A Draft Proposal for an Industry Protocol for the Cleanup of Raccoon Latrines

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DISCLAIMER: An overview of this paper was presented at the 14th Wildlife Damage Management Conference during the Concurrent Sessions. We thought our membership might find its unabridged version useful. Please note that this document was not edited by the editors of the Proceedings; it was simply formatted to improve its usability and match the Proceedings.
A Draft Proposal for an Industry Protocol for the Cleanup of Raccoon Latrines

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ABSTRACT Since raccoon (Procyon lotor) latrines in close proximity to human structures pose a potential health risk, an increasing number of Wildlife Control Operators (WCO) have offered latrine cleanup services to their clients. While several government agencies have created recommendations for the removal of latrines, these tend to focus on outdoor latrines and not those found within structures. Since the cleanup of latrines in structures raises a number of safety and ethical concerns related to the selling of these services, it is advisable that industry standards be created to protect the safety of clients and service providers and to reduce unethical business practices. This document is an attempt to establish such a protocol.

KEY WORDS Baylisascaris procyonis, raccoon roundworm, latrine cleanup, raccoon, Procyon lotor, protocol, wildlife control operator.

INTRODUCTION


Several issues underscore the need and complexity surrounding the creation of this protocol. First, while clinical infection with Baisascaris procyonis (known as larva migrans) is relatively uncommon, infected individuals can suffer ocular or neurologic injury, sometimes leading to death (Kazacos 1997, 2000, 2001, Kazacos and Boyce 1989, 1995). Second, the roundworm eggs are hardy, capable of surviving for years in the soil. Their viability in attics, barn lofts, and other hot, dry environments is less (they die from desiccation), although exact demise times are unknown at the present time (Kazacos 2001). Third, disinfection is hindered because chemical disinfectants are either impractical or ineffective in killing the eggs (Kazacos 2001, Gavin et al. 2005). While research has shown that the eggs and larvae perish at 144° F, it is likely that higher temperatures and/or greater heat may be required to kill eggs insulated or sheltered by organic debris and other materials (Shafir et al. 2007). Additionally, we must be careful not to encourage paranoia given that raccoon latrines and these eggs are widespread in the environment and have been found in playgrounds and green areas (Chorazy and Richardson 2005), while recognizing the risk that latrines on property (particularly outdoor latrines) pose (Roussere et al. 2003).

Given the possible infection risk coupled with the high potential consequences of infection posed by raccoon latrines, how should WCOs handle them? While several government agencies have created recommendations for the removal of latrines (see Latrine Removal Documents in the bibliography), these tend to focus on the removal of latrines outside of structures (hereafter outdoor latrines).

Since the WCO industry has not established its own protocols at this time, this document is an attempt to begin this process. The goal of this publication is to draft a protocol to guide individuals or businesses in the safe and effective removal of raccoon feces that are potentially infected with Baylisascaris procyonis.
**Final Note**

This document is only a proposal. It should be seen as an attempt to provide WCOs some standards for the cleanup of raccoon latrines. It should NOT be used as official policy. Although grateful to my reviewers (some listed below), much more work needs to be done before such standards are adopted. Until the Centers for Disease Control (CDC), Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), or some other recognized governmental agency defines the risk and sets parameters, I cannot make any additional statements other than to note that raccoon droppings do pose a potential health risk.
Proposed Guidelines For Latrine Cleanup

INTRODUCTION These guidelines are intended to provide WCOs with recommended procedures and information that should facilitate the successful completion of raccoon latrine removal projects. The guidelines are not mandatory requirements as situations may demand modifications. However, it is expected that WCOs will have justification for said modifications.

1.0 Summary of General Provisions
The practices specified in this document shall generally apply to latrine abatement projects performed for private entities.

1.01 Contractors’ General Responsibilities.
The contractor shall furnish all labor, materials, facilities, equipment, services, insurance, and incidentals necessary to remove all specified latrines within the work area as indicated in the project specifications. The contractor shall negotiate with the client concerning whether the project involves simply latrine removal alone or latrine removal and area restoration. The contractor shall provide the client with a comprehensive pre-work assessment and proposal along with a good-faith cost estimate. The contractor shall comply with industry standards and use accepted state-of-the-art materials and products throughout all phases of the project.

2.0 Regulatory References
All work shall be performed in compliance with current federal and state regulations, including U.S. EPA, OSHA, and state regulatory agencies and any other accepted state-of-the-art industry standards. The most recent edition of relevant regulations, standards, documents, or codes shall be in effect including:

- U.S. Environmental Protection Agency (EPA) Regulations
- U.S. EPA Worker Protection Rules
- Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, OSHA, U.S. Department of Labor (Respiratory Protection), Title 29 CFR Section 1910.134
- OSHA, U.S. Department of Labor (Access to Employee Exposure and Medical Records), Title 29, CFR, Section 1910.20
- OSHA, U.S. Department of Labor (Hazard Communication for the Construction Industry), Title 29, CFR, Section 1926.59
- OSHA, U.S. Department of Labor (Hazardous Waste Operations and Emergency Response; HAZ-WOPER), Title 29, CFR, Section 1910.120
- Local health departments

Any conflicts or overlap in these requirements shall be governed by the more stringent regulation or standard.

3.0 Guidelines for Pre-Abatement Planning
The work area shall be clearly defined by the Service Agreement. All areas and conditions included as part of the work area shall be identified and shall be included in the Service Agreement. Areas with known latrines shall be identified during site inspection and shall be clearly described in the Service Agreement. Any suspected latrines shall be identified and the client notified.

The contractor shall be responsible for verification of all quantity measurements on project estimates/assessments.

The contractor shall be required to establish barricades, post warning signs and coordinate with clients and/or their representatives to plan and schedule work activities to minimize the impact of latrine abatement on any areas that may remain occupied during the project.

The contractor shall be required to seal the work area, ensure that critical barriers are placed over all openings to the regulated area, ensure the heating, ventilation and air-conditioning (HVAC) system in the work area is turned off through the final clearance phase of the project, ensure that all steam and hot pipes are cooled prior to set up and work and neutralize all mechanical hazards (such as moving belts or shafts) in the work area.

4.0 Submittals:
4.01 Pre-work Submittals.
NOTE: The client or their representative may elect to require abatement contractors to submit any or all of the following prior to beginning work on the project: A detailed plan describing the procedures proposed for use in complying with the requirements of the project specifications. The plan shall include the location and layout of decontamination areas, the sequencing of latrine work and methods to be used to assure the safety of building occupants, workers, and visitors to the site. The plan shall also include methods for controlling dust emissions in the work area and the containerization of latrine debris.

Documentation that the WCO holds appropriate licenses.

Contractor to provide documentation upon request of respirator training and fit testing for each employee of the contractor who will be on the site. Fit test documentation shall be less than or equal to 12 months old at the end of the project (29 Code of Federal Regulations Section 1910.134).

Contractor to provide upon request a disposal plan for contaminated materials.

A listing of authorized personnel to be granted access to work area.

The names and numbers of person(s) to be contacted on behalf of the contractor in cases of emergency.

Material Safety Data Sheets (MSDSs) for all chemicals that will be used or that will be present at the job site.

5.0 Site Security Measures:
Supervision of the latrine abatement work shall be performed by a Competent Person (as defined by OSHA 29 CFR 1926.1101) employed by the contractor at all times. All latrine abatement workers shall be properly trained. (Accreditation has not been established in the industry yet).

The latrine work area shall be restricted to authorized, trained, and properly protected personnel.

Entry into the work area by unauthorized individuals shall be reported immediately to the project supervisor and the client and shall be documented in the project log.

The contractor shall remain in compliance with all rules, codes, standards, and regulations governing the safety of all individuals at the worksite and shall be solely responsible for any injuries, accidents, exposures or liabilities occurring due to non-compliance or failure to secure the work area.

6.0 Personnel Protection Practices:
Worker protection measures, including protective clothing, respirators and other equipment shall be the responsibility of the contractor.

The contractor shall operate in compliance with OSHA regulations for worker safety and protection during abatement activities.

6.1 Worker Exposure.
6.1.1 Feces exposure to skin or clothes.
Wash skin with plain soap and warm water—clean thoroughly under the nails with a brush.

Wash clothes separately in very hot (rec. 150–160+°F), soapy water; bleach is not required but can be used if desired.

Note that eggs are not infective in fresh feces as they need at least 11–14 days to incubate to infectivity (Kazacos 2001). “Under sufficiently warm but fluctuating temperatures (e.g., cooler nights), most eggs should reach infectivity in 3–4+ weeks” (Kazacos 2001).

6.1.2 Ingestion or inhalation/swallowing of fecal material.
One cannot become infected through true inhalation (to the lungs), only by swallowing in mucus or actual ingestion (Kazacos 2001). If a person believes they have swallowed or ingested fecal material, medical personnel should be contacted immediately and the situation explained. While no preventive treatments have been established, anthelmintic treatment initiated quickly (within 1–3 days of exposure) has been shown to be beneficial in animals and is recommended for humans (Kazacos 2001, Murray and Kazacos 2004, Gavin et al. 2005).

7.0 Work Area Preparation and Latrine Removal Methods:
The contractor shall post appropriate warning signs at all entrances to the work area and designate a stag-
ing and worker decontamination area (preferably on a paved area).

The contractor shall provide isolation of the work area from occupied areas of the building using temporary physical barriers, such as 6-mil plastic sheeting. Workers in decontamination areas preferably should wear disposable Tyvek® coverings over minimal clothes, and washable boots with boot covers. Anything or anyone leaving the work area shall be properly decontaminated. Tyvek® coverings should be carefully removed and disposed of properly and workers should shower with warm water and soap. Other clothing should be thoroughly laundered with hot water (150–160°F) and detergent after cleaning up the latrine.

Negative air pressure shall be maintained within the work area at a pressure differential of -0.02 inches of water relative to the outside environment. A minimum of 4 air changes per hour shall be achieved within the work area throughout the project. At a minimum, high efficiency particulate air (HEPA) filters used in negative air machines shall be replaced after 600 hours of use. Alternatively, high capacity HEPA-filtered air scrubbers should be used to maintain the work area under a filtered environment.

The contractor shall be responsible for maintaining the required negative pressure environment within the work area. The contractor shall also be responsible for obtaining any legal certifications or licenses for any patented systems used on the project.

Negative air pressure shall be maintained continuously in the work area from the beginning of the latrine abatement project until final air clearance is achieved. The contractor shall use industry-accepted latrine removal procedures. All visible evidence of latrine debris shall be removed using methods such as manual removal, wet wiping, wet brushing, wet scraping, fine particulate vacuuming and other state-of-the-art techniques or better. Dry sweeping shall be prohibited in the work area. All areas and surfaces shall be cleaned and restored to original condition or better.

Projects involving contaminated soil areas shall generally require a minimum of 4 inches of surface soil removal extending out at least 12 inches on all sides of the fullest extent of the latrine's perimeter.

In preparation for latrine waste disposal, the contractor shall remove and properly containerize all latrine-contaminated materials including disposable coveralls and polyethylene sheets. Contaminated materials shall be adequately wetted and packaged in sealed leak-tight containers. Wet latrine waste shall be placed into labeled leak-tight wrappings and/or containers according to industry standards or better.

Latrine waste containers shall be transported in enclosed vehicles to an appropriate disposal site.

8.0 Cleaning Standards:
Inaccessible latrine materials (e.g. in wall cavities, etc.) may be sealed or encapsulated in place with prior approval of the client.

All contaminated surfaces in the work area and decontamination unit shall be wet wiped and cleaned. All debris shall be disposed of in a manner consistent with disposal guidelines of the CDC for infectious materials.

Wet wiping should be done with hot soapy water with or without 20% bleach (1% hypochlorite) (Kazacos 2001). Bleach does not kill the eggs. Bleach simply removes the adhesive outer coat of the eggs so that they will not stick to surfaces (Kazacos 2001). Once released, the eggs will be easier to remove via wiping. Once organic debris has been removed and following wet wiping, strong microparticulate vacuuming can be done to further clean surfaces, and animal impacted surfaces cleaned with a steam vacuum or high temperature water head/high suction extractor. Final cleaning should be with a HEPA-filtered vacuum.

Heat treatments will kill eggs, hence steam disinfection, steam vacuuming or a high temp water/suction extractor is recommended for both inside and outside areas. Propane torching can be used for contaminated soil and other impervious materials in outside locations.

All areas of the abatement project shall be subject to visual inspection. Photographic evidence of work is strongly encouraged.
9.0 Supply List for Latrine Removal and Cleanup:

The following list covers materials needed for interior and external latrine cleanup. WCOs are expected to adapt the list to the conditions they confront on the job site.

- Disposable nitrile rubber gloves (they are stronger than latex)
- Durable leather or other type of glove to protect hands from injury.
- N-100 ½ Face-mask (full face is recommended for interior latrines)
- Rubber boots (shin height)
- Heavy-duty plastic garbage bags (puncture resistant Force-Flex type, 3 ml thickness)
- Other rigid containers for material disposal (soil, etc.)
- Shovel or metal scoop
- Paper towels
- Portable propane torch for small areas, use weed burner for large areas. Flame spreader will help speed the heating process.
- Scalding/Boiling water
- Buckets for hot, soapy water
- Disposable sponges
- Bleach
- Tyvek-style disposable coveralls
- Access to water
- Exhaust fans (indoor work)
- Fire extinguisher
- Pump sprayer
- Steamer, steam vacuum, high temp water head/high suction extractor
- Warning signs
- Plastic sheeting
- Lighting equipment
- First aid kit
- Eye protection
- Soap
- Disinfectant spray
- Duct tape
- Warning tape to provide boundaries for decontamination area
- HEPA filter vacuum cleaner

9.1 Are vacuums an appropriate clean up tool?

Following physical removal of latrine feces and debris and wet wiping, vacuuming with a fine particulate industrial vacuum has been used to clean up areas inside structures. Baylisascaris eggs are comparatively large particles (63–88 µm by 50–70 µm) (Kazacos 2001) which can be removed using a strong vacuum with a fine particle capture size filter. Powerful truck-mounted units with an acceptable MERV rating would work for this purpose, and depending on the filtration can also remove mold, spores, and other fine debris that may be present; these are typically vented into the outside environment. Portable vacuums with disposable filter bags that capture particles in this range or better should also suffice, provided the vacuum system is a powerful one with good seals to prevent any peripheral leakage. When a portable vacuum is used, it is better to use as high a filtration as possible (e.g., MERV 13–16+ to HEPA) that insures removal of any infectious organisms that may be present, perhaps combined with or following steam disinfection.

Based on available science and logic, vacuuming should not be used as the primary removal method of raccoon fecal accumulations, but as one step in final cleanup once large debris has been physically removed. The eggs are present in the feces, and the only opportunity for contact with the eggs is where the eggs are present on the surface of the fecal matter or in feces that are broken up. To reduce dust and stirring up of debris, the feces should be wetted down using a pump spray bottle or other sprayer prior to removal, then removed via hand, scoop or shovel where the feces remain intact as much as possible. Given the inefficiencies and leakage of commonly used insulation removal vacuums, these should not be used as a primary removal method. Common insulation removal vacuums utilized by 99% of WCO/PCO’s are not HEPA efficient regardless of what type bag is used on the collection end because the air to cloth ratio is too low (fan produces too much air to have it all go through the filter media) so there is much leakage through the bag seams and around the connection points (bag collar). An insulation vacuum can be fitted with a high MERV
or HEPA after filter with the correct plumbing, but there is not a complete system available commercially. There are, however, truck mounted high MERV vacuum systems available but they are significantly more expensive than traditional insulation removal systems. High MERV or HEPA retrofits for standard insulation vacuums should run in the $5,000–7,000 range (does not include insulation and vacuum related equipment) and total cost for a true, HEPA-filtered vacuum system, trailer mounted, will probably be in the $12,000-$15,000 range depending on components and who fabricates it.

10.0 Instructions for Cleaning Up Raccoon Latrines:

10.1 Outdoor Raccoon Latrine Clean up.
Read the instructions below and follow the instructions carefully.

Establish staging and decontamination area.

Wear personal protection equipment (PPE).

Avoid stirring up dust and debris. Lightly mist the latrine area with water from a pump-spray bottle to reduce latrine material from becoming airborne. It may be advisable to spray disinfectants capable of killing bacteria, fungi, etc. that may be contained in the feces as well. Always follow the label. Use a shovel or disposable rigid scoop to gently lift feces and any other contaminated material and place it into a heavy-duty puncture resistant plastic garbage bag or rigid container. Remove at least 4 inches of soil below the latrine and at least 12 inches of soil buffer around the perimeter of the latrine and dispose of in a rigid container.

For bagged feces and debris, close the plastic bag tightly with a thick rubber band, “twist-tie” or tape, and place it into another garbage bag (“double-bagging”), and discard it in your garbage collection can, making sure that raccoons cannot get into the can. Large quantities of removed soil are best discarded in landfill disposal sites. Consult sanitation officials for proper permits and process.

Disinfect hard, smooth surfaces (including shovel blades) with heat, such as by flame, boiling water or steam. Surfaces can also be cleaned with high temperature water/high suction extractor systems.

Before flaming any latrine site, call your local fire department for details on local regulations and safety practices. Concrete pads, bricks, and metal shovels or garden implements may be flamed without damage. Do not attempt to flame surfaces that can melt or catch fire. For these use steam or scalding water. Break up and turn over contaminated soil several times, thoroughly flaming the soil each time. It is important to understand that this heat will sterilize the soil making it barren of plant life for some time, but these areas can easily be reseeded. “Contractor should ensure that use of weed burning propane torch or similar devices complies with local fire control and air quality regulations.”

10.2 Cleanup of Indoor Latrines.

10.21 Cleanup of Indoor Latrines (non-attic).
Unfortunately, standards concerning removal, encapsulating, or leaving latrines alone have not been established, thus contractors should discuss with clients whether latrine removal or encapsulation is even necessary. For example, if the area such as an attic is essentially unused and not going to be entered (i.e., there are no AC units or storage located there) then removal may not be necessary. One cannot assume that any portion of a home will not be entered, even wall cavities, and clients should be made aware that there may be a potential risk for a period of time if nothing is done.

However, it is well-known that eggs in hot, dry locations (including attics, barn lofts etc.) die from desiccation, rendering them harmless (Kazacos 2001). This usually takes several weeks to months, exact times being unknown. Thus one recommendation for such areas is to seal them off, making sure raccoons no longer have access, and simply leave them alone for an extended period of time during which the eggs will die. At that point the feces are dried out and hard and may be cleaned up without risk of this infection at the owner’s discretion. Other standard precautions should still be taken. The decision to clean these areas up or not also depends on how much feces are present, along
with amounts of raccoon urine, which may be odiferous and which may stain and damage ceilings and wall boards.

Establish staging and decontamination areas.

Place plastic sheets to cover floor and isolate pathway to the contaminated area, to prevent contamination of other portions of the house.

Wear PPE. Full face respirators recommended for indoor work.

Determine appropriate cleanup option. Wet down material prior to physical removal of latrine feces and debris. Use wet wipe of areas with hot soapy water with or without added bleach. Final cleanup and decontamination is done using a steam vacuum, strong micro-particulate vacuuming and/or use of scalding water or steam to kill residual eggs, such as a high temperature water/high suction extractor apparatus. It is generally NOT recommended that portable propane torches be used within buildings.

Steam cleaners or high temperature extractors are the BEST option available for killing residual eggs in indoor latrines in flammable areas. Steam units are small, compact and can be manipulated to emit steam in a variety of configurations. Once fecal accumulations are physically removed, the area can be treated with steam in order to subject the area to temps greater than 144°F to kill any eggs that may be present on the surfaces. Some commercial units are steam vacuums or high temperature water suction extractors which will both sterilize and remove material from carpets and other surfaces. Portable HEPA vacuums with removable filter traps are used as a final step and to collect post-abatement samples for assessment.

Steam cleaners can be found here:
http://www.walmart.com/ip/Mcculloch-Mc1275-Heavy-Steam-Cleaner/10771195
http://www.sharkclean.com/steamlanding.shtml
http://www.therma-kleen.com/
http://www.steamvaporclean.com/

10.22 Cleanup of Interior Latrines (Attic)
Follow steps in 10.21. Note that latrines in inaccessible or unused attics may simply be left alone, especially for small areas of contamination where urine staining and ceiling damage is not present. Once raccoons are barred from entering and adding to the area, eggs in such areas will die from desiccation and no longer pose a risk (see above). If such attic areas are to be cleaned up, it is still a good idea to let the area sit untouched for several months prior to cleanup, thereby greatly reducing any hazards associated with the cleanup due to natural demise of any eggs present.

Removing Latrines from Attic Insulation: Avoid stirring up dust and debris. Lightly mist the latrine area with water with or without bleach to reduce dispersal of dust. Use hand removal or a shovel to gently lift feces and any other contaminated material and place it into a heavy-duty puncture-resistant plastic garbage bag. Remove all fecal matter and all insulation under the latrine to the ceiling. Also, hand-remove a buffer area of insulation at least 12 inches greater than the perimeter of the latrine. Close the plastic bag tightly with a strong rubber band, “twist-tie” or tape, and place it into another garbage bag (“double-bagging”). All removed insulation, materials, and debris should be transported to a sanitary landfill for disposal. Consult sanitation officials for proper permits and process if required. The key threat with indoor latrines is spreading the contamination to the living space.

After removal of feces, insulation and debris from the attic, the attic space surfaces can be cleaned utilizing hospital grade disinfectants or similar cleaning agents. Fog/mist the entire latrine area with an antimicrobial spray. This solution kills or inhibits the growth of microorganisms (bacteria, fungi, or protozoans) left after initial cleanup. Several options are available for cleaning rafters and studs. Wet sponge with soapy water with or without 20% bleach (1% hypochlorite), followed by steam cleaning, strong micro-particulate vacuuming or both. Urine soaked or stained ceiling drywall may need to be removed and replaced, necessitating closure of the living space below. All furniture should be removed first and the area barricaded off before proceeding.

Professionals should dispose of contaminated materials, cleaning tools, cleaning supplies, and wastewater according to state and local laws. Disinfect all reusable cleaning tools and water containers with boiling water or steam or, in the case of metal tools such as shovels, flaming will work. Dispose of bags at a landfill that
accepts solid waste/animal waste in accordance with local regulations. It may also be burned in a licensed incinerator.

11.0 Final Clearance Certification
The work area could be considered clean when there is no visible residue present on work area surfaces, and this may suffice from a practical sense, but this does not guarantee that no residual eggs are present. The gold standard for successful abatement would be the lack of any eggs present in microscopic samples. Methods have been developed that examine final HEPA vacuum samples for eggs (Kazacos, unpub.), using fecal flotation methods modified for soil and debris examination (Kazacos 1983.). As a final clearance assessment, samples examined by sedimentation concentration followed by sucrose flotation of final HEPA debris should be negative for eggs (Kazacos, unpub.). These methods should only be done by a qualified parasitologist or microbiologist properly trained to isolate and identify Baylisascaris eggs from such samples. At the present time, availability of this testing is limited and not commercially available.

12.0 Suggested Criteria For Evaluating Latrine Contractor Qualifications
Contractors should be able to provide, upon request, a list of references of persons or firms who can attest to the quality of their work.

Contractors should be able to provide, upon request, a list of prior latrine abatement contracts, including names, addresses, and telephone numbers of building owners for whom the projects were performed.

Contractors should be able to provide, upon request, the name of a qualified environmental microbiologist or parasitologist and/or laboratory with whom they work who is trained to examine samples for the presence of Baylisascaris eggs.

Contractors should be able to provide, upon request, photo evidence collected during and after completion of previous projects.

Contractors should maintain written standard operating procedures and employee protection plans which include specific reference to all applicable OSHA, EPA, and state regulations.

It is suggested that contractors and employees document that they have taken a 40 hour HAZWOPER program including microbe training.

Contractors should possess general liability, workman's compensation, and other necessary insurance coverage.

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REFERENCES


Latrine Removal Documents


HAZWOPER (pronounced /hæzwˈpər/) is an acronym for Hazardous Waste Operations and Emergency Response. It refers to five types of hazardous waste operations conducted in the United States under OSHA.