/> Submit questions and photos through this website.
- Nebraska Extension Wildlife: <https://wildlife.unl.edu/> for resources on wildlife damage, identification, diseases, and conservation.
- Plant and Pest Diagnostic Lab. Nebraska Extension. UNL faculty and staff from Plant Pathology, Horticulture, Agronomy (Weed Science), and Entomology diagnose pests and give recommendations for controlling pest problems. <https://plantpathology.unl.edu/plant-pest-diagnostic-clinic>

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