

# Rodent Management on NYS Farms Survey

## Project Leaders

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## Project Location

Virtual.

## Abstract

Recent research has demonstrated that wildlife, including mammalian predators and raptors, are exposed to second generation anticoagulant rodenticides (SGARs). The most likely pathway for this exposure is on- and off-target poisoning of rodents, which are then consumed by predators. To combat this issue, some governments (the state of California and British Columbia) have placed restrictions on the sale and use of SGARs. However, in some cases, these restrictions have not reduced exposure risks for rodent predators. One possible explanation is that non-target and secondary poisonings occur in agricultural settings, where product uses are still allowed. Currently, not much is known about the use of rodenticides on farms in New York State, or the education that farmers receive regarding the implementation of these products. Therefore, a survey was developed to obtain preliminary information on the use of rodenticides in agricultural production. Results of the survey suggest that rodents are a problem in key areas on farms, such as production and storage. In most cases, farmers perform the rodent management, with 60% using rodenticides. Of the 141 individuals that responded to the survey, 56% are not certified with a private or commercial applicators license, and 89% indicated that they have not received training on rodent control. These results highlight the need to provide education to farmers on safe and effective techniques to manage rodents on farms that reduce risks to non-target organisms.

## Background and Justification

Each year, commensal rodents such as the Norway rat (*Rattus norvegicus*), house mouse (*Mus musculus*), and *Peromyscus* mice (*P. maniculatus* and *P. leucopus*) cause billions of dollars in damage (Pimentel et al. 2005). In agricultural settings, a small portion of this damage is from direct consumption of product, while contamination with feces, urine, or carcasses contributes to significant losses. In addition, rodent burrowing can injure people, pets, and livestock, and damage equipment, while gnawing on wires can lead to both structural fires and loss of function for farm machinery.

Management options to reduce rodent populations include the use of traps, rodenticide baits, rodenticide tracking powders, asphyxiation via burrow treatments with carbon monoxide and carbon dioxide, and birth control. These techniques can be combined with sanitation and exclusion practices that limit access for food, water, and shelter to have long-term impacts on populations. To date, rodenticide-based management campaigns are the most economically feasible solution (Quinn et al. 2019), in part because they are easy to deploy. However, unintended consequence of rodenticide baiting programs are well-known and documented, including nontarget and secondary effects of using second generation anticoagulant rodenticides (Elliott et al. 2014; Murray 2011; Stone et al. 1999). [Second generation anticoagulant rodenticides](#), or SGARs, were developed in

response to genetic resistance in some rodent populations to first generation anticoagulant rodenticides (FGARs). Compared to FGARs, SGARs can kill after a single feeding, have longer half-lives, and accumulate in the liver of exposed organisms. Predators that feed on poisoned animals can acquire SGARs, which can then have sub-lethal and lethal effects.

A recent study evaluated bald and golden eagle (*Haliaeetus leucocephalus* and *Aquila chrysaetos*, respectively) exposure to anticoagulant rodenticides from specimens submitted to the Southeastern Cooperative Wildlife Disease Study (Niedringhaus et al. 2021). Rodenticide exposure in the non-random sample of eagles was high, and the geographic distribution of sample origins was reported (Niedringhaus et al. 2021, Figure 1). Reviewing this distribution map led to the observation that exposures were not occurring near major metropolitan areas, where rodenticide use is high due to large mouse and rat populations. One explanation for this observation could be that rodent management in agricultural settings is contributing to secondary exposures in raptors.

In New York State, agricultural producers can legally apply general use rodenticides on their farm to several production and storage areas without state certification (Table 1). However, in the absence of a certification requirement, agricultural producers may have little or no training on the proper use of rodenticides, despite the potential to use them over large areas.

On-Farm Site	Certification Required to Apply:	
	General-Use Rodenticide	Restricted-Use Rodenticide
Crop production area (e.g., field, orchard, vineyard, greenhouse, nursery, Christmas tree farm)	None	Private
Retail greenhouse/nursery	None	Private
Produce-packing facility	None	Private
Storage of: planting material, harvested crop, livestock feed/bedding	None	Private
Livestock buildings/feedlots/pastures	None	Private
Manure handling areas for farm use	None	Private
Farm equipment storage	None	Commercial
Farm residence (including household-related sites)	None	Commercial
Farmworkers housing	Commercial	Commercial

Table 1. Certification requirements for applying rodenticides on farms in New York State. Developed by D. Wixted in consultation with the New York State Department of Environmental Conservation Bureau of Pesticides Management (2021).

To better understand rodent management practices by agricultural producers in New York State, we developed and deployed a nine-question survey. Results identify opportunities for education and outreach to agricultural producers on safe and effective rodent management techniques.

## Objectives

1. Survey New York State agricultural producers to understand the extent of rodent problems at their facilities and determine current rodent management practices.
2. Provide basic rodent management information to agricultural producers.

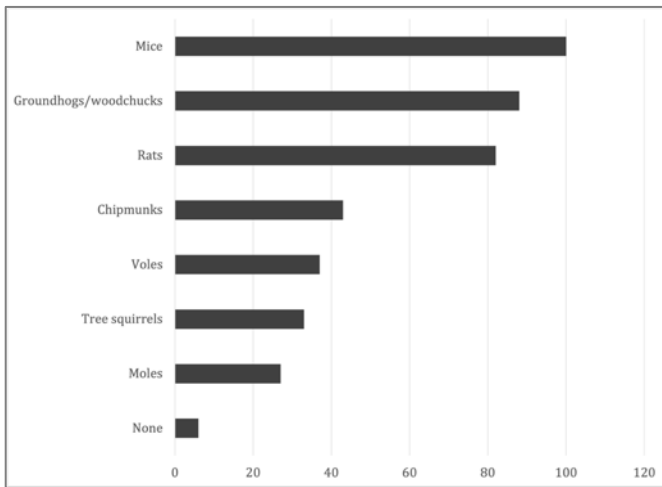
## Procedures

1. Survey New York State agricultural producers to understand the extent of rodent problems at their facilities and determine current rodent management practices.
  - o A [nine-question survey](#) was developed, reviewed, and used to develop a Qualtrics survey.

- The survey was distributed on listservs known to the two Project Leaders, and to NYSIPM Program Staff, who sent the survey on to various commodity-specific listservs.
2. Provide basic rodent management information to agricultural producers.
- Results of the survey were presented at two events to reach educators and agricultural producers.
  - Two presentations were scheduled that delivered basic rodent management information to agricultural producers.

## Results and Discussion

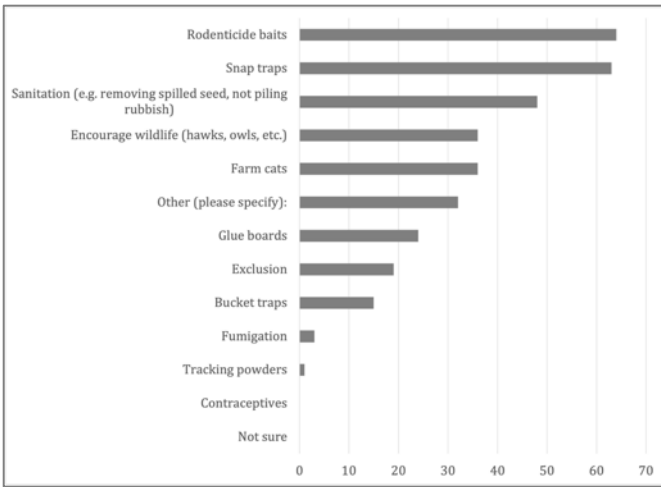
A total of 141 people responded to the digital survey. A printable version was created for communities that do not use technology, but no additional responses were recorded (see Appendix for paper version). The following figures represent survey results, and figure descriptions providing the survey question:



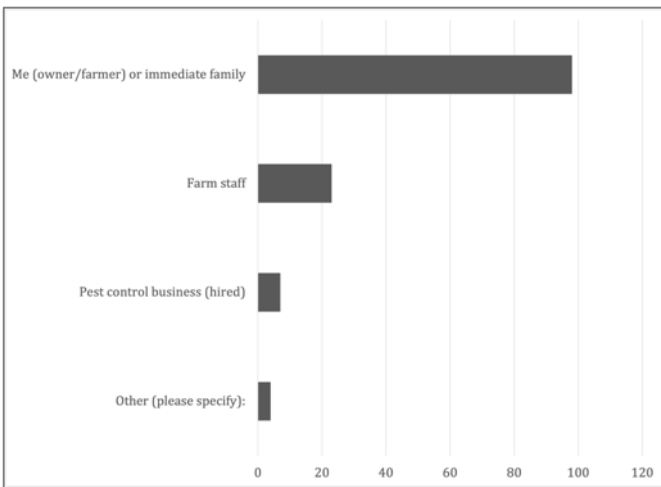
**Figure 1.** Question 1: “Which rodents have you ever seen the need to control anywhere on your farm (inside or out, excluding your house and yard/garage/sheds associated with it)? Select all that apply.”

	Percent	Count
Manure handling areas	1.5 %	5
Farm stand/store (including retail greenhouse or nursery)	3.4 %	11
Packaging areas	4.0 %	13
Seed/propagation material storage	4.9 %	16
Forage fields	5.2 %	17
Other (next slide):	5.2 %	17
Pastures	5.5 %	18
Animal enclosures/feedlots	5.5 %	18
Farm equipment storage	10.1 %	33
Animal feeding areas	11.0 %	36
Feed/grain storage facilities	11.6 %	38
Animal housing	15.0 %	49
Crop production (fields, orchards, nursery, greenhouse, vineyard, Christmas tree farm, etc.)	17.1 %	56

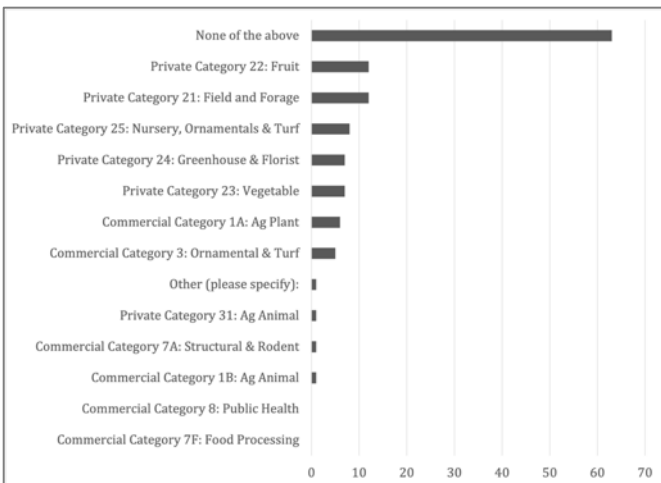
**Table 2.** Question 2: “Where are rodents a problem on your farm? Select all that apply.” Additional sites listed by respondents include: evergreen nursery, greenhouse, maple syrup lines (three responses), poultry tents, tack room: chew on leather goods, community garden, cellar, house/worker housing (two responses), barn foundation, under concrete slab to sheds, produce storage, seedling beds and field trees, processing area, field edge.



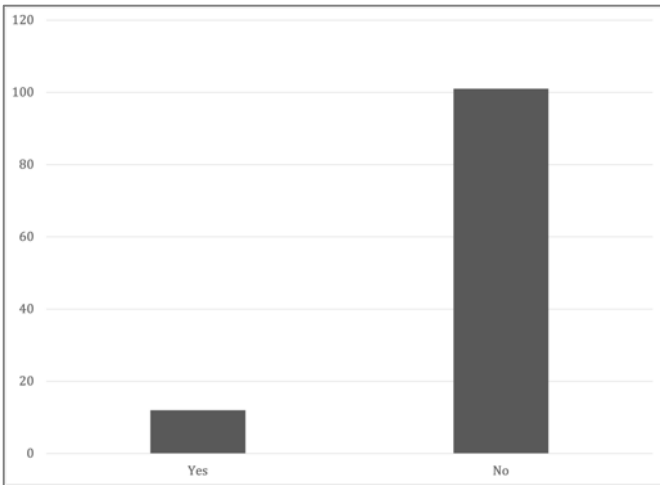
**Figure 2.** Question 3: “What methods are used to manage rodent pests? Select all that apply.” Write-in responses included: mint [used as repellent], close mowing (two responses), stone apron around building, encourage foxes, dogs (four responses), gun (11 responses), Tomcat hawk [rodenticide bait], trap: leg; have-a-heart; live; conibear, electric trap, electrocution, run over with vehicle, protect tree trunk with plastic wrap.



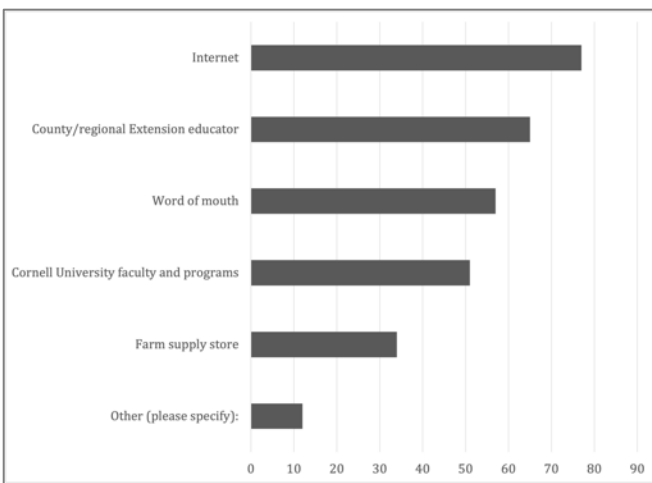
**Figure 3.** Question 4: “Who implements the methods used to manage rodents?”



**Figure 4.** Question 5: “Which of the following pesticide applicator certifications do you or your staff hold? Select all that apply.”



**Figure 5.** Question 6: “Have you or others on your farm received any training on managing rodents?”



**Figure 6.** Question 7: “What sources of information would you use to learn about rodent management? Select all that apply.” Additional responses included: self, crop consultant, municipal garden manager, commodity specific meetings, local IPM personnel, country folks, exterminator (two responses), chemical rep, Cornell webinar, science, experience.

We also asked two open-ended questions. Question 8: “What are your biggest concerns about rodents on your farm?” We received 94 responses, and each response often including multiple issues. These are summarized below, with items categorized and text modified by the project leaders.

- **Physical Damage:** farm equipment, strings on hay/straw bales, gnawing in home, gnaw on barn structural wood, gnaw on wires: milking system, chewing damage: chicken house, tunneling in insulation, soil excavation at foundation, damage in orchard (tree trunks). damage grape vines. girdling trees and saplings. damage to garden crops, gnawing on leather bridles and sheepskin/wool felt saddle pads.
- **Harm:** pathogens/disease, (people, pets, livestock), tick-borne pathogens, feed contamination, feed consumption, secondary poisoning (wildlife, pets), food safety, damaged product, exported with product, rats killing chickens, injury: woodchuck holes, injury to horses.
- **Challenges:** management in organic production, preventing population explosions, blamed by neighbors, customer perceptions. keeping them out, being unaware of a problem.

Question 9: “Please share any questions you have about rodent management.” We received 30 responses to this question. Responses are summarized below, with items categorized and text modified by the project leaders.

- **General:** how to remove/control rats, how to eradicate woodchucks under foundation, how to eliminate & prevent rodents in cattle habitation, best practices for prevention, best control for moles, remove from under house where they have burrows, methods to prevent rodent & rabbit from chewing tree bark, non-lethal management options, any good deterrents?, methods to encourage natural predators of rodent pests
- **Trapping:** can woodchucks be controlled with traps?, best traps to use, where to get bucket traps?
- **Baiting:** best bait to use, how often to bait?, safe placements?
- **Exclusion:** rodent-proof building to prevent burrowing

The responses to this question highlight opportunities for education and outreach based on the continuum of answers. Whereas some individuals were concerned about animal welfare and environmental considerations of management, others wanted the most effective “poison.”

Results from this survey indicate that rodents are a problem for agricultural production in New York State. They represent risks to the people, pets, and livestock on farms, and cause economic damage by directly consuming or contaminating product and gnawing on structures. To address this damage, agricultural producers undertake rodent management. Of the 141 people that responded to the survey, 60% indicated that they use rodenticides to manage pests, and 89% of respondents indicated that they have not received training on rodent control. Instead, they may rely on internet searchers and word of mouth to obtain information on rodent management. With a lack of training on proper pesticide use, it seems possible for agricultural producers to contribute to non-target effects of rodenticides. Further investigation is needed to determine the practices used by agricultural producers in New York State. We hope to provide additional training to interested agricultural producers, and develop resources that are practical and useful for this important audience.

## Outcomes and Impacts

Two presentations were provided to educators and agricultural producers about survey results, and an additional two presentations provided general rodent management information for producers. A total of 174 people attended the four meetings, but three of the sessions were recorded and are available on demand.

- Frye, MJ & D.J. Wixted. 11/17/2021. [Rodent Management and Rodenticides on the Farm](#). Cornell University Agriculture, Food & Environmental Systems In-Service, Cornell University Cooperative Extension, Virtual. Invited Speaker. 64 attendees; recording available.
- Frye, MJ & D.J. Wixted. 02/22/2022. [Rodent Management and Rodenticides on the Farm](#). 2022 Empire State Growers Expo, New York State Vegetable Growers Association, Virtual. Invited Speaker. 29 attendees; recording available.
- Frye, MJ. 02/04/2022. Tips and Tricks for Rodent Management on the Farm - Rodent Management in Grain Processing Facilities. Hudson Valley Value-Added Grain School, Capital Area Agriculture and Horticulture Program, Virtual. Invited Speaker. 42 attendees.
- Frye, MJ. 03/23/2022. [Rodent Management on the Farm](#). Capital Area Agriculture and Horticulture Program, Virtual. Invited Speaker. 39 attendees; recording available.

## References

- Elliott, J.E., S. Hindmarch, C.A. Albert, J. Emery, P. Mineau, & F. Maisonneuve. 2014. Exposure pathways of anticoagulant rodenticides to non target wildlife. *Environmental Monitoring & Assessment* 186(2): 895-906.
- Murray, M. 2011. Anticoagulant rodenticide exposure and toxicosis in four species of birds of prey presented to a wildlife clinic in Massachusetts, 2006-2010. *Journal of Zoo and Wildlife Medicine* 42(1): 88-97.
- Niedringhaus, K.D., N.M. Nemeth, S. Gibbs, J. Zimmerman, L. Shender, K. Slankard, H. Fenton, B. Charlie, M.F. Dalton, E.J. Elsmo, R. Popping, B. Millsap, & M.G. Ruder. Anticoagulant rodenticide exposure and

toxicosis in bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) in the United States. *PLoS One* 16(4): e0246134.

Pimentel, D., R. Zuniga, and D. Morrison. 2005. Update on the environmental and economic costs associated with alien- invasive species in the United States. *Ecological Economics*. 52: 273–288.

Quinn, N. 2019. Assessing individual and population-level effects on anticoagulant rodenticides on wildlife. *Human-Wildlife Interactions* 13(2): 200-211.

Quinn, N., S. Kenmuir, & K. Krueger. 2019. A California without rodenticides: challenges for commensal rodent management in the future. *Human-Wildlife Interactions* 13(2): 212-225.

Stone, W.B., J.C. Okoniewski, & J.R. Stedelin. 1999. Poisoning of wildlife with anticoagulant rodenticides in New York. *Journal of Wildlife Diseases*:35(2): 187-193.



**Cornell University**  
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The New York State IPM Program helps people manage pests in ways that minimize environmental, health and economic risks. In addition to expertise in agricultural commodities, our program provides education about 'structural pests,' including rodents. The purpose of this survey is to collect information about current rodent management practices around farms to identify opportunities for outreach. (online: [https://cornell.ca1.qualtrics.com/jfe/form/SV\\_a5HcSjws6ref59Y](https://cornell.ca1.qualtrics.com/jfe/form/SV_a5HcSjws6ref59Y))

1. Which rodents have you ever seen the need to control anywhere on your farm (inside or out, excluding your house and yard/garage/sheds associated with it)? Select all that apply.

- Rats
- Mice
- Moles
- Voles
- Tree squirrels
- Chipmunks
- Groundhogs/woodchucks
- None [if you select None, skip to question #5]

2. Where are rodents a problem on your farm? Select all that apply.

- Crop production (fields, orchards, nursery, greenhouse, vineyard, Christmas tree farm, etc.)
- Forage fields
- Pastures
- Animal housing
- Animal enclosures/feedlots
- Animal feeding areas
- Manure handling areas
- Feed/grain storage facilities
- Seed/propagation material storage
- Farm equipment storage
- Packaging areas
- Farm stand/store (including retail greenhouse or nursery)
- Other (please specify): \_\_\_\_\_

3. What methods are used to manage rodent pests? Select all that apply.

- Snap traps
- Glue boards
- Bucket traps
- Rodenticide baits
- Tracking powders
- Contraceptives
- Fumigation
- Exclusion
- Sanitation (e.g., removing spilled seed, not piling rubbish)
- Farm cats
- Encourage wildlife (hawks, owls, etc.)
- Not sure
- Other (please specify): \_\_\_\_\_



4. Who implements the methods used to manage rodents?
- Me (owner/farmer) or immediate family
  - Farm staff
  - Pest control business (hired)
  - Other (please specify): \_\_\_\_\_

5. Which pesticide applicator certifications do you and/or your family or staff hold? Select all that apply.
- Private Category 21: Field and Forage
  - Private Category 22: Fruit
  - Private Category 23: Vegetable
  - Private Category 24: Greenhouse & Florist
  - Private Category 25: Nursery, Ornamentals & Turf
  - Private Category 31: Ag Animal
  - Commercial Category 1A: Ag Plant
  - Commercial Category 1B: Ag Animal
  - Commercial Category 3: Ornamental & Turf
  - Commercial Category 7A: Structural & Rodent
  - Commercial Category 7F: Food Processing
  - Commercial Category 8: Public Health
  - Other (please specify): \_\_\_\_\_
  - None of the above

6. Have you or others on your farm received any training on managing rodents?
- Yes
  - No

7. What sources of information would you use to learn about rodent management? Select all that apply.
- Word of mouth
  - Farm supply store
  - County/regional Extension educator
  - Cornell University faculty and programs
  - Internet
  - Other (please specify): \_\_\_\_\_

8. What are your biggest concerns about rodents on your farm?

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9. Please share any questions you have about rodent management.

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