<http://www.amnh.org/our-research/natural-science-collections-conservation/general-conservation/preventive-conservation/integrated-pest-management>

Integrated Pest Management

**General Information on IPM and Collections**

Preventing specimens from being attacked and damaged by pests is a major challenge of collection management. In collections facilities, the two most common types of pests are insects and fungi.

In the past, pest management usually involved regular applications of toxic chemicals (pesticides or fungicides) to specimens and collection areas. In recent years, however, health and safety concerns have led institutions to move away from this approach in favor of preventative and protective measures that are not based on chemicals. These include upgrades and repairs to building structure; installing better cabinetry; better control of temperature and humidity in collections areas; removing food and other organic materials from collection areas; more effective monitoring; and treatment of outbreaks through freezing or anoxic environments. Using these different measures in combination is known as “integrated pest management.”

**Objectives for an institutional IPM plan**

* To develop collection management practices that are consistent with city, state, and Federal health safety regulations
* To foster good communication with other departments responsible for ensuring the success of an IPM Plan (e.g. Facilities Operations and Custodial Services)
* To facilitate a swift and unified response to pest problems among departments with the understanding that the achievable goal is management; no policy will ever eradicate the pest problem

**The first step in an IPM plan is [preventing access](http://museumpests.net/prevention-introduction/prevention-building-envelope/" \t "_blank) – determining how pests enter your building and modifying behaviors and habits that enable pests, once in, to continue to live and breed.  Preventing access will include the following:**

* Identifying and fixing problems in the building and room structure that allow pests entry (e.g., cracks in roofs and walls, doors and window seals) and then, ideally, providing for well sealed cabinets that deter access to specimens.
* Maintaining an environment in collections areas that is not hospitable for pests. Pest infestations can sometimes be directly related to **[temperature and relative humidity](http://www.amnh.org/our-research/natural-science-collections-conservation/general-conservation/preventive-conservation/temperature-and-relative-humidity-rh" \t "_self)**.  Ensure that collections areas do not have high heat or humidity conditions that will allow pest populations to flourish.
* Keeping food and food preparation far away from collections housing.
* Making sure that collection areas are kept clean and free of trash, debris and foodstuffs that could encourage pests.  Good housekeeping helps prevent infestations.
* Developing new collection procedures to make sure that new collections and packing material are safe to enter collections areas.

 Use of Solid Wood Packing Material (SWPM)

* A particular issue affecting the transport of paleontological specimens from the field is the use of solid wood packing materials; because of their weight, paleontological specimens frequently are shipped in wooden crates and pieces of wood are often used to provide additional strengthening for large field jackets. SWPM refers to primary wood packing materials such as crating, pallets, packing blocks, drums, cases and skids.
* SWPM is vulnerable to attack by wood boring insects; crates and pallets made from untreated wood are thought to have been the source of the **[1996 outbreak of the invasive Asiatic long-horned beetle (](http://en.wikipedia.org/wiki/Asian_long-horned_beetle" \t "_blank)*[Anoplophora glabripennis](http://en.wikipedia.org/wiki/Asian_long-horned_beetle" \t "_blank)*[)](http://en.wikipedia.org/wiki/Asian_long-horned_beetle" \t "_blank)**. In a collection environment they may cause serious damage to untreated wood artifacts, furniture, and structural timbers. Failure to use appropriately treated SWPM, and to provide evidence of such when shipping specimens into the country, may be grounds for denial of entry, destruction of the shipment, and legal sanctions including fines.

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|  | **Solid Wood Packing Material (SWPM)**  *SWPM refers to primary wood packing materials such as crates, pallets, packing blocks, drums, cases and skids. SWPM is vulnerable to attack by wood boring insects which, in a collection environment, may cause serious damage to structures, office furniture, artifacts and specimens.  For institutions that transport exhibits or large specimens internationally it is essential to be aware of the legal requirements for documentation and treatment of SWPM.* |

The second part of an IPM plan is **[monitoring](http://museumpests.net/monitoring-introduction/" \t "_blank)**. All buildings have their own ecosystem based on their location and other historic factors.  Some pests will always be found inside. Monitoring this ecosystem provides a useful way to determine what species are common in your facility and when conditions might have changed to allow one species to become common enough to present a danger to the collections.  Insect traps, such as sticky traps or pheromone traps, are commonly placed throughout collection areas and checked on a regular basis, recording the contents.  Pest sightings or an uptick in pest activity should prompt an investigation into potential causes.

If pests are found in traps**[identification](http://museumpests.net/identification/" \t "_blank)**is an important third step.  Identification will allow decisions to be made on how potentially damaging the activity may be to the collection.  Identifying the pest also aids in ensuring that a proper course of remedial action is chosen.

**[Elimination](http://museumpests.net/solutions/" \t "_blank)** is the fourth element of an IPM plan. The use of chemical agents to deal with either routine pest mitigation or more entrenched infestations should be left to professional pest management companies who are trained and licensed in accordance with state regulations and health and safety standards. To deal with infestations at the specimen or collection level the two most common procedures are low-temperature (freezing) or low oxygen (anoxia) treatments.

For More Information on IPM visit **[www.museumpests.net](http://museumpests.net/" \t "_blank)**. This website is a product of the Integrated Pest Management Working Group (IPM-WG) – an ad hoc group of museum professionals (collection managers, entomologists, conservators, etc) – which has put together useful tools for collecting institutions to help them implement and run integrated pest management programs.  The IPM-WG is sponsored by the American Museum of Natural History.

**Collection Specific**

*IPM and Invertebrate Zoology Collections*

Entomology collections are, ironically, extremely vulnerable to pest infestation.  Many large collections have been treated in the past with heavy metal pesticides and, in more modern times, with fumigants to ward off invaders but these do not fully protect collections from infestation.  Researchers must be aware of the history of pesticide and fumigant use for their own safety (see the section on Residual Pesticides in the Health & Safety section of this site for more information).  Tips for keeping invertebrate collections safe from pests include:

* Use inert materials for specimen storage (e.g. polyethylene foam rather than cotton wool)
* Use well sealed cabinets for storage.
* Keep the RH low. If entomology collections must be stored in environments prone to damp (e.g. basements) they should be in microenvironments (i.e. storage cabinets) with a desiccant such as silica gel.
* Inspect collections quarterly looking for frass, insect excrement which often looks like sand or sawdust.
* If there is concern that a specimen is infested it should be frozen.

*IPM and Vertebrate Zoology Collections*

Hair and skin of vertebrate zoology collections make them extremely vulnerable to pest infestation.  As a result most collections have been treated in the past with pesticides and/or fumigants.  Researchers must be aware of the history of their collections for their own safety (see the section on Residual Pesticides in the Health & Safety section of this site for more information).  Mammalogy collections do well in cold storage conditions that are inhospitable to pests.  Osteological collections too are vulnerable to infestation as the fat/grease in the bone is extremely attractive to insects.

Mothballs and substances such as Vapona® are no longer legal or appropriate treatments for museum collections.  If an infestation is suspected, skins, skeletons and full taxidermy mounts can generally be safely frozen which will kill all life stages of a pest infestation (for more on proper freezing procedures visit the Treatment page of the museumpests.net website). [http://www.museumpests.net/treatment.asp]  Infestations that cannot be dealt with by freezing should be treated by an appropriate, licensed pest management professional.

*IPM and Paleontology Collections*

While most fossils are not prone to infestation, pests can affect certain categories of paleontological material (e.g. subfossil bones or mummified specimens) or sometimes the adhesives used on specimens.  Pests can cause damage to associated items, such as specimen labels, paper archives, padding materials, or drawers and cabinets. Poor pest management may lead to the paleontology collections becoming a reservoir for pest problems elsewhere in an institution.

*IPM and Physical Sciences Collections*

As with paleontological specimens, physical science collections are not prone to infestations but should be monitored to ensure that they do not become a breeding ground for infestations that could spread to other more vulnerable areas of an institution.  Pests can damage specimen labels, padding, drawers and cabinets that are essential for the proper care of geological collections.

**Additional Resources**

The website of the IPM-Working Group **[www.museumpests.net](http://www.museumpests.net/" \t "_blank)** was specifically developed to present resources for implementing IPM and treating infestations in museums and other cultural institutions.  Resources include the PestList, a listserv for questions relating to IPM, templates for developing IPM policies and procedures, identification and treatment fact sheets and bibliography and web resources.

The National Park Service Conserve-O-Gram series has several documents that deal with IPM including:

* 3/4 - Mold: Prevention of Growth in Museum Collections [**[http://www.nps.gov/history/museum/publications/conserveogram/03-04.pdf](http://www.nps.gov/history/museum/publications/conserveogram/03-04.pdf" \t "_blank)**]
* 3/6 - An Insect Pest Control Procedure: The Freezing Process [**[http://www.nps.gov/history/museum/publications/conserveogram/03-06.pdf](http://www.nps.gov/history/museum/publications/conserveogram/03-06.pdf" \t "_blank)**]
* 3/7 - Monitoring Insect Pets with Sticky Traps [**[http://www.nps.gov/history/museum/publications/conserveogram/03-07.pdf](http://www.nps.gov/history/museum/publications/conserveogram/03-07.pdf" \t "_blank)**]
* 3/8 - Controlling Insect Pests: Alternatives to Pesticides [**[http://www.nps.gov/history/museum/publications/conserveogram/03-08.pdf](http://www.nps.gov/history/museum/publications/conserveogram/03-08.pdf" \t "_blank)**]
* 3/9 - Anoxic Microenvironments: A Treatment for Pest Control [**[http://www.nps.gov/history/museum/publications/conserveogram/03-09.pdf](http://www.nps.gov/history/museum/publications/conserveogram/03-09.pdf" \t "_blank)**]
* 3/11 - Identifying Museum Insect Pest Damage   [**[http://www.nps.gov/history/museum/publications/conserveogram/03-11.pdf](http://www.nps.gov/history/museum/publications/conserveogram/03-11.pdf" \t "_blank)**]

**[Combating Pests of Cultural Property](http://www.cci-icc.gc.ca/resources-ressources/agentsofdeterioration-agentsdedeterioration/chap06-eng.aspx" \t "_blank)** by Tom Strang and Rika Kigawa of The Canadian Conservation Institute has comprehensive information on IPM.

**[Canadian Conservation Institute Notes](http://www.cci-icc.gc.ca/resources-ressources/ccinotesicc/index-eng.aspx" \t "_blank)** offer practical advice about issues and questions related to the care, handling, and storage of cultural objects. Relevant Notes include:

* N3/1 Preventing Infestations: Control Strategies and Detection Methods
* N3/2 Detecting Infestations: Facility Inspection Procedure and Checklist
* N3/3 Controlling Insect Pests with Low Temperature
* N3/4 Psocids or "Book Lice": a Warning of Dampness