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Bugged? Responding To and Preventing Insect Infestations

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Preservation Essentials

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Bugged? Responding To and Preventing Insect Infestations

By Sara J. Holmes, National Archives at St. Louis

A variety of insects can potentially damage collections in archives. Archivists need to be wary of possible insect infestations in both their collection storage areas and in new acquisitions. Insects are readily attracted to tight, dark spaces and seek to establish habitats inside the folds of boxes, in piles of undisturbed boxes, in corners, and under furniture. Maintaining a cool, dry environment and keeping up with regular housekeeping can prevent infestations by discouraging insects and by detecting their presence before damage to collections can occur.

IPM: Integrated Pest Management

All archives should have an IPM (Integrated Pest Management) plan. This is a nonchemical means of controlling environment, food sources, and entry into your building to prevent infestations and quickly address them when they do occur. The use of pesticides is a safety concern for people and may negatively impact the collections as well. Preventive strategies and vigilance can largely eliminate the need for any pesticide use in collection areas except as a last resort.

It is not the paper itself that attracts most insects, but the sizes, starches, and adhesives found in paper-based collections. Some insects will attack cellulose (paper) and proteins (such as leather, parchment, vellum). Others may be interested in objects or textiles kept in the collection. Damage from pests is not simply from "dining," but also comes from tunneling and nesting activities, as well as frass (excrement).

Silverfish, firebrats, psocids, and cockroaches are all common in book and paper-based collections. Silverfish and firebrats will feed on paper sizing, chew paper, and damage bindings to reach adhesives. Both like dark, humid areas. Psocids (also known as booklice) feed on mold growth and may be present when humidity is high. Psocids feed on pastes and glues, but do not create holes in paper. Cockroaches, however, will eat book pages, adhesives, and leather. Termites will attack wood and paper. Rodents, especially mice, can cause large amounts of damage by chewing through paper during their nesting activity.

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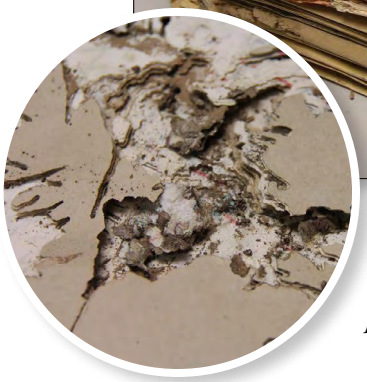
Termite activity can occur in areas that allow pests to enter and can result in great damage if the area is not monitored.



Termites will tunnel through paper as well as wood.

The psocid, also known as booklice, is tiny and measures under 4mm. It is attracted to microscopic mold and can be found on food, paper, and other materials. It may also be attracted to wheat starch paste, which is used in conservation treatments to mend paper.

Silverfish are attracted to water sources and humid areas. They will quickly scour over available surfaces, especially book bindings, and will seek to stay between pages and folds of boxes. Photo by Buffalo State College Program in Art Conservation.

Bugged?

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Some insects are not a direct threat to collections, but their presence can attract others that are—no insect infestation should be ignored even if the collections have not yet been affected.

The first rule in implementing IPM is to eliminate food sources and keep housekeeping standards up to prevent insect activity.

Know and Maintain Your Building

It is important to know your building well and look for all possible points of entry. Doors or windows may not be well sealed even if kept closed. Be sure that weather stripping is used when necessary and add door sweeps on exterior doors that may have gaps. Cracks in walls or foundations, vents or air ducts may allow pests to enter. Be sure that vents are screened to keep birds and rodents out, and also check for openings around pipes. Keep the area at the foundation of your building graveled and graded away from the building, and maintain plantings at least one foot away to hold insect habitats at bay.

Insects are attracted to water sources. Identify all locations of water pipes, restrooms, water fountains, sinks, janitorial closets, AC units, and so on that may provide havens for insects. Inspect these areas regularly.

Control where food can be stored and disposed of by limiting its use to kitchens and staff lounges only. Ensure that food waste is taken directly outside on a regular schedule. Be aware that potted plants can provide a safe haven for insect pests. If plants are maintained, select locations carefully away from collection storage and regularly check that plants are healthy and not overwatered.

Download a copy of the "Integrated Pest Management Checklist" from the Smithsonian Museum Conservation Institute to help make a full assessment of your building and plans for IPM from si.edu/mci/english/learn_more/taking_care/index.html.

Monitor Collections and Storage Areas

Monitoring collection areas regularly is necessary to identify infestations before damage occurs. Be sure that collection areas are cleaned routinely, and check at least once a month for pests.

Be sure to look under furniture and inside boxes. Look for live insects, dead bodies, eggs, and damage from insects. While damage to paper and bindings in the form of losses and "scraping" of the surfaces of bindings by insects such as silverfish are obvious, it is important to be aware of the different appearances of frass. Staff dusting collections should be on watch for unusual small piles of dust that may be beetle frass, which is fine, granular, and powdery. Frass can vary in color depending on the insect and what was digested. Silverfish leave tiny black flecks, while roaches leave small pellets and black streaks. If frass is noted, collections nearby should be checked.

Insect traps are an ideal way to monitor insect activity and track seasonal changes. Sticky traps are the most common. Be sure to use a style that allows you to handle it easily and view the trapped insects. Traps can be found locally at hardware stores.

To log and document your observations and information from your traps, you will need to mark the location of each trap on a floor plan. When placing traps for the first time, study your floor plan and note likely entry routes and water sources, and locate traps in those areas. Number and date each trap and place according to your floor plan. For the first three months, check your traps weekly. Refine locations as needed and update your floor plans to show new locations. Once you are confident you have located your traps well, check them at least once a month. Sticky traps should be replaced every two months or when full. In cases of infestation, place traps every 10 feet and check after 48 hours of placement.

Always be sure to document your findings! Keep copies of your floor plans, and create logs noting the date checked and location of each trap along with the number of insects, type of insects, and stage of growth for each trap found. Note any activity at places other than the traps with clear information on date and place. Online insect identification guides can be helpful in correctly identifying the insects you find. Be sure to look at the guide available on the museumpests.net website, which focuses on insects problematic for museum collections. You may also want to check with a local university or college for assistance in identifying the insects you find.

Incoming Collections

All too often, collections coming to archives have been stored in poor environments, such as basement or attics, garages, or even barns, where pest activity is high. All incoming collections should be kept away from collec-

tion storage areas until you have checked them for any insect activity. The steps below outline a procedure for inspection:

1. Examine collection for insect or pest activity. Remove all items from boxes and check inside folders, between pages, inside envelopes, and inside book bindings for insect bodies, droppings, or damage. Be sure to dispose of old boxes used to ship or transport the materials.
2. Place collection in new boxes, preferably archival storage, and isolate away from other collections in a clean, cool, and dry area.
3. Check boxes at least every few weeks. Use a sticky trap on a side wall and nearby the boxes to help monitor.

Treating Infested Materials

Chemical fumigants are very toxic and pose health hazards to staff. Some may even change the chemical structure of archival collections. Fumigants such as ethylene oxide should be used as a last resort, with materials sent off-site and given time to off-gas for several weeks after treatment before they return to your facility.

Materials with insect debris and even some active infestation may be treated by vacuuming through nylon using a HEPA vacuum. This should only be attempted if the paper is stable enough to withstand the treatment. Vacuuming should be completed in isolation away from collections, and the vacuum's bag and filter should be promptly disposed of and removed from the building when work is completed. The treated materials should remain in isolation for further observation, with sticky traps around the boxes and on the side walls to help monitor for further activity.

Controlled freezing can be used on most paper materials. Household or commercial freezers may be used. Items must be bagged and sealed unless using a freezer with temperature and humidity controls. Papers and files should be loosely packed to allow for fast freezing, but materials can be boxed and then sealed in a large bag. The bagging acts as a barrier against fluctuating moisture content, but also prevents insects from escaping before they die.

Materials to be frozen should be kept at room temperature. Never store in a cool area prior to freezing—a rapid change in temperature is necessary, or freeze-resistant insects will acclimate to lower temperatures and survive the process. Freezing should occur quickly, with a temperature to 0°F within in four hours and to -20°F within eight hours. For ideal treatment, freezing should be at -29°F for at least 72 hours.

Slowly thaw in the freezer by bringing the temperature back up to 0°F over eight hours, then bring up to room temperature. The freezing process can be repeated again to treat freeze-resistant insects that need more than one cycle to be killed. Keep bagged until returned to an isolated area to monitor for at least several weeks. Maintain documentation of the length of time and temperature used in freezing in your IPM records.

Modified atmospheres can be used in a fumigation chamber or in low-permeability plastic bags. When using a chamber, air is evacuated and carbon dioxide or nitrogen is added. Once treatment is completed, the vacuum is released and carbon dioxide or nitrogen gas removed. Low-permeability bags can also be used, with materials sealed in with an oxygen scavenger that reduces oxygen inside the bag. Both methods are more advanced and may require the services of a conservator or a contractor to complete.

Gamma radiation may also be a possibility. This process leaves no residual radiation after treatment, but the level must be controlled to limit possible oxidation in the cellulose of paper. Consult with a conservator before planning this method.

Heat can remove insects, but will damage paper. Never attempt treatment in a microwave. Pages and covers can burn, metal attachments can cause arcing, and adhesives can soften if microwaved.

For More Information

The website museumpests.net has extensive information on setting up an IPM, identifying insects, and further resources, including subscription information for the e-mail distribution of "PestList," where you can seek answers to questions.

A guide to museum pest management, "Approaches to Pest Management in Museums," can be downloaded from the Smithsonian at si.edu/mci/english/learn_more/taking_care/index.html.