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DOCUMENTARY HERITAGE & PRESERVATION SERVICES FOR NEW YORK

Introduction to Integrated Pest Management

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Documentary Heritage and Preservation Services for New York is a five year initiative to deliver collections-related training, preservation surveys, archival assessments, and other services to the historical records community in New York.

New York State Archives

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Website: dhpsny.org

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E.A. SEGUY.

What is Integrated Pest Management (IPM)?

- A multi-strategy, environmentally sensitive, and economical approach to pest control - primarily through non-chemical means.
- Prevention and management of pests by monitoring activity, controlling the climate, eliminating food and water sources, blocking building entry points, and establishing good housekeeping practices.

Why use IPM in libraries and archives?

- Less harmful than pesticides for human beings and the environment
- Minimizes the necessity of pesticides
- Cost-effective and sustainable
- Safer for objects in the collection

Basic IPM Strategies

Avoid/Block

Detect/Assess

Identify

Respond

Identification

DIY Pest ID Kit

- USB microscope, magnifying glass, or loupe
- Pest atlas, online resource, or pest identification book with photographs
- Sticky traps or insect food pheremones
- Light source (i.e. LED flashlight)
- Tweezers
- Small zip-lock baggies or plastic/glass vial with lid
- Small brush
- Pencil
- Pest log book
- Camera

Know Your Pests!

Vertebrates

- Rodents: rats, mice, squirrels
- Birds: sparrows, pigeons, starlings
- Larger vertebrates: rabbits, feral cats, bats, raccoons, possums, snakes

Signs of Pest Activity (Vertebrates)

Rodents

- Droppings
- Gnaw marks
- Nests made from shredded paper and cloth
- Paw prints
- Noises and unusual odors

Birds

- Nests
- Feathers
- Urine and excrement

Signs of Pest Activity (Insects)

- Borers
- Shredders
- Grazers

Borers

- Damage hardwoods and softwoods, animal-glued plywood, furniture, wicker, wood-pulp paper, books.
- Leave behind exit holes, tunnels, and frass (excrement or refuse left by insect larvae)

Borers

Common furniture beetle

Woodworm (furniture beetle larvae)

Powderpost beetle

Shredders

- Consume keratin - the protein in hair, wool, parchment, feathers, skin, horn, nails, and hooves.
- Leave behind silken tubes, frass, and larval cast skins.

Shredders

Webbing clothes moth

Case-bearing clothes moth

White-shouldered house moth

Shredders

Varied carpet beetle

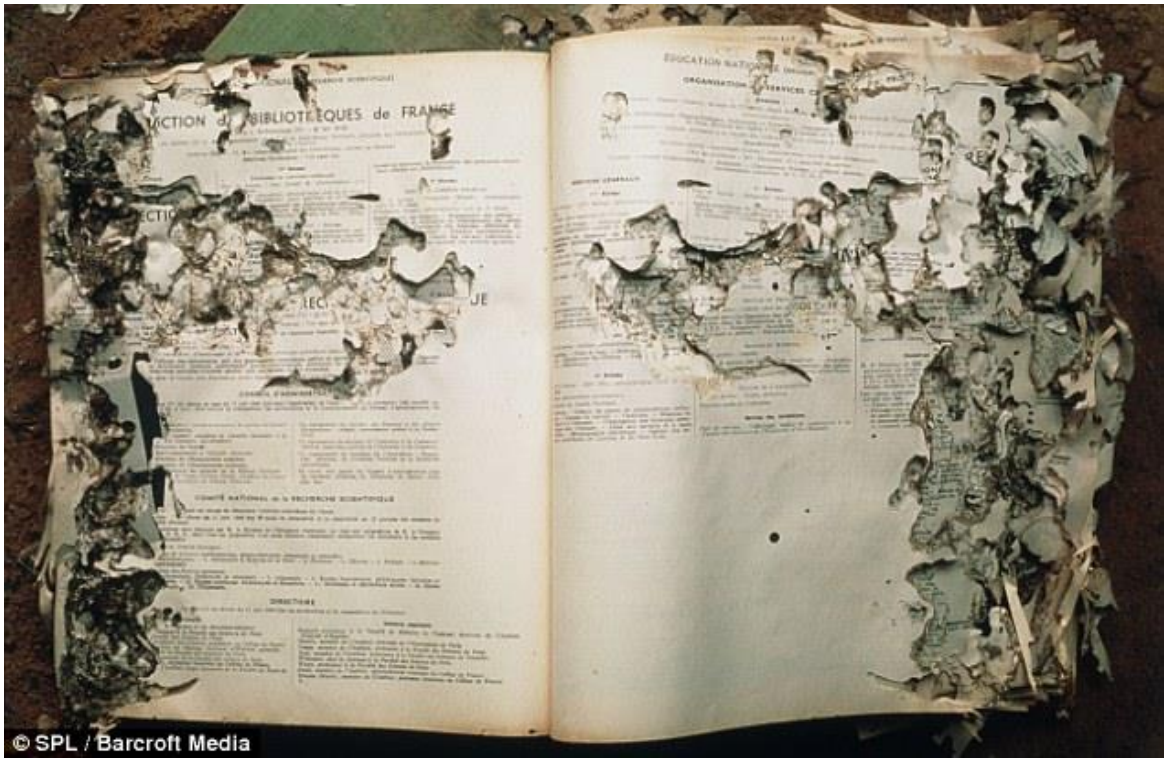
Black carpet beetle

Vodka beetle

Drugstore beetle

Grazers

- Primarily feed on starch and protein, thrive in damp conditions.
- Damage objects by scratching and eroding them.



Grazers

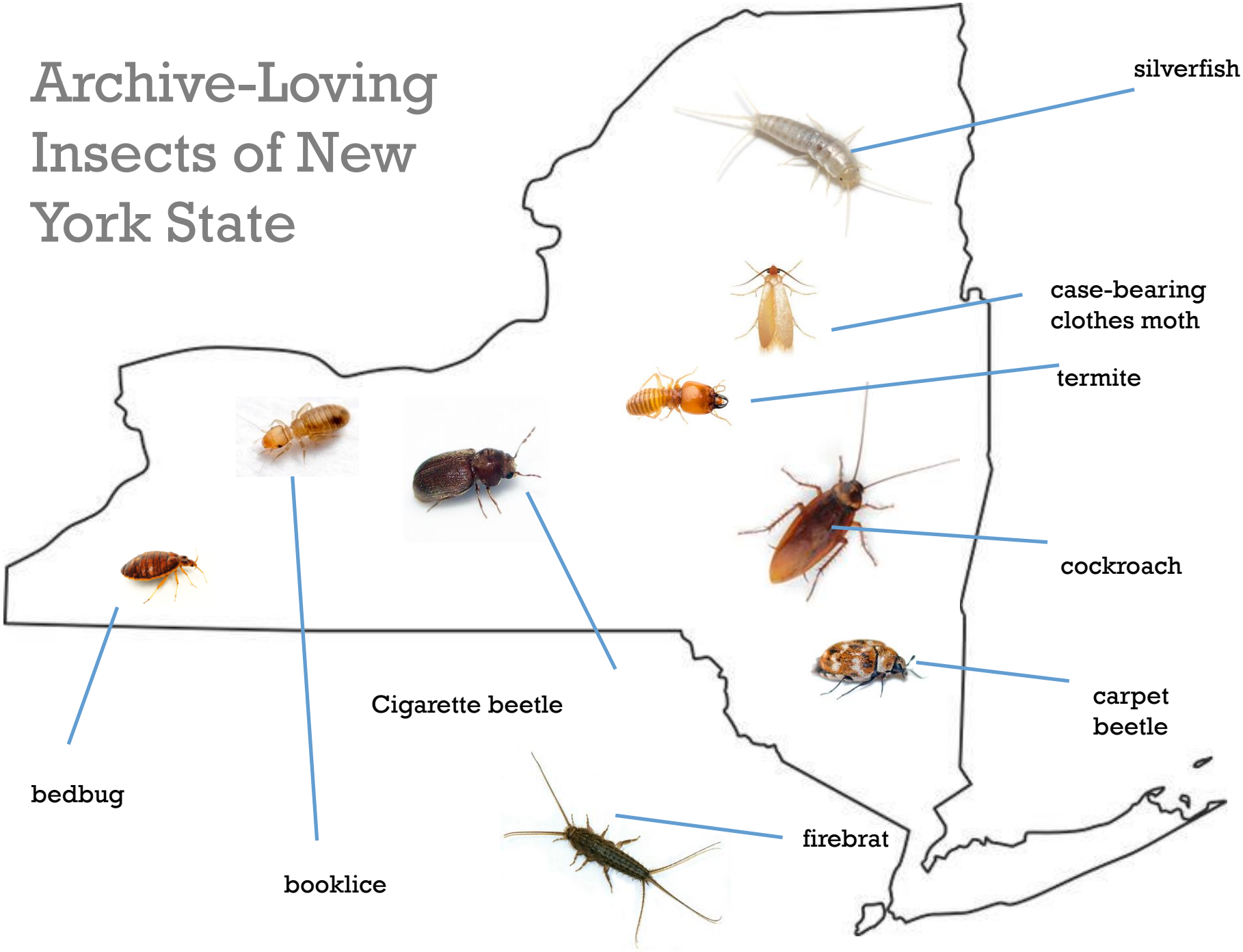
Book louse

Silverfish

Cigarette beetles

Cockroaches

Archive-Loving Insects of New York State



Meet the Book Scorpion!

Assessing Risk

Evaluating a site for risk:

- Which parts of the collection are most at risk?
- Which part of the building(s) is most at risk?
- Are there any activities, such as serving food during events, which might present a good opportunity for pests?
- Are there signs of insects or other pests?
- Where are they?
- Are they breeding?
- Is there any visible damage?
- If there are insects, are they still alive?
- What species are they?
- How many are there?
- How many objects appear to be affected?

Materials at risk for insect attack

- Fur
- Dried herbarium specimens
- Feathers
- Animal skins
- Hair
- Damp organic material
- Parchment and vellum
- Starch-based adhesives
- Silk
- Dried food
- Hair
- Insect and natural history specimens
- Paper which is dirty or damp
- Wood

Avoid/Block

What attracts pests?

- **Food**:
  - paper, wood, leather, wool, human food
- **Warmth**:
  - 68˚F and above
- **Humidity**:
  - high humidity and dampness
- **Hiding spots**:
  - ventilation ducts, cracks between floorboards, unused rooms, flowers and plants, dead space underneath exhibition furniture and storage cabinets, gaps between walls and floors, chimneys.

Preventive Methods to Avoid and Block Insect Pests

- **Housekeeping**
  - Cleanliness eliminates food sources and nests
- **Maintenance**
  - Repairing holes, cracks, and sealing gaps
- **Quarantine**
  - Potentially infested objects are segregated from collection materials
- **Regular and thorough inspection**
  - Continuous monitoring for early signs of a pest infestation

Monitoring Pests

Sticky traps

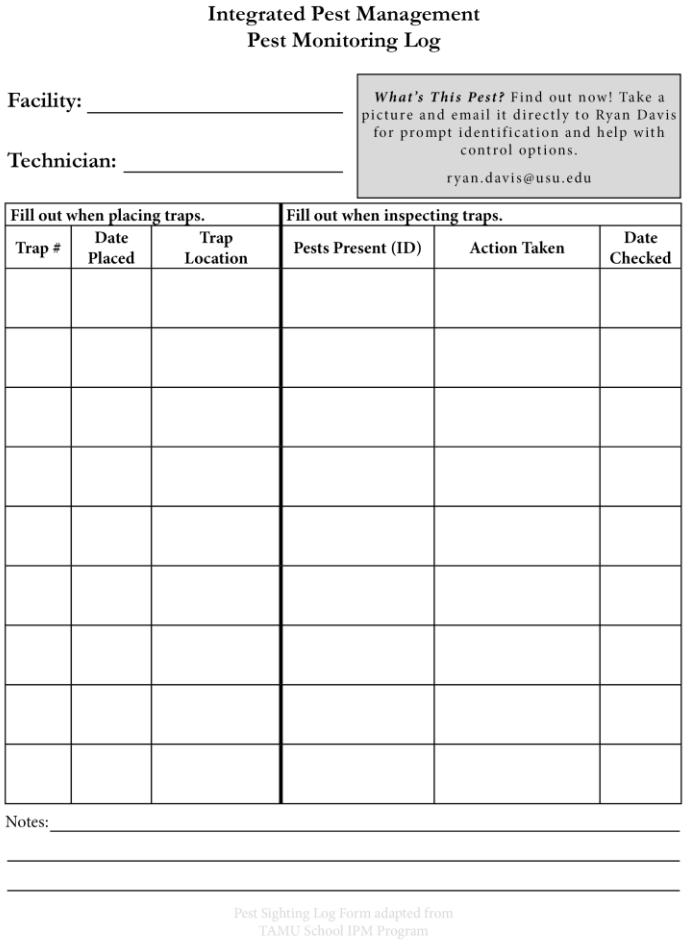
Photo: Museum of the Order of St. John

Photo: National Gallery of Ireland

Pheromone Traps

Using Traps Effectively

- Traps should be placed in a regular grid pattern with positions marked on a building map
- Insects caught in each trap should be recorded and identified with the information in a Pest Log
- Choose the right trap for the type of pest and environment your collection is in!



Integrated Pest Management
Pest Monitoring Log

Facility: _____

Technician: _____

What's This Pest? Find out now! Take a picture and email it directly to Ryan Davis for prompt identification and help with control options.

ryan.davis@usu.edu

Fill out when placing traps.			Fill out when inspecting traps.		
Trap #	Date Placed	Trap Location	Pests Present (ID)	Action Taken	Date Checked

Notes: _____

Pest Sighting Log Form adapted from
TAMU School IPM Program

Pest log: Utah State University

What can you learn from traps?

- Identify and track pest and non-pest insects living in your institution
- Note an increase in insect population in a specific area
- Monitor spread of pests from one area to another
- Track an invasion of adult insects in summer
- Pinpoint localized infestation in a problem area
- Determine the success or failure of a control treatment

Response

Infestation Response Options

- Isolation
- Low temperature treatment
- High temperature treatment
- Modified atmospheres (anoxic, CO_2, Nitrogen/Argon gas treatment)
- Fumigation with toxic gasses (NOT recommended!)
- Pesticide treatment (also NOT recommended!)

(Image: Bob's Burgers)

Isolation/Bagging

An object suspected of infestation is placed on a white backdrop (i.e. blotter or another white, object-safe material) and sealed in a polyethylene bag. The sealed package is monitored for weeks or months.

Isolation

- Pros:
  - Quarantines an object suspected of infestation so that nearby objects are not infested.
  - Allows the object to be monitored for weeks or months so that pests can be identified and the life cycle stage determined.
  - Can be used for a variety of types of objects.
  - Appropriate for complex objects and objects entering or re-entering an institution.
- Cons:
  - Time-consuming, only appropriate for a small number of objects.

Low Temperature Treatment

- Freezing an infested object (or objects) in order to kill pests.
- Sometimes used as a preventive measure when items arrive from a place with a suspected infestation.
- Objects are first placed in a polyethylene bag or sealed with a polyethylene sheet, then placed in a freezer for >72 hours or longer. Ideally, a the freezer should reach -20˚F.
- Objects should be allowed to return to room temperature by remaining wrapped for 24 hours outside of the freezer. Some objects may need two cycles.
- Documentation should always be done when an object is frozen.

Low Temperature Treatment

- Pros:
  - Short treatment time.
- Cons:
  - Should not be used on oil or acrylic paintings on canvas, objects with layers of media, photographic materials, cased photographs, and glass archival materials.
  - Can increase the fragility of delicate objects, especially when they are returning to room temperature.

Heat Treatment

Exposes objects to heat in order to kill insects. Short exposures of 130˚F are sufficient to eradicate many pests.

Several types of proprietary heat treatment:

- Thermo Lignum
- Solar bagging – uses the sun

Heat Treatment

- Pros:
  - Very effective
  - Can be applied to both small and large scale infestations, from one object to an entire building
- Cons:
  - Not recommended for items which are sensitive to changes in RH
  - Not recommended for low melting-point waxes, some adhesives, flammable and explosive objects, and some plastics which melt or deform when exposed to heat

Modified Atmospheres

- Anoxia (low or no oxygen)
- Controlled Atmosphere Treatment/carbon dioxide (CO2) treatment
- Nitrogen/argon gas treatment

Photo: museumpests.net

Anoxic Treatment

- The infested object(s) are placed in a sealed enclosure with oxygen scavenger packets, and the air is removed.
- Oxygen levels are reduced to <0.5% for 21 days, producing an atmosphere which is almost entirely composed of nitrogen.
- Length of treatment may vary, but 21 days is sufficient to kill almost all insects at all stages of life.

Anoxic Treatment

- Pros:
  - Inexpensive
  - Works for a variety of materials
  - Effective
- Cons:
  - Time-consuming
  - Can be difficult to maintain RH equilibrium
  - Must be monitored
  - Unable to be used on objects with Prussian blue dyes or pigments

Controlled Atmosphere Treatment (CAT)

- In a sealed container, carbon dioxide (CO_2) is used to displace oxygen to levels low enough to kill insects at all stages of life.
- In a vacuum-sealed enclosure, air is evacuated and the enclosure is filled with CO_2; this is repeated until the atmosphere inside the enclosure is roughly 60%.
- After 3-4 weeks, the CO_2 is removed from the enclosure and the treatment is completed.

Controlled Atmosphere Treatment

- Pros:
  - Safe for most objects
  - Can be set up in-house
  - Very effective at killing insects from all stages of life
  - No "residual" effects
- Cons:
  - Time-consuming
  - Expensive
  - Requires special equipment, knowledge, and possibly permits/licenses to use
  - Must be monitored

Nitrogen/Argon Gas Treatment

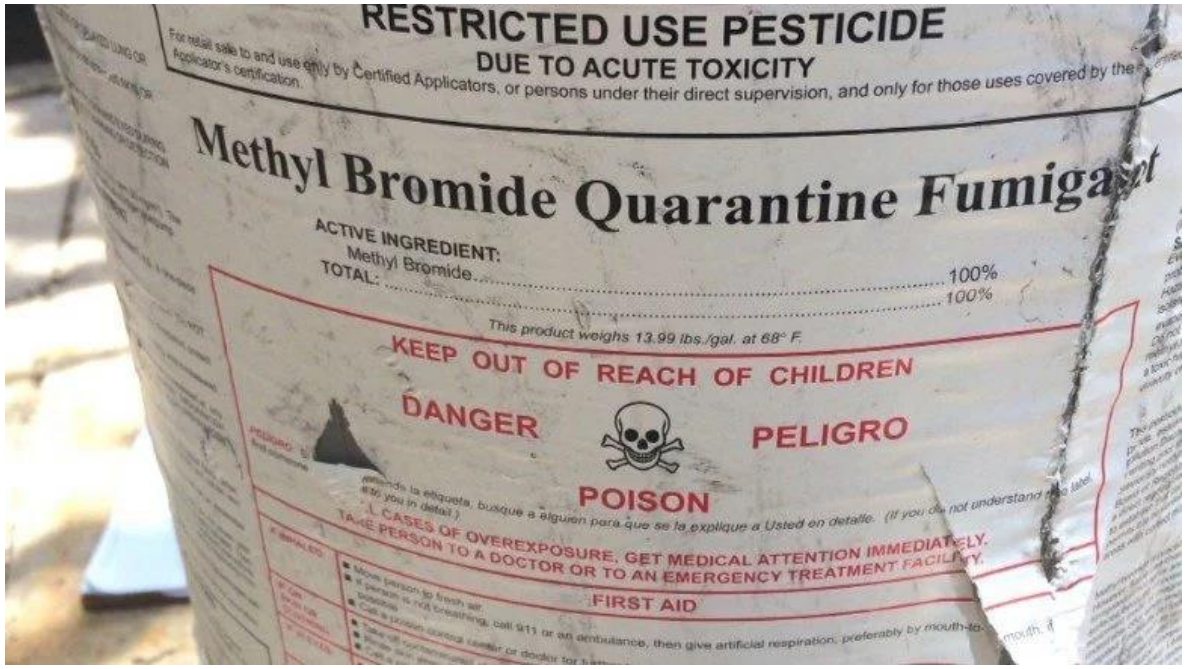
Works similarly to other modified atmosphere treatments, using nitrogen and argon gas to push oxygen levels down to inhospitable levels for insects; insect death results in between 2-6 weeks.

Nitrogen/Argon Gas Treatment

- Pros:
  - Can be more time-efficient than CO2 treatment
  - Appropriate for a wide variety of objects
  - Argon can prevent bio-deterioration from fungi and bacteria
- Cons:
  - Expensive
  - Nitrogen can contribute to growth of certain microorganisms

Fumigation With Toxic Gases

- Last resort only – objects should be sent to a commercial facility for treatment and allowed to off-gas before being returned to an institution.
- Objects treated in the past with fumigants such as ethylene oxide, methyl bromide – these are rarely used now.



Pesticide Treatment

- Never treat collections materials directly with pesticides – this can change the physical structure and chemical makeup of an object!
- Buildings themselves can be treated in some cases, but only by licensed individuals and only when there are no other alternatives.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Online Resources for Pest Identification

- www.museumpests.net/pestlist
- www.pestworld.org/pest-guide/
- http://pic.orst.edu/pest/idpest.html
- https://nysipm.cornell.edu

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