

Collection Storage Pest Monitoring: A Starting Plan

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Professional guidance, not regulation. This plan condenses the pest monitoring guidance published by the National Park Service (NPS), the Northeast Document Conservation Center (NEDCC), and the MuseumPests Working Group (MPWG, museumpests.net). None of these documents is a regulation. Every number carries a source tag in brackets; full addresses are in Section 11. Where the sources disagree, the plan names each one. Talk to a conservator before treating any object.

1 What monitoring is for

- Monitoring shows the base level of pests, finds active infestations, and helps set the level of activity each collection, zone, and building can accept. Data tied to locations also support requests for exclusion work such as door sweeps [MPWG Monitoring].
- Over time, trap data show an infestation as it starts, seasonal trends, and weak points in the building envelope. Traps “do nothing to prevent or control an infestation.” Sticky traps are for insects; mice and rats are caught with snap traps [COG 3/7].

2 Trap placement

Plan the layout

- Draw a floor plan with doors, windows, water and heat sources, drains, HVAC vents, cabinets, and what each enclosure holds [NPS MH 5:20]. Use the same trap spots every month [COG 3/7].
- Give each spot a unique ID, such as room name plus a decimal number (S.1, S.2) [COG 3/7]. When a trap moves, retire its ID [MPWG Monitoring]. Write the date and ID on each trap, facing out [COG 3/7].

Where traps go

- At wall/floor junctions, flush against the wall, at intervals of **5–10 m (16–33 ft)** depending on room size [COG 3/7]. Pests tend to travel along walls [NPS MH 5:20].
- In corners; near doors, vents, fireplaces, and other entry points; on windowsills; in dark, undisturbed spots [COG 3/7]. Near water, drains, damp places, and heat sources; under furniture; inside and outside cabinets [NPS MH 5:20].
- One trap on either side of each entry door**, plus traps in high-risk zones (feathers, wool, taxidermy) and by sinks [MPWG How to Monitor]. Windowsill traps detect adult dermestids, which seek daylight [NPS MH 5:17].
- Inside cabinets, set traps so the sticky surface can never touch an object [COG 3/7]. Tent traps are recommended for general use [NPS MH 5:18], not tray-type glue-boards [NEDCC 3.10].

How many

No square-footage formula exists [MPWG How to Monitor]. Start with the number of traps staff can check reliably, then add [COG 3/7]. A simple room with one door can start with **2 traps** [MPWG How to Monitor].

Pheromone and light traps

- Not for routine monitoring [COG 3/7; NPS MH 5:19]. Use only when a target pest is suspected, in well-sealed rooms [NPS MH 5:19]. Keep lures at least **15 ft (5 m)** from any door that opens to the outside or is opened regularly, and never in contact with objects, containers, or mounts [NPS MH 5:19; MPWG Pheromone].
- No light traps in rooms with windows or gaps under doors, outdoors, or where UV falls on light-sensitive objects [NPS MH 5:19].

Rodent snap traps

- About **8 traps per room**, more in larger rooms, with **2 on each side** of entry points. Every **6–10 linear feet** along walls, two traps parallel to the wall or one with its trigger end against it [NPS MH 5:30]. MPWG prefers quiet corners (Section 10).
- Keep traps out **year-round**, baited with cotton or yarn [NPS MH 5:31]. Mice fit through **1/4-inch** openings, rats through **1/2-inch** [COG 3/12].

3 Check and replace schedule

Task	Interval
Check sticky traps at start-up or after a treatment	Weekly [COG 3/7]; for the first 3–6 months [NPS MH 5:20]
Check sticky traps, routine	Monthly [COG 3/7; NEDCC 3.10]. MPWG: monthly, every 2 months, or quarterly [MPWG How to Monitor]; quarterly is “a minimal goal” [MPWG Monitoring]
Check sticky traps during an infestation	Every 1–2 weeks [NPS MH 5:53]; daily [MPWG How to Monitor]
Replace sticky traps	At least monthly , or sooner if dirty or no longer tacky [NPS MH 5:21]. Clean traps with no catches may be reused [COG 3/7]
Inspect rodent snap traps	Daily [NPS MH 5:18]

Task	Interval
Replace pheromone lures	On the lure's active life, or when the trap is saturated [MPWG Pheromone]
Inspect outside-access doorways, hallways, and windowsills	Monthly [NPS MH 5:51]
Inspect pest-sensitive objects	Every 3 months , especially spring and fall [NPS MH 5:21]
Spot-check objects; inspect the structure	Every 6 months (structure: at least) [NPS MH 5:21]

Dead pests on traps feed other pests [NPS MH 5:21]. Dermestid larvae eat trapped insects and can escape traps [NPS MH 5:70].

4 What to record

- Trap number, location, date, species, number of each species, life stage, trap replacement date, unusual conditions, climate control, and weather [NPS MH 5:20]. The side the insect entered from, if relevant [COG 3/7].
- Identify to genus and species where possible. Photograph what you cannot identify. Keep a reference collection of dead pests [NPS MH 5:53–54].
- Mark catches on the floor plan down to the case or shelving unit [NPS MH 5:15]. Compare catches with RH and temperature logs and outside weather [NPS MH 5:54].
- A year of data helps separate a real increase from seasonal change [MPWG Monitoring]. Record every pest incident and treatment in the object's file [MPWG Low Temp]. Keep all monitoring records permanently [NPS MH 5:53].

Date	Room	Trap ID	Species (genus, species)	Life stage	Count	Entry side	Trap replaced?	RH / temp	Notes / photo no.	Initials
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5 Action thresholds

NPS: "The action threshold for any area housing collections is the sighting of **ONE** larva or adult pest or any traces of the insect or organism." [NPS MH 5:26]

- A perimeter invader, which does not eat collections, still meets the threshold where collections are housed. In a non-collections zone such as an entry hall, find the source and increase inspection; objects need not be isolated [NPS MH 5:25–26].
- Rodents: **one rodent**, or droppings, fresh gnawing, or grease marks [NPS MH 5:40]. Treat any mouse or rat sign as if hantavirus is present; do not vacuum [NPS MH 5:31]. Mold: any evidence, active or inactive [NPS MH 5:84].
- MPWG treats acceptable activity as specific to each collection, zone, building, and institution [MPWG Monitoring]. Set thresholds before monitoring starts and write them into the IPM plan. Expect more catches in historic buildings [NPS MH 5:26].
- Larvae point to an active local infestation; adults may be new arrivals. A cluster of catches, or catches from one side of a trap, points to the source [COG 3/7]. Outdoor insects mean a door or window is letting them in [NEDCC 3.10].
- Live insects, fresh frass, and damage mean an active infestation. If signs look old, clean the item, seal it in clear polyethylene, and watch it **2–3 weeks** [MPWG Active]. After treatment, add traps [NPS MH 5:5] and monitor for several months before calling the site clear [COG 3/7].

6 Pests to know in a collection

Common name	Scientific name	What it damages	Source
Webbing and casemaking clothes moths	<i>Tineola bisselliella</i> ; <i>Tinea pellionella</i>	Mainly soiled woolens; also silk, felt, fur, feathers, and hair. Only larvae cause damage; adults lack functional chewing mouthparts.	NPS MH 5:35; MPWG FS Clothes Moth
Black carpet beetle	<i>Attagenus unicolor</i>	Wool, silk, fur, felt, feathers, leather, insect specimens, casein and hide glues, books, bird and mammal specimens.	NPS MH 5:33
Varied carpet beetle	<i>Anthrenus verbasci</i>	Woolens, carpets, wall hangings, hides, horns, and bone objects; common in insect collections. Larvae do the damage.	NPS MH 5:33–34; COG 3/11
Silverfish; firebrat	<i>Lepisma saccharina</i> ; <i>Thermobia domestica</i>	Fabrics, paper and sizing, glue and paste in bindings. Silverfish signal moisture problems. NEDCC disagrees on firebrats.	NPS MH 5:38, 5:78
Cigarette beetle	<i>Lasioderma serricorne</i>	Flax, spices, seeds, dried plants, books, crude drugs; dried herbarium specimens.	NPS MH 5:37
Drugstore beetle	<i>Stegobium paniceum</i>	Foods and spices; books and manuscripts.	NPS MH 5:37
Booklice (psocids)	Psocodea, e.g. <i>Liposcelis</i> spp.	Mold on paper and starchy binding glue. Minimal damage; they signal moisture and likely mold.	NPS MH 5:39
House mouse; rats	<i>Mus musculus</i> ; <i>Rattus</i> spp.	Gnawed objects; droppings, urine stains, nests. Carcasses and nests host clothes moths and dermestids.	NPS MH 5:25; COG 3/12

7 Incoming material quarantine

- Inspect, isolate, and monitor all incoming objects, including new accessions and new and returning loans, before they enter storage or exhibit areas [NPS MH 5:23]. Include non-collection items such as office supplies and gift shop stock [MPWG Quarantine].
- Use an isolation room next to shipping and receiving, outside the collections area, well sealed and well lit; if there is none, a well-sealed cabinet outside the collections area [NPS MH 5:23–24].
- Set each object on a white surface and seal it in polyethylene. Put objects with mold in lidded cardboard boxes instead. Bagging is not a treatment, and some insects chew through plastic [NPS MH 5:24].
- Isolate for at least **one month**. Metal, glass, ceramic, and stone need inspection and cleaning, not isolation [NPS MH 5:24]. Woodboring beetles: at least **12 weeks** at room temperature; **one year** is preferable [NPS MH 5:25].
- Discard packing that cannot be verified pest-free, such as cardboard, in an exterior container [NPS MH 5:24]. Move material into clean archival boxes, with a tent trap on an inside wall [NEDCC 3.10].
- Hold objects from cold storage at or above room temperature for **1 week or more** before freezing [MPWG Low Temp]. Routine fumigation of incoming material is “unwarranted and dangerous” [NEDCC 3.10].

8 Non-chemical treatment options

Conservator first. NPS: choose a treatment for an infested object “in consultation with a conservator and the regional curator” [NPS MH 5:25]. Freezing “should not be used on a routine or preventive basis” [COG 3/6].

Freezing

Freezer temperature	Minimum time at temperature	Conditions [NPS MH 5:6]
–20 °C (–4 °F)	1 week	Object bagged and sealed, then placed in a freezer already at target temperature. Its center must reach temperature in under 6 hours ; add that time to the total.
–30 °C (–22 °F)	72 hours	
–40 °C (–40 °F)	48 hours	

- Wrap in acid-free tissue and seal in polyethylene. Afterward, leave it sealed at least **24 hours**, until it reaches room temperature [NPS MH 5:7]. Before freezing, hold RH within **35–65%** [COG 3/6].
- Do not freeze wax, inlaid wood, or canvas paintings [NPS MH 5:7]; wood-panel paintings; painted or lacquered wood; finished furniture; ivory or teeth; drums and other objects under tension; composites containing glass, high-fired ceramics, or metal [COG 3/6]; plant specimens not fully dried; photographic materials other than acetate film and modern prints [MPWG Low Temp].
- Freezing does not kill mold [NPS MH 5:85] and gives no lasting protection [NEDCC 3.10]. Do not freeze objects with rodent signs; isolate them at room temperature at least **3 weeks**, with **6 weeks** strongly suggested [NPS MH 5:31].
- Sources disagree** on time near –20 °C: **two 48-hour cycles** [COG 3/6], **1 week** [NPS MH 5:6], **14 days** [MPWG Low Temp], or **2 weeks at –18 °C** [COG 3/8]. At –29 °C (–20 °F): **72 hours** [MPWG Low Temp; NEDCC 3.10].
- Carbon dioxide at about **60%** [COG 3/8] may require a special permit or operator's license under local rules [MPWG CO2]. Most libraries and archives need professional help for gas treatments [NEDCC 3.10].

Anoxia (low oxygen)

- Oxygen: below **0.1%** [COG 3/8]; no more than **0.5%** [COG 3/9]; below **0.5%** [MPWG O2 Scavenger]. Above **1%** is not effective [COG 3/9].
- Time: **2 weeks** at room temperature, though cigarette beetle may need **10–12 days** [COG 3/9]; **21 days** [MPWG O2 Scavenger]; **3 weeks at 25 °C**, or **4–5 weeks at 20 °C or below** for some species such as woodborers [COG 3/8].
- Use oxygen-barrier film; ordinary polyethylene lets oxygen through. Nitrogen is below **5% RH**, so humidify it [COG 3/8]. Heat seals must be wider than **3/8 in. (1 cm)**. Fungi are not killed [COG 3/9]. Not for Prussian blue dyes or pigments [MPWG O2 Scavenger].

Heat (only as the sources describe it)

- A short exposure at **55 °C (130 °F)** kills all life stages [MPWG Heat]. NEDCC gives **130 °F for 3 hours** but, in most instances, does not recommend heat for cultural heritage materials [NEDCC 3.10].
- COG 3/8: only with guidance from a conservator experienced in heat treatment [COG 3/8]. NPS: not widely used for museum collections because it can damage objects [NPS MH 5:8]. Never microwave collection material [COG 3/8; NEDCC 3.10; MPWG Heat].

9 Environment: humidity, housekeeping, envelope

- Keep RH below **65%** [NPS MH 5:27; COG 3/4]. Mold spores are less likely to germinate at **45–55%**. Target **18–20 °C (64–68 °F)** [COG 3/4]. Most psocid species do not survive below **50% RH** and increase at **65%** and above [MPWG FS Book Lice].
- Vacuum with a HEPA filter at least **monthly**, not a broom [NPS MH 5:28–29]. Clean collection storage thoroughly at least every **6 months** [NEDCC 3.10]. Remove trash **daily** [NPS MH 5:28].
- No food, drink, smoking, or live or dried decorative plants in collection areas [NPS MH 5:27]. Cut flowers can

- bring in varied carpet beetles [MPWG FS Carpet Beetle].
- Raise cabinets **4–6 in.** off the floor [NPS MH 5:27]. Store collections at least **4 in.** up, not directly against outside walls [COG 3/4]. White surfaces make frass visible [NPS MH 5:18]. Check wall voids and suspended ceilings for lint and carcasses [NPS MH 5:29].
- Seal exterior holes **1/4 in.** or larger [NPS MH 5:27] with material mice cannot chew, such as copper gauze or

- steel wool [MPWG FS Mouse]. Fit **20-mesh** screens on windows, vents, hot air registers, and floor drains, and sweeps and gaskets on doors [NPS MH 5:28].
- Vegetation-free strip: **18–30 in.** [NPS MH 5:28] or about **12 in.** [NEDCC 3.10]. No rodent bait indoors [NEDCC 3.10; MPWG Rodent Traps]. Snap trapping plus exclusion is the most effective rodent strategy [NPS MH 5:30].

10 Where the sources disagree

Topic	One position	Other position
Routine trap checks	Weekly at first, then monthly [COG 3/7; NEDCC 3.10]	Weekly [NPS MH 5:18]; monthly [NPS MH 5:53]; quarterly minimum [MPWG Monitoring]
Trap replacement	At least monthly [NPS MH 5:21]	“every few months” [NPS MH 5:53]; reuse clean, empty traps [COG 3/7]
Routine pheromones	No [COG 3/7; NPS MH 5:19; MPWG Pheromone]	Species lures for webbing clothes moth [MPWG FS Clothes Moth]
Freezing	Two cycles; frost-free only in an emergency [COG 3/6]; self-defrosting “should never be used” [COG 3/8]	One cycle suffices [COG 3/8; NEDCC 3.10; MPWG Low Temp]; frost-free “is acceptable” [MPWG Low Temp]
Anoxia	Below 0.1% oxygen; indicator shows below 0.1% [COG 3/8]	0.5% [COG 3/9; MPWG O2 Scavenger]; indicator changes below 0.5% [COG 3/9] or “may produce variable or inaccurate results” [MPWG O2 Scavenger]
Heat on collections	55 °C is sufficient [MPWG Heat]	Not recommended [NEDCC 3.10]; conservator only [COG 3/8]
RH ceiling	Below 65% [NPS MH 5:27; COG 3/4]	Below a maximum of 70% [NEDCC 3.10]; below 50% for psocids [MPWG FS Book Lice]
Carpet beetles on leather, silk	Both eaten [NPS MH 5:33; COG 3/11]	“Leather is generally not attacked and silk is not a food source” [NEDCC 3.10]
Firebrats, booklice	Firebrats eat fabric, paper, bindings; psocids cause minimal damage [NPS MH 5:38–39]	Firebrat “is not a pest of collections”; booklice “do not damage collections” [NEDCC 3.10]
Rodent glue boards	Do not use [NPS MH 5:30]	Can be used [NEDCC 3.10]; occasionally necessary [MPWG Rodent Traps]
Rodent trap spots	Every 6–10 ft along walls [NPS MH 5:30]	Quiet corners, not mid-run or along walls [MPWG Rodent Traps]
Clothes moth chemicals	Not appropriate [NPS MH 5:72]	Insecticide in cracks the vacuum cannot reach may be needed [MPWG FS Clothes Moth]
Isolation period	At least one month [NPS MH 5:24]	2–3 weeks to test activity [MPWG Active]; often several months [MPWG Low Temp]

11 Sources

Read from the publishers’ servers on September 26, 2026. MPWG fact sheets (FS) are legacy PDFs, since replaced by a new format.

- COG 3/7** NPS Conserve O Gram 3/7, Monitoring Insect Pests with Sticky Traps (updated Jan. 28, 2026). <https://www.nps.gov/articles/000/conserve-o-gram-3-7-monitoring-insect-pests-with-sticky-traps.htm>
- COG 3/6** NPS COG 3/6, The Freezing Process (1994). https://www.nps.gov/subjects/museums/upload/03-06_508.pdf
- COG 3/8** NPS COG 3/8, Alternatives to Pesticides (1998). https://www.nps.gov/subjects/museums/upload/03-08_508.pdf
- COG 3/9** NPS COG 3/9, Anoxic Microenvironments (1999). https://www.nps.gov/subjects/museums/upload/03-09_508.pdf
- COG 3/11** NPS COG 3/11, Identifying Museum Insect Pest Damage (2008). https://www.nps.gov/subjects/museums/upload/03-11_508.pdf
- COG 3/12** NPS COG 3/12, Identifying Mouse and Rat Damage (updated Jan. 23, 2026). <https://www.nps.gov/articles/000/conserve-o-gram-3-12-identifying-mouse-and-rat-damage-in-museum-collections.htm>
- COG 3/4** NPS COG 3/4, Mold: Prevention of Growth (2007). https://www.nps.gov/subjects/museums/upload/03-04_508.pdf
- NPS MH 5:page** NPS Museum Handbook, Part I, Ch. 5, Biological Infestations (2014). https://www.nps.gov/subjects/museums/upload/MHI_Ch5_BiologicalInfestations.pdf
- NEDCC 3.10** NEDCC Preservation Leaflet 3.10, Integrated Pest Management (2007; resources updated 2024). <https://www.nedcc.org/free-resources/preservation-leaflets/3.-emergency-management/3.10-integrated-pest-management>
- MPWG Monitoring** Monitoring. <https://museumpests.net/monitoring-introduction/>
- MPWG How to Monitor** How to Monitor. <https://museumpests.net/monitoring-trapping/>
- MPWG Pheromone** Pheromone Tips. <https://museumpests.net/monitoring-trapping/monitoring-pheromone-tips/>
- MPWG Rodent Traps** Rodent Trap Selection. <https://museumpests.net/monitoring-trapping/monitoring-rodent-trap-selection/>
- MPWG Active** Determining if an Infestation Is Active. <https://museumpests.net/solutions/solutions-determining-if-an-infestation-is-active/>
- MPWG Low Temp** Low Temperature Treatment (updated Apr. 2025). <https://museumpests.net/solutions-low-temperature-treatment/>
- MPWG Heat** Heat Treatment (updated 2018). <https://museumpests.net/solutions-heat-treatment-2/>
- MPWG O2 Scavenger** Oxygen Scavenger Treatment (updated July 2020). <https://museumpests.net/solutions-oxygen-scavenger-treatment/>
- MPWG CO2** Carbon Dioxide Treatment (updated 2017). <https://museumpests.net/solutions-controlled-atmospherecarbon-dioxide-treatment/>
- MPWG Quarantine** Examination & Quarantine (updated 2025). <https://museumpests.net/prevention-introduction/prevention-examination-and-quarantine/>
- MPWG FS Clothes Moth** (Oct. 2019). <https://museumpests.net/wp-content/uploads/2019/10/Webbing-Clothes-Moth-10-21-19.pdf>
- MPWG FS Carpet Beetle** (Mar. 2012). <https://museumpests.net/wp-content/uploads/2019/03/Variied-Carpet-Beetle.pdf>
- MPWG FS Book Lice** (Aug. 2018). <https://museumpests.net/wp-content/uploads/2018/08/book-lice.pdf>
- MPWG FS Mouse** (Mar. 2019). <https://museumpests.net/wp-content/uploads/2019/03/House-Mouse.pdf>