



INTEGRATED PEST MANAGEMENT PROGRAMS FOR MUSEUMS, LIBRARIES & CONSERVATION / PRESERVATION FACILITIES

**Prepared for
Harvard University Museums & Libraries
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24 July 2014**

Museums and libraries encounter many of the same pest issues that burden any other facility, but they face particular additional challenges because of the low thresholds for damage to their specialized and valuable collections and the difficulties in detecting these sometimes tiny and elusive pests. Efforts are necessary to protect valuable collections as well as the health of personnel who manage, handle and utilize the holdings.

Integrated Pest Management (IPM) relies upon diverse and appropriately designed proactive and reactive strategies to exclude, monitor and manage pests in manners that provide greater benefit than risk to people, the environment and the specimens and artifacts within a museum collection and archives within library holdings.

A basic tenet of IPM relies on an appropriately designed and implemented program of monitoring, combined with the accurate and prompt identification of pests, to better inform decisions on the design and extent of any interventions. Carefully considered and applied IPM efforts can protect facilities, valuable collections and personnel within, and reduce risks to the fiscal health and reputation of the institution.

A rational museum and library IPM program will include components to:

- Define goals and expectations,
- Inspect / monitor for general and collection-specific pest issues,
- Identify pests and evaluate pest damage,
- Document pest issues and responses,
- Educate personnel to reduce pest intrusion and to recognize pest related problems,
- Evaluate and enhance sanitation, exclusion and containment controls,
- Set action thresholds.

The Environmental Public Health program of EH&S can assist with all phases of this effort.

Define goals and expectations



The initial step in designing a suitable museum and library IPM plan will be based upon a thorough and detailed needs analysis of the facility. This is accomplished through meetings with building operations / facility maintenance and curatorial / library personnel to review the history of pest monitoring and management issues throughout the facility, and to define and stratify areas based upon contents, value, risks, visibility / perception to public and personnel. The physical characteristics of the building and specific collection areas are to be assessed by review of blueprints and direct and thorough observation to identify pest entry and dispersal opportunities. Existing organizational plans are to be reviewed to ascertain existing or potential pest-related tasks, responsibilities and responses for facility personnel and vendors, and to gauge the levels of monitoring effort, visibility and vendor access that will be accessible to the client. A thorough inspection of the interior and exterior of the property shall be undertaken to detect evidence of pests as well as conditions that are conducive to support or permit entry of pests. The information derived from such initial meetings and inspections will permit a focused, rational and economical IPM monitoring plan appropriate for the facility and the contents within.

Inspect / monitor for general and specific pest issues

The IPM monitoring plan will specify a program of routine active inspections and use of passive monitoring tools to detect pest issues throughout the facility. The goal of such a monitoring program is to detect pests and associated damage as early as is practical, so that efforts can be pursued to minimize the spread of the pest and associated damage, and to limit concerns to museum / library personnel and visitors.

The extent, frequency and manner of monitoring shall be a function of the priorities of the curators and librarians, the composition of the collections, the frequency of potential intrusions facilitated by incoming holdings and movements by personnel, and the uses of the space. For instance, sensitive and valuable artifacts and collection areas will require specific monitoring plans that differ dramatically from those appropriate to office areas, food service and public display areas.

The IPM monitoring plan will:

- Define the responsibilities of museum / library personnel and vendors,
- Describe the kinds and frequency of monitoring activities and kinds of traps,
- Establish a log to document pest sightings, pest damage and action responses (see below).

Identify pests and evaluate pest damage

Proactive and reactive interventions are best scripted to protect against pests that are actually present as well as those most likely to be encountered with consideration of the frequency and location of their presence and the associated risks associated with each kind. Whereas diverse online resources exist for pest identification, visual comparisons



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with online images are often inadequate to ensure accurate identification. Similarly, relatively few pest management companies employ personnel capable of delivering timely and expert evaluations of pests. This becomes particularly problematic when the pests detected within museums are of exotic origin. The design and conduct of reactive interventions depends upon the precise identification of the offending pest, and the cost and success of the effort is correlated to the speed with which a rational response can be mounted.

Document pest issues and responses

A logging system should be established to: document and record the timing and location of inspections as well as pest sightings and pest-associated damage; inform facility personnel and vendors of specific problems; and to track the timeliness, manner and success of interventions / responses. The system should also document each use of pesticide as well as the credentials of personnel applying such products.

Ideally, the documentation system will rely upon modern, field-deployable electronic communication devices to speed incident reporting, minimize paper records, allow for imaging of pests and pest-related damage, and permit remote searching and tracking of incidents and responses.

Such a documentation system will allow for entry and searching specific for the facility, room number, cabinet/shelf location, pest type and kind of damage detected. It should ideally date / time stamp and detail inspection visits at each location, describe findings from surveillance devices, and include details from routine service logs (with identification of kind and amount of pesticides applied).

Educate personnel to reduce pest intrusion and to recognize pest related problems

Museum and library personnel, including those involved in curatorial, administrative, maintenance (including contractors and cleaners), food distribution / catering, security and public education services should be informed how their actions may contribute to pest problems, and define their responsibilities and value to a successful IPM program. For instance, each staff member – as well as contractor - may meaningfully take steps to help exclude pests, reduce their spread within the facility, and detect and immediately report any signs of pests or pest-associated damage. An on-site IPM coordinator may then decide whether the incident can be handled by facility personnel, await routine scheduled visits by pest management vendors, or should be escalated for rapid inspection and response. All museum and library personnel should periodically be reminded of their critical role as the eyes and ears for early pest detection and for ensuring they refrain from contributing to pest problems (for instance, by not having unsecured food in offices).



Certain museums and libraries contain exhibits of living specimens for decorative or educational purposes. An IPM monitoring plan will specify that pest control personnel shall inspect and approve plants intended as decorations (whether in public areas or private offices) before the plants and their supporting medium (soil, pots, etc.) enter the museum. Such plants and planters are to be examined periodically by pest control personnel, and pest surveillance devices shall be deployed and examined at defined intervals. Decorative animal displays (e.g. fish tanks) shall similarly be examined to ensure that spilled food or moisture conditions do not contribute to pest problems. Living animals and plants maintained for educational / display / research purposes shall comply with appropriate regulatory requirements. Animal and plant rearing rooms as well as support facilities (food storage, cage cleaning, etc.) areas shall require additional specific levels of pest exclusion and monitoring.

Evaluate and enhance sanitation, exclusion and containment controls

Proper sanitation is a key IPM element in reducing the attraction and persistence of certain pests in any facility. Hence, the frequency and extent to which food and wastes are secured and removed can have profound effects on the kinds and abundance of diverse pests. Improperly stored food and the presence of food residues are major attractants of insects and rodents. Sanitation issues include all interior areas (classrooms, offices, display areas, receiving departments, food service and catering areas, restrooms, corridors, decorative plantings, etc.) as well as on the exterior (loading dock, dumpsters, etc.) and within the infrastructure of the building (drains, conduits, ventilation and elevator shafts, etc.). An IPM monitoring plan includes an inventory of opportunities for pest entry and the means to exclude the pests. These steps better ensure that the facility is secure and as ‘pest-proof’ as is practicable.

The IPM monitoring plan shall define periodic (e.g. annual) inspections by building managers to detect settlement cracks, penetrations, faulty gaskets, missing and damaged screens, gaps around doors, as well as other potential points of pest entry. Plumbing fixtures and seals around pipes and conduits are to be inspected periodically and documented by operations workers to better ensure that pests are denied sources of water and entry points. Appropriate repairs are to be initiated promptly. Bird and rodent nests and harborages and wasp nests on the exterior of the structure are to be removed, and the sites modified when practical to reduce their recurrence. Tree branches, bushes and climbing vines shall be assessed at least quarterly, and kept clear of building walls. Exterior doors, particularly those associated with loading docks, shall be kept closed when not in use. Refuse must be secured (e.g. bagged and within closed dumpsters) and removed from the loading dock area frequently to avoid attracting pests.

Specific environmental management controls should be considered to reduce that likelihood that museum / library pests will thrive. For instance, an acceptable humidity



level may be achieved by use of HVAC systems that will reduce pest survival while not posing damage collections of the museum or library. Special environmental (cooling / heating / fumigation / anoxic) chambers may be appropriate for routine proactive disinsection procedures as well as for reactive treatments when pests or damage are detected.

Set action thresholds

An IPM action threshold shall define the point at which a pest reaches an unacceptable level of abundance, and when corrective actions are justified. Action thresholds and the kind and extent of intervention will vary greatly, and depend – amongst many considerations - upon the kind and abundance of the pest detected, the risks of that pest to the facility's holdings, and the location of that pest within the facility.

A single wood-boring beetle associated with an artifact in a secure area of an art museum may stimulate a rapid response to assess risk and trigger a measured intervention. That same beetle observed in the museum lobby, however, may simply be deserving of a slight increase in the frequency or extent of standard monitoring practices. Similarly, whereas a few cockroaches in a basement maintenance area may be prompt some additional baiting or other control measures, those same cockroaches within a food service area may trigger a rapid and extensive review of sanitation issues and the application of additional treatments, as warranted. The finding of a bed bug on a returned library book may stimulate increased inspections and occasional isolation and treatment of certain incoming items, but sightings of bed bugs on upholstered furniture in a library should elicit a more rapid intervention by pest control personnel and a reconsideration of the kinds of furnishings provided in the library. An occasional book louse is to be expected in any collection of natural history specimens and in every library. The presence of thriving population of these pests in such locations, however, should incite a rapid review and amendment of environmental conditions to suppress their abundance. Clover mites are ubiquitous outdoors during the warmer months, and they pose no risk to persons or to most facilities they may enter. But, because their crushed bodies will permanently blemish porous items, the presence of these mites in libraries and museums should motivate efforts to reseal window and door frames, check the integrity of the building envelope and to pursue other means to exclude entry by the mites. An aggressive program of monitoring is critical to detect pests before they pose significant damage, and to inform intervention plans meant to abate and prevent such losses.

Specimens and packing materials arriving from other institutions, as well as unprepared or freshly prepared specimens from any source, are potential means to introduce pests. The curatorial staff of each division shall determine whether incoming samples should be



presumptive treated by freezing, heating, cleaning, anoxia / fumigation or other means before specimens are brought into collections areas.

Specific monitoring measures:

Display cases and specimens and artifacts, whether displayed or stored, shall be inspected at defined intervals (at least annually, and more often as appropriate). Whereas curatorial / library personnel will routinely inspect the more sensitive areas and items, inspections of other areas may instead be contracted to vendors. Passive monitoring traps (baited or non-baited) may be included in these exhibits and throughout the facility. They should be inspected at about monthly intervals. Traps within display and storage cases are usually best inspected by curatorial personnel, whereas those elsewhere in the facility may be examined by defined maintenance staff or by the pest control vendor. Smaller pests caught on traps or by other means will require examination with the aid of a microscope or other suitable magnification device, and assessment by personnel skilled in identifying those diminutive creatures. The IPM monitoring plan may include the installation of pest attractive light or pheromone traps in strategic areas. The pest control vendor shall inspect and service these at defined relevant intervals, and record and report any findings. Because certain pests become disoriented by artificial and natural light sources, monitoring personnel should schedule inspections of specimens accumulating in the diffusers of ceiling or wall-mounted light fixtures and on the interior shelf of window ledges.

Food preparation rooms, gift shops, storage closets and other specialized areas shall be scheduled for routine inspection and passive monitoring, as appropriate.

Environmental Health & Safety resources: The Environmental Public Health program of EH&S can assist with guidance, planning of IPM efforts and facilitating their execution. Depending upon the extent of effort, a cost-recovery process may be proposed. A stepwise approach is suggested to design a rational and effective plan suitable for each facility.

Define goals and expectations: Effort required for the needs analysis portion for any specific museum or library IPM monitoring program depends upon the size of the facility, the age and general construction of the building, the history and extent of pest incidents, the profile of uses (storage, display, food preparation, office, etc.) within, the kinds and manner of storage for specimens / artifacts / accessions, the specific risks associated with the collections, the availability and utility of blueprints, and the availability of key curatorial, library and facility personnel. In general, the needs analysis portion may be performed within one day. Larger or more complex facilities may require correspondingly greater efforts.



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Inspect / monitor for general and collection-specific pest issues: Effort necessary to complete an initial inspection of the museum or library building, including exhibition halls, offices, storage / curatorial areas, maintenance rooms, food service areas will depend upon the size and complexity of the facility. In general, the initial inspection is expected to require about a day of effort. A detailed monitoring program can then be

devised to include a description of the kinds and locations of passive traps recommended for monitoring the facility, and the recommended sampling intervals for each.

Identify pests and evaluate pest damage: Specimens of presumed pests may be evaluated by curatorial / conservator personnel, by pest control vendors, or by the EH&S environmental public health officer.

Document pest issues and responses: Pest control vendors may provide their own software solutions to document, image and track incidents, or resources may be developed by the facility personnel or by outside vendors. EH&S can assist by reviewing such systems that may be considered by museum and library personnel. Any significant pest problem or planned use of pesticides on Harvard property is to be reported to the EH&S Environmental Public Health officers by museum and library personnel.

Educate personnel to reduce pest intrusion and to recognize pest related problems: Specific training sessions for museum personnel may be scheduled to present and review IPM monitoring and response procedures. EH&S can provide this service on a negotiated basis.

Evaluate and enhance sanitation and exclusion controls: Review of sanitation / exclusion controls may be provided by a pest control vendor or they may be negotiated with the EH&S program.

Set action thresholds: EH&S has expertise and resources to work with museum personnel to evaluate risks for diverse pests and pest management efforts, and to set action thresholds and management procedures appropriate for their institution and collections.