Maine Board of Pesticides Control

Report on the Implementation of LD 356: Resolve, Directing the Board of Pesticides Control to Prohibit the Use of Rodenticides in Outdoor Residential Settings

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maine
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CONSERVATION
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I. Abbreviations and Definitions

25 (b)	Non-section 3 FIFRA minimum risk products
ARs	Anticoagulant Rodenticides
BE	EPA's Biological Evaluations
BiOps	EPA's Biological Opinions
BMPs	Best Management Practices
BPC	Board of Pesticides Control
DACF	Department of Agriculture, Conservation and Forestry
EPA	United States Environmental Protection Agency
FGAR	First Generation Anticoagulant Rodenticide
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
IPM	Integrated Pest Management
SGAR	Second Generation Anticoagulant Rodenticides

II. Overview and Background

Overview of LD 356 Requirements

On June 8, 2025, the Governor signed LD 356: Resolve, Directing the Board of Pesticides Control to Prohibit the Use of Rodenticides in Outdoor Residential Settings (Resolves 2025 c. 47) into law (Appendix A). This bill directs the Board of Pesticides Control (BPC) to create rules that prohibit the use of rodenticides and rodenticidal baits in outdoor residential settings, with exemptions for certified applicators (Private or Commercial). The bill requires BPC to submit a report on the implementation of this bill. The goal of this report is to provide an overview of rodenticide use in Maine, outline current stakeholder data related to rodenticides, including rodenticidal baits, reports and regulations from other states, and present a timeline for fully implementing the legislation.

History of Development

Rodenticides are defined as pesticides that repel, mitigate, or kill rodents, including mice and rats. Prior to the 1920s, most rodenticides used were heavy metals (such as arsenic) or poisons (such as strychnine), which were highly effective at killing rodents but also had implications for human and non-target health. In the 1940s, the first anticoagulant rodenticide, Warfarin, was developed. Other similar molecules were developed soon after, with these chemistries being known as "First Generation Anticoagulant Rodenticides" (FGARs). These active ingredients require multiple feedings, in which these materials are typically incorporated into rodent bait foods. After multiple feedings, the active ingredient causes blood to thin, inhibiting the rodent's ability to clot blood, inducing hemorrhaging, and eventually leading to organ failure. While highly effective at killing pest rodents, the heavy use of FGARs led to the development of resistance in rodent populations. Research in the 1970s led to the development of other active ingredients that were categorized as "Second Generation Anticoagulant Rodenticides" (SGARs). These materials were effective on FGAR-resistant pest populations and were more toxic, only requiring one feeding.

Rodenticide Exposure in Wildlife

As noted above, SGARs are more toxic than FGARs, and, therefore, require a smaller dose of the active ingredient to induce lethality. Both FGARs and SGARs are fat-soluble, meaning that they can accumulate in tissues, particularly the liver. This is especially a concern for SGARs, which are metabolized and depurated (or removed from the body) more slowly compared to FGARs. Therefore, SGARs have an elevated tendency to bioaccumulate in tissues. Because SGARs are retained in tissues longer, predatory animals can be poisoned if they consume prey that has ingested rodenticides. This type of pesticide exposure is termed secondary poisoning. A summary highlighting the differences between FGARs and SGARs is presented in Table (1) below.

Table 1. A comparison of First Generation Anti-Coagulant Rodenticides (FGARs) and Second Generation Anti-Coagulant Rodenticides (SGAR). LD_{50} is the accute oral lethal dose for half the animals in a toxicological test.

	Active Ingredient	Acute Toxic dose (LD_{50}- mg/kg)	metabolism	depuration	persistence	bioaccumulation	secondary poisoning
FGAR	Chlorophacinone	3.2	faster	faster	lower	lower	less likely
FGAR	Diphacinone	2.3					
FGAR	Warfarin	10.4					
SGAR	Bromadiolone	0.56	slower	slower	greater	greater	more likely
SGAR	Difethiolone	0.56					
SGAR	Difenacoum	1.8					
SGAR	Brodificoum	0.3					

x

Although secondary poisoning in birds of prey and carnivorous mammals (*e.g.,* bears and fishers) is not always lethal, at high enough concentrations it is associated with negative health outcomes, including increased disease and parasitism rates, decreased fecundity, and increased risk of morbidity in offspring. However, it remains scientifically challenging to determine a toxic concentration of rodenticides that adversely affects the physiology and development of wildlife. For example, Serieys (2015) observed the presence of both anticoagulants and parasitic mange in urban bobcats, but it was unclear if this association was a correlation or causation. To further evaluate if rodenticides attenuate the immune system in wild feline species, a controlled study was designed to determine if exposures to brodifacoum dampens the immune system in domesticated cats (Kopanke et al., 2018). This laboratory study revealed that brodifacoum at environmentally-relevant concentrations did not alter the immune system in cats. To the best of our understanding, no other study has evaluated whether or not anticoagulant exposure weakens the immune system in felines, which could in turn increase the risk of mange. Nonetheless, it is widely accepted that rodenticides are routinely detected in wildlife, which could pose a health risk to these species. Only a handful of reports in the scientific literature document secondary poisoning in New England. However, evidence points to the ubiquity of secondary poisoning caused by rodenticides. These data include sources from:

- A 2012-2016 study in Massachusetts examined the possibility of secondary poisoning in 94 red-tailed hawks. This study revealed that 96% of autopsied hawks had at least one rodenticide, and more than half had at least three detected rodenticides. Only 17 hawks had rodenticide concentrations associated with toxicosis (Murray et al., 2017).
- In 2020, the same authors performed a follow-up study in 43 hawks; the more recent study revealed at least one rodenticide in 100% of the individuals; more than 90% had been exposed to at least two rodenticides (Murray, 2020).

- In Maine, 53% of sampled fishers contained at least one rodenticide (n= 106). This percentage increases to 93% and 100% in New Hampshire and Vermont, respectively (Silveira et al., 2024). Predictably, this study demonstrated that exposure to rodenticides is mostly driven by proximity to urban areas adjacent to natural areas that are prime habitat for fishers.
- The Maine Department of Inland Fisheries and Wildlife performed a limited sampling of rodenticides in 2024. This study detected rodenticides in bears (4 out of 4 individuals) and hawks (4 out of 6).
- The New England Wildlife Center reports ~100-200 cases of secondary poisoning in non-target animals annually (New England Wildlife Center, 2023).
- A study examining 303 eagles from across the country identified rodenticides in 82% of individuals, which attributed to 4% of the mortalities (n=12) (Niedringhaus et al., 2021).
- In California, more than 80% of all bears, bobcats, mountain lions, and fishers contained at least one rodenticide. The same study noted rodenticides were not detected in deer (n=37), underscoring that carnivores are more at risk of exposure to rodenticides as a result of secondary poisoning. (Maron, 2024).

Collectively, these studies point to the prevalence of rodenticides found in wildlife. However, it remains scientifically challenging to determine if the detection of rodenticide(s) in predatory animals (*i*) causes lethality, (*ii*) presents a contributing comorbidity, or (*iii*) results in an asymptomatic outcome. Therefore, the data should be interpreted with caution.

Rodenticide Exposure in Domestic Animals

In addition to wildlife, domestic animals are subject to the accidental consumption of rodenticidal bait. Compared to predatory animals, even fewer scientific studies have attempted to identify the prevalence of poisoning in domestic animals.

To gain insight into the risk of rodenticides to domestic animals, the BPC mined the EPA Incident Data System, which collects self-reported exposures to pesticides. A manual analysis of this database reveals that each year, there are roughly 1,150 incidents of rodenticidal exposure in domestic animals, resulting in about 60 fatalities annually. The data are not specific to individual states, which prevented an estimate for exposure to pets in Maine. Again, because these are self-reported incidents and not verified, the data should be treated with uncertainty.

Rodenticide Exposure in Humans

Nearly 3,000 Americans are hospitalized each year as a result of accidental rodenticide exposure. Most human dietary exposures resulted from the consumption of contaminated chicken and pork, and children under the age of five are the most at risk (Mercer et al., 2022); this mode of exposure likely reflects the high usage of rodenticides in husbandry and the livestock industry The risk of rodenticide lethality in humans is extremely low, and is partly driven by allometric dosing (meaning humans require a much larger dose compared to rodents to induce toxicosis). For example, the maximum residue limit of diphacinone in food is 0.5 ppm (0.5mg/kg). At this level, it is estimated that a 160 lb human would need to eat 105 lbs of pork meat (or 6.7 lbs of pig liver) each day to experience the same chronic effects as rats. This unrealistic risk to humans *via* food exposure holds true even for the most toxic rodenticide, brodifacoum, under the worst-case scenario. For example, the highest recorded concentration of brodifacoum in wildlife was reported to be nearly 9 mg/kg in the liver of bears. At this

concentration, a 160 lb human would need to consume an estimated 6 lbs of liver to experience lethality (McMillan et al., 2018).

Mode of Action in Non-anticoagulant Rodenticides
Other rodenticides that are not anticoagulants also exist, but these chemistries are typically less toxic and therefore have decreased efficacy in rodents. The alternatives to anti-coagulant rodenticides include zinc phosphide, bromethalin, strychnine, and cholecalciferol. The modes of action for these molecules are discussed below.

Zinc phosphide is a stable molecule and only becomes reactive when mixed with water. Upon ingestion, this active ingredient reacts with water in the stomach to release phosphine gas, which inhibits the ability of all animals to produce cellular energy. Depletion of cellular energy causes cell death and, ultimately, organ failure. The rodenticide bromethalin has a very similar mode of action, which indirectly interferes with the ability of cells to make energy; this rodenticide is a short-chain PFAS as defined by the State of Maine and the Organization of Economic Cooperation and Development. Cholecalciferol perturbs the homeostasis of calcium and phosphate in the bloodstream; elevated levels of these two ions in the blood cause renal and cardiovascular dysfunction, culminating in organ failure. Lastly, strychnine antagonizes neurotransmitters responsible for maintaining neurological and muscular poise; this rodenticide induces muscular convulsions, including the diaphragm, and results in asphyxiation.

III. EPA Regulation of Rodenticides

History of EPA actions to date

The U. S. Environmental Protection Agency (EPA) has taken several actions on rodenticide products to date. In 2008, a risk mitigation decision (RMD) was made after a lawsuit was filed with the agency regarding these chemistries. The RMD outlined new minimum packaging and size requirements for products on the consumer market, new packaging requirements for tamper-resistant packaging, and requirements for bait stations. In 2022, EPA issued proposed interim decisions related to 11 rodenticides undergoing registration review. These reviews were also part of a larger effort by EPA to implement requirements under the Endangered Species Act (ESA) to consider endangered and threatened species as a part of its registration reviews. EPA has released its final Biological Evaluations (BEs) on 11 rodenticides as of November 2024 (Appendix B-1). The next step in this process is for the U. S. Fish and Wildlife Service (USFWS) to use EPA's biological evaluations to form their own Biological Opinion (BiOps) that EPA will use to make its final mitigation recommendations related to ESA.

Federal Restrictions on Rodenticides for Consumers

EPA has restricted the use of pelleted baits for the general use consumer market. On EPA's website, they explain these restrictions for general consumers and for agricultural use products (EPA, 2025):

> ***Rodenticide Products for Consumer Use***

The rodenticide products currently available on the consumer market are ready-to-use bait stations that contain and/or are packaged with a rodenticide bait that is in block or paste form. Pelleted baits no longer are permitted to be used in rodenticide products targeted for consumer markets.

The bait components of the ready-to-use bait station products currently registered for the consumer market to control mice and/or rats contain one of the following rodenticides:

- *Bromethalin*
- *Chlorophacinone*
- *Diphacinone*

If bait stations are of a refillable design, up to one pound of bait to be used to fill or refill the bait station may be included with the bait station in the retail package. Ready-to-use bait stations that are not refillable must be properly disposed after the bait in them has been consumed or contaminated.
Ready-to-use bait station products are labeled for use:

- *indoors; or*
- *indoors and outdoors within 50 feet of buildings.*

Rodenticide Products for Structural Professional and Agricultural Use Products

These products include rodenticide baits registered for use by professional applicators to control rats and/or mice in or near (within 100 feet of) buildings and other structures or for use in and near agricultural buildings and man-made agricultural structures. They may contain any one of the active ingredients mentioned under Types of Rodenticides.

- *Products geared to these categories of users are not to be sold in "consumer" stores, including drug stores, grocery stores, hardware stores, club stores, and similar retail outlets.*

- *Products containing second-generation anticoagulants must be sold in containers holding at least 16 pounds of bait if they are labeled for use by professional applicators and at least eight pounds of bait if labeled for use in or near agricultural structures.*

- *Professional- and agricultural-use products containing first-generation anticoagulants, bromethalin, cholecalciferol, or zinc phosphide must be sold in containers that hold at least four pounds of bait.*

The bait products marketed to these categories of users may be in block, paste or pelleted form. These products are not packaged in or with bait stations. However, the labels for these products require use of tamper-resistant bait stations:

- *If bait is to be placed in any indoor or outdoor location to which children under six years-of-age, pets or nontarget wildlife have access.*

- *For all applications made outdoors and above ground.*

Bait stations suitable for using these bait products in such areas are commercially available. Baiting of burrows outdoors is permitted only for pelleted baits that are placed at least six inches down active rat burrows.

Rodenticide Strategy Plan for Endangered Species Act

In 2024, EPA published its final Biological Evaluations (BEs) for rodenticides (Appendix B-1). EPA's final BE assessed 11 rodenticides (Brodifacoum, Bromadiolone, Bromethalin, Chlorophacinone, Cholecalciferol, Difenacoum, Difethialone, Diphacinone, Strychnine, Warfarin, Zinc phosphide) and their potential impacts on endangered and threatened species habitats and found that they:

- Will have no effect on 88% of species and 95% percent of critical habitats;
- Are not likely to adversely affect 4-11% of species and 1% of critical habitats;
- Are likely to adversely affect 1-8% of listed species and 4% of critical habitats; and,
- Have a likelihood of future Jeopardy/Adverse Modification (J/AM) of less than 5% of listed species and less than 1% of critical habitats.

EPA also released the rodenticide strategy plan within the Biological Evaluation document, where it outlined mitigation measures to reduce impacts on endangered species (Appendix B-2). These mitigation measures were found to be applicable to 78 listed species and five critical habitats to avoid and minimize exposure to the 11 assessed rodenticide active ingredients. The mitigation measures identified by EPA in the rodenticide strategy are as follows:

1. Restrict the use of bait stations to only those that exclude listed species by size or behavior. Beyond the standard bait stations now in use, custom bait stations for the exclusion of listed species (primarily mammals) could be used within their ranges. An example is the bait station recommended by the state of California in PRESCRIBE for use within the range of the SKR. This mitigation is intended to reduce the potential for primary exposure.

2. Prohibition of broadcast and below-ground in-burrow applications in locations where needed to protect listed species, such as a "pesticide sensitive area" within the USFWS designated range of listed species. This mitigation is intended to reduce the potential for primary exposure to specific listed species.

3. Prohibition of broadcast and below-ground in-burrow application within and beyond the range and/or critical habitat for species that have the potential to consume rodenticides via secondary consumption. This mitigation is intended to reduce the potential for secondary exposure.

4. Restricting bait station placement to within five feet of man-made structures in areas with listed mammals that are small enough to enter bait stations. This mitigation measure would reduce the likelihood that bait stations will be placed in the species' habitat. This mitigation measure is intended to reduce the potential for primary exposure.

5. Prohibiting application directly to water. This prohibition is already included on many labels and would not apply to conservation uses (*i.e.*, island eradication). This measure would ensure that rodenticides do not enter water bodies, which are not approved use sites. This mitigation measure is intended to reduce the potential for primary exposure.

6. Mandatory or advisory post-application follow-up statements for carcass search, collection, and disposal within the species' range and/or designated critical habitat. This mitigation measure could be used for all active ingredients and use patterns. For below-ground in-burrow applications made in fields and other non-structural use sites, users would need to monitor open burrows at specific times depending on the toxicity characteristics of the active ingredient (*e.g.*, how quickly the rodenticide causes mortality could be considered). This mitigation measure is intended to address secondary exposure by reducing rodenticide exposures of predators and scavengers with a high potential for secondary poisoning.

7. Post-application follow-up statements for bait-spill or bait kick-out. Removing spilled bait or bait that has been ejected from a burrow or disturbed by an animal is intended to reduce primary exposure by removing rodenticide bait at the soil surface.

8. Prohibiting use in areas or at times of the year when listed secondary consumers might be exposed (*i.e.*, if species are active or in the area). USFWS determined this measure was needed to protect listed species in the previous biological opinions for the rodenticide products Rozol Prairie Dog Bait and Kaput-D Prairie Dog Bait. This measure would reduce exposure to predators and scavengers and is intended to reduce the potential for secondary exposure.

9. Covering the burrow hole after applications made in fields and other non-structural use sites for appropriate species that live in closed burrow systems (*i.e.*, pocket gopher). This mitigation measure is intended to reduce exposure to primary consumers that might enter the burrow. This would not apply to all target species and would depend on their behavior. This measure would not apply to target species that live in open burrow systems (*i.e.*, Norway rat).

10. Updating the Terms and Conditions of Registration to include a clause that EPA will notify registrants upon issuance of the Biological Opinion if additional measures would be necessary and that the registrants agree to amend their product labeling or cancel their registrations as EPA determines are necessary based on any applicable final Biological Opinion.

11. Require the applicator to report dead or dying non-target animals to EPA's website (https:/www.epa.gov/pesticide-incidents) as soon as possible. This helps ensure that that impacts to non-target wildlife are tracked, so that adjustments to the label or bulletin instructions may be made.

These mitigation measures are important to discuss because they reflect future label changes that EPA may implement to pesticide products. In this section of their report, EPA has also included the following statement about indoor uses of rodenticides: "Registrants have inquired if these mitigation measures are applicable if they were to amend consumer product labels to indoor-only bait stations. Indoor use will not reasonably result in exposure to listed species or Critical Habitat (CH); therefore, those use patterns are No Effect (NE) for all species. Accordingly, EPA has not identified J/AM for indoor uses, and none of the listed species' mitigation in this strategy is relevant for indoor uses." More information on the full mitigation measures that EPA may implement, and data associated with making these determinations, can be found in the full Strategy in Appendix B-2.

While this is a nationally relevant conversation, it's important to note that in Maine, we have ten species that are federally listed as endangered or threatened (USFWS, 2025). Of these ten species, only one, the Canada Lynx (*Lynx canadensis*), is threatened and has an overall "May Affect" determination because of its potential for secondary exposure from the consumption of mammals.

IV. Board Authority and Regulation in Maine and Other states

BPC Authority

BPC is the state's lead agency with governance over pesticides in Maine. Primacy for enforcement is delegated to Maine by EPA through the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA, 7 U.S.C. §136-136y) and the Maine Revised Statutes Title 7 and Title 22. BPC is a 7-member public policy board with members appointed by the governor, that sets policy and makes decisions, including licensing applicators, registering pesticide products, and enforcing state/federal regulations. These members hold 4-year terms, and must be comprised of individuals that fulfill specific criteria outlined in 7 MRS §1471-B as follows:

To provide the knowledge and experience necessary for carrying out the duties of the board, the board must consist of the following members:

- *one person with practical experience and knowledge regarding the agricultural use of chemicals;*
- *one person who has practical experience and knowledge regarding the use of chemicals in forest management;*
- *one person from the medical community;*
- *a scientist from the University of Maine System specializing in agronomy, entomology or plant pathology having practical experience and expertise in integrated pest management;*
- *one commercial applicator;*
- *and 2 persons appointed to represent the public.*

The 2 members appointed to represent the public must have a demonstrated interest in environmental protection. A member appointed to represent the public may not have a financial interest in activities regulated by the board and may not be an individual who has been or is licensed, certified or given a permit in this State or any other state for activities regulated by the board. The term must be for 4 years, except that of the initial appointees, 2 serve 4-year terms, 2 serve 3-year terms, 2 serve 2-year terms and one serves a one-year term. Any vacancy must be filled by an appointment for the remainder of the unexpired term.

In addition to the Board, BPC is also comprised of staff, who are the individuals employed by the state to operate and facilitate the day-to-day functions of the Board. These operations include conducting Board meetings, registering pesticide products, administering

examinations and licensures, offering educational credits for existing licensees, toxicological guidance and research, enforcement and compliance of violations, among other tasks.

Rodenticide Regulations in Maine

There are no specific restrictions on using rodenticides in Maine. Currently, rodenticides and rodenticide baits are exempt from notification requirements in CMR 01-026 Chapter 26: Standards for Indoor Pesticide Applications and Notification for All Occupied Buildings Except K–12 Schools for the Maine Notification Registry, which is a list of property owners to be notified when applications are made within 250 feet of their property. Commercial applicators treating properties with rodenticides must have the proper licensing as outlined in CMR 01-026: Chapter 31: Certification and Licensing Provisions/Commercial Applicators, including a 7A Structural General Pest Control category. Private applicators and homeowners do not need a pesticide applicator license to use rodenticides on properties they own or lease.

Registrations

In Maine, there are 206 rodenticide pesticide products registered for use (Table 2). These products can be broken down into FGARs, SGARs, Non-Anticoagulants, and 25 (b) minimum risk products. Some states, like Maine, review and register 25 (b) products that are exempted from registration by EPA. These products are considered "minimum risk" by the agency, but they still must meet several conditions related to active ingredients, labeling requirements, and claims made. Nine of these products are classified as rodenticidal baits, according to Maine registration data.

Table 2. Registrations of rodenticides in Maine, generated on November 17, 2025. Given the changing nature of registrations, the number of registrations is likely to change after this list was generated.

Maine Rodenticide Registrations	**Number of 2025 Registrations**
First Generation Anti-Coagulants (FGARs)	**38**
Warfarin	4
Diphacinone	28
Chlorophacinone	6
Second Generation Anti-Coagulants (SGARs)	**62**
Brodifacoum	14
Bromadiolone	36
Difenacoum	2
Difethialone	10
Non-Anti-Coagulant	**97**
Bromethalin	67
Cholecalciferol	12
Zinc Phosphide	18
Minimum Risk (25b)	**9**
Corn Gluten[1]	6
Sodium Chloride	4
Cottonseed Oil	2
Soybean Oil	2

[1]Corn Gluten is the primary active ingredient in 6 minimum risk rodenticides and is paired with a secondary active ingredient, either sodium chloride or soybean oil.

Licensing

In Maine, commercial applicators have to follow guidelines outlined in CMR01-026 Chapter 31: Certification and Licensing Provisions/Commercial Applicators (Appendix E), which include passing a core exam, at least two category exams, and, for some individuals, a regulations and verbal master exam. For those seeking to apply for-hire rodenticide applications, individuals must complete a Category 7A: Structural General Pest Control exam to become certified in this area of application. Currently, there are 457 individuals with a 7A category on their licensure. While this category is specifically for individuals who apply rodenticides in outdoor residential settings, it also encompasses any individuals performing perimeter treatments with pesticides. It's possible that not all individuals in this category offer rodent control services and apply rodenticides.

Use Data

Maine collects use data from commercial applicators through annual summary reports as required by CMR 01-026 Chapter 50: Reports and Record Keeping (Appendix E-2). These reports are summaries of all pesticides that commercial applicators use in a calendar year, and the aggregate reports from companies are required to be submitted electronically through BPC's portal, the Maine Pesticide Enforcement, Registration, and Licensing Software (MEPERLS). These reports are self-entered by companies, and accuracy lies with the entering party. While BPC does collect and summarize this information, it does not have the resources or staff to assess or refine the data submitted for quality control or quality assurance. Therefore, these data below may be inaccurate or incomplete (Figure 1).

Most rodenticidal baits have low concentrations of active ingredients, often less than 1%, and the totals in Figure 1 represent only the total pounds of active ingredients. Some active ingredients may not have had any products registered in the years sampled. Between 2018 and 2020, zinc phosphide was used the most by commercial applicators, and in 2021, soybean oil was the most used active ingredient. According to these reports, a total of 11.398 lbs, 2.550 lbs, 15.281 lbs, and 2.140 lbs of rodenticides were used in 2018, 2019, 2020, and 2021, respectively.

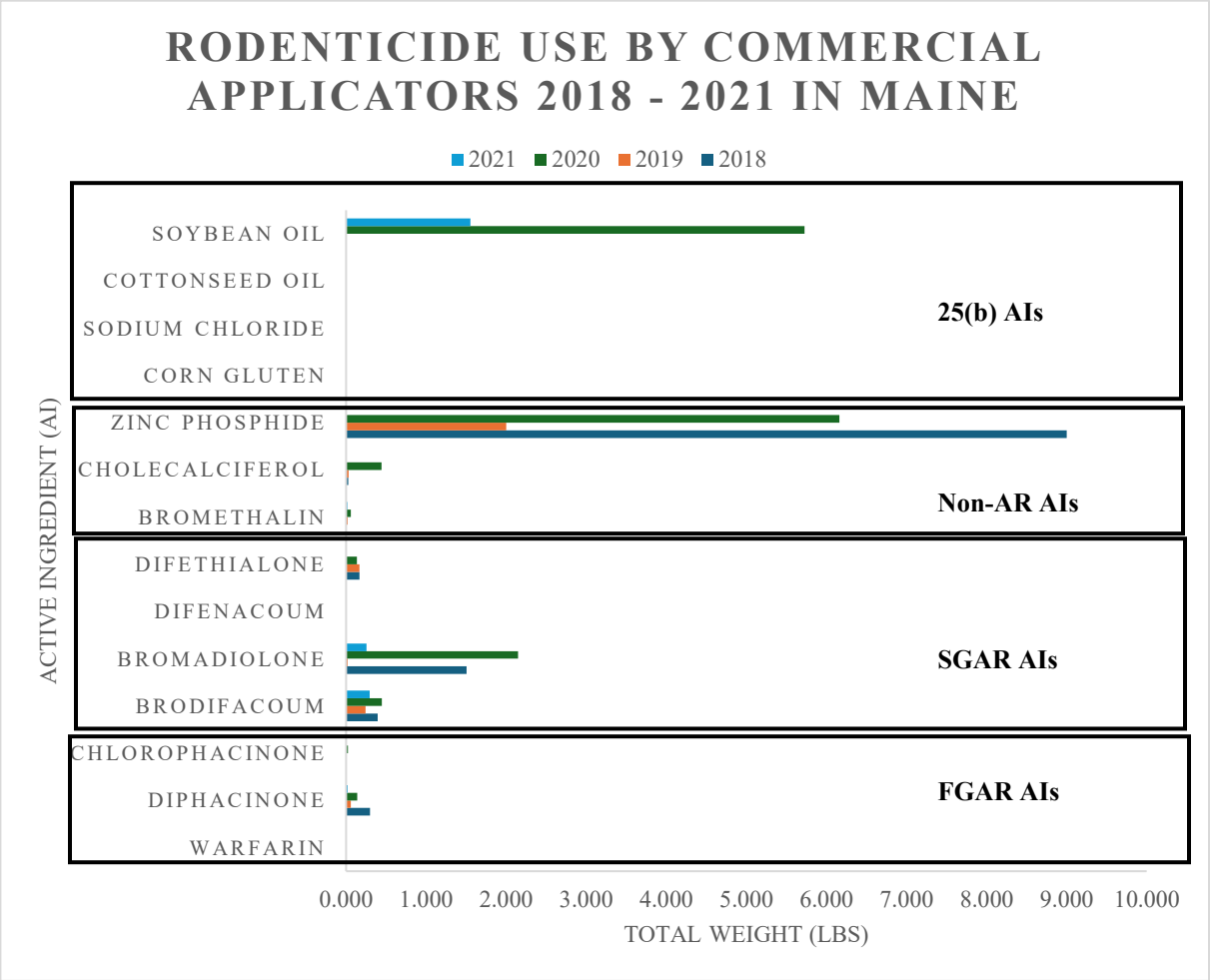

Figure 1. Aggregated total use by weight (lbs) of rodenticide active ingredients by commercial applicators between 2018 – 2021 in Maine. Data is presented by type, with 25(b) AIs referencing 25 (b) FIFRA exempt active ingredients, Non-AR AIs referencing non-anticoagulant rodenticides, SGAR AIs referencing Second Generation Anticoagulant Rodenticides, and FGAR AIs referencing First Generation Anticoagulant Rodenticides. Data is aggregated from commercial applicator summary use reports.

Regulations and Legislation in Other States

Regulations on rodenticides vary from state to state. Some states have implemented restrictions on rodenticides, including making SGARs restricted-use pesticides, due to their heightened risk for secondary and tertiary exposure. A restricted-use pesticide may only be purchased and used by a certified applicator and may only be sold and/or distributed by a licensed restricted-use pesticide dealer.

California

A recent revision was made to Food and Agricultural Code (FAC) section 12978.7 by Assembly Bill (AB) 2552 (Chapter 571, Statutes of 2024). Effective January 1, 2025, most uses of FGARs chlorophacinone and warfarin are prohibited. Under the amended law, most uses of FGARs and SGARs are prohibited. Prohibitions include residential or home uses and most industrial and institutional uses, such as use in and around restaurants (that do not have an attached brewery or winery), grocery stores, airports, offices, construction sites, ports and terminal buildings, shipyards, timber yards,

schools, shopping malls, sewers, and sewage treatment plants. In addition, uses of FGARs or SGARs on many non-production agricultural sites (such as cemeteries, golf courses, parks, highways, and railroads) are also prohibited. Use of an FGAR or SGAR in a wildlife habitat area is also prohibited unless the use meets one of the exemptions.

Connecticut
Pursuant to the recently passed Public Act No. 25-33, starting January 1, 2026, all second-generation anticoagulants are classified as restricted-use pesticides.

Rhode Island
Rhode Island Pesticide Regulation 250-RICR-40-15-2 requires that a bait box has attached to it or contained therein a readable label with the following information: Brand or trade name; EPA registration number; name and percentage of active ingredients in the bait box; and, appropriate signal word; that is, "Danger-Poison," "Warning," or "Caution," as stated on the pesticide label and the name, address, and phone number of the pest control company placing the bait box.

South Carolina
Pursuant to Code of Regulations Ch.27 § 1075 Sec. B, South Carolina's pesticide regulatory authority (Clemson University Department of Pesticide Regulations (DPR)) imposed a temporary restricted-use designation for SGARs effective February 1, 2025. In November of 2025, DPR extended this designation indefinitely.

Vermont
As a result of recently passed legislation under 6 V.S.A. § 918, SGARs are classified as restricted-use pesticides in the State of Vermont.

Washington
Washington Administrative Code 16-228 § 1380 includes requirements for outdoor, above-ground use of rodenticidal baits, including mandatory use of tamper-resistant bait stations that are clearly labeled with applicator and active ingredient information.

Massachusetts
A recent petition in 2024 by the Harvard Law School Animal Law and Policy Clinic requested immediate suspensions of all anticoagulant rodenticides (ARs). In response, the Massachusetts Pesticide Board Subcommittee contracted with an independent research group to develop a 3-phase study on ARs, including their toxicity, effect on human health and the environment, reasonable alternatives, and recommendations. Phase 2 of the study was recently completed, and the final report was published in October 2025. (Appendix C).

Rodenticides and Rodent Populations

It is globally accepted that proximity to human food sources is the major contributing factor that predicts invasive rat infestations and urban rat populations; native rat populations are less reliant on human food waste. A recent study in California estimated the population fluxes of native and invasive rats prior to and during the COVID lockdown, when human-induced food sources were rapidly curtailed (Shukla and Wilmers, 2024). Predictably, depletion of human garbage and food waste decreased invasive rat activity, but had no effect on native rats. The authors conclude that while rodenticides might offer a short-term benefit to controlling rodents, more effective strategies employ structural changes that limit rats' access to food

waste. This same conclusion (*i.e.,* that rodenticides alone inadequately control rat populations) was drawn by scientists in Brazil who monitored the effectiveness of different strategies to control rodents over a three-year timespan (Awoniyi et al., 2022; Pertile et al., 2022).

More recently, a 2025 study revealed that rat populations are increasing in most American cities, despite the fact that some municipalities have enacted aggressive rodenticide campaigns aimed at controlling these pests (Richardson et al., 2025). The researchers observed that cities with the greatest rate of temperature increase and urbanization experienced the largest increase in rat populations. These two predictive factors increase the food supply and foraging time for rats. New Orleans was one of two American cities that witnessed a decrease in the urban rat population. Notably, New Orleans has experienced a population decline since Hurricane Katrina.

Although California and British Columbia have recently enacted a ban on anti-coagulant rodenticides, it is still too early to determine how these new policies will affect local rodent populations. Caution should be implemented when pest management companies infer that bans will increase rodent populations. Due to the myriad factors that dictate rodent ecology and population levels, there will be hurdles to designing a cost-effective experiment that will allow researchers to tease out factors and isolate whether or not a rodenticide ban alters rodent populations in an urban setting.

Rodenticide Stakeholder Survey Results

An anonymous stakeholder survey was sent to applicators, pesticide product registrants, growers, and interested parties to gather more information about the impacts of a prohibition of rodenticides through BPC's GovDelivery listserv. It was also included in BPC's 2025 monthly updates for September, October, and November. In total, there were 38 respondents, with the majority from pesticide product registrants or industry representatives (Figure 2, Table 3).

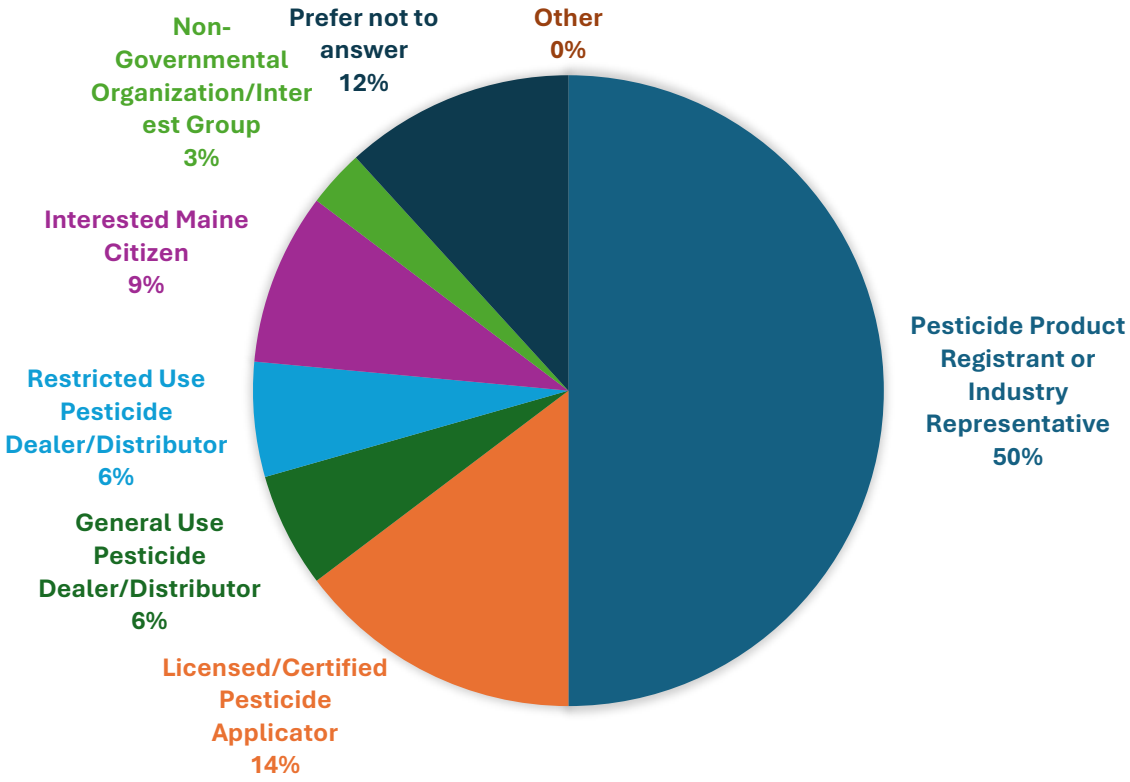

Figure 2. Broad industries or identities of respondents from BPC's 2025 rodenticide stakeholder survey.

Table 3. Survey questions with yes or no answers from the rodenticide stakeholder survey.

Question	Yes	No
If First Generation Anticoagulant Rodenticides, FGARs, become state-restricted-use pesticides, will it have a negative impact for you or your company?	24	14
If Second Generation Anticoagulant Rodenticides, SGARs, become state-restricted-use pesticides, will it have a negative impact for you or your company?	24	14
Should it be required that all outdoor use of rodenticides be confined to tamper-resistant bait boxes?	20	18
Should it be required that all tamper-resistant bait boxes be anchored when used outdoors?	11	27
Should it be required that all outdoor bait boxes be labeled with the name and contact information of the pest management professional or other individual responsible for maintaining them?	17	21
Should the use of rodenticides, including rodenticidal baits, be prohibited in outdoor residential settings, with exemptions for licensed certified applicators?	6	32

One of the questions was an open-ended long response where individuals could give their written feedback on how this Resolve could be implemented. A total of 30 respondents answered this question. A full list of responses can be found in Table 4.

Table 4. Answers to the long-answer question from the rodenticide stakeholder survey soliciting feedback about what the Board should do to implement this Resolve.

#	Given that the Board must make policy or rulemaking changes to implement this resolve, what additional feedback would you like to provide to the Board?
1	The requirement that only certified applicators may apply rodenticides outdoors is expensive and exclusionary. Those individuals in the community who are underprivileged will no longer have an affordable means to manage their rodent control.
2	Restricted use would increase my business influx and I would not be sitting home...I spend hours and hours maintaining license requirements only to be under cut by an illegally operating landscaper just reading the pictures and admiring the flowers on the front of the label... Increase the Restricted level and penalties for unlicensed applications...we have forever chems in our drinking water because of human stupidity...seriously...let's be more responsible ...birds eat rodents mammals eat birds humans eat birds and mammals... Poison kills more than just its target...
3	Do what is best for the greater community.
4	Is certified same as licensed? May need clarity.
5	The ban would not only have a negative impact on our company but a negative impact on human health. Rodents carry and transmit numerous diseases and by not controlling them, the risk of transmission to humans increases. Additionally, many households can not afford to hire a professional pest control applicator
6	Making all rodenticides restricted use by certified, trained individuals should be the first step before a blanket ban. Strengthen the rules and regs, strengthen the accountability, strengthen the paper trail.
7	The label is the law, pesticides are used to protect people, animals and our food from harm. If instructions are being followed there should be no issues using Rodenticides in outdoor setting. Like with anything responsible use and education should be the focus not a restriction.
8	I realize this survey is residential focused and that does likely need attention from rule makers. However, we are focused on agricultural use that very much needs the ability for responsible purchase and application of second generation anticoagulants in the agricultural setting. Not suggesting that warnings or training should not be included somewhere but it will be detrimental for these products to be fully restricted. We currently manufacture and sell larger quantities of products that would not be applicable to residential use and therefore are intended for ag use.
9	Changing this policy would affect our business by over $100k a year.
10	prohibiting these types items will have a massive impact on rat/mouse population and we'll be overrun
11	In other states where there have been bans, they are seeing an astounding resurging of rodent activity & related damages & risks to personal, crops, disease etc
12	please dont restrict
13	Heavy regulations could easily allow for an explosion of the rat population, increasing disease and property damage.
14	Due to past regulations, you have forced the consumer to purchase more product necessary to control rodents. This leaves unused product laying around where non-targeted animals or children might get into the rodenticide. The consumer should be able to purchase their needs. The restriction California has placed on rodenticides have created a rodent problem for the people. If you follow the same guidelines of restrictions, then we can look to have an over population of rodents in this Country that occur in third World Countries.

15	Rodenticides are necessary to keep the rodent population down. Further regulation would put the general population at a health risk.
16	$100k or more of negative fiscal impact
17	please do not restrict the use of first or second generation anticoagulants
18	There are not enough licensed applicators to be able to keep up with the demand/need for application of rodenticides.
19	This would negatively impact my business.
20	The rodent population will multiply quickly because acreages and farms won't pay that kind of money for a professional. Low-income people can't afford professional exterminators. This is not a good solution. 1 mouse can have 7 litters in a season. Average litter size is 5. That is 35 new mice from 1 mouse. Then there are rats, etc. Don't make rodent control harder or it gets out of control quickly along with the diseases they spread.
21	We believe what's been proposed is too restrictive.
22	Allow citizens to use these products to best manage rodent problems on their private properties.
23	I support the resolve and hope the Board promulgates effective rules.
24	My company has scientific data spanning over two years that the use of our completely non toxic rodenticide is completely effective and safe for eliminating rodents both indoors and outdoors. I recommend that the regulation explicitly exclude non toxic rodenticides from this regulations and encourage their use by providing incentives to exterminators and property owners.
25	We need products that work and kill unwanted animals, restricting anticoagulants for consumers and pushing them to pesticide companies doesn't always address problem and you rely on unwanted people outside your home.
26	Questions #5. and #6. should apply to FGARS, SGARS and to Professional Use only.
27	Questions #5 (re: anchoring all tamper-resistant bait boxes) and #6 (re: labeling all outdoor bait boxes) should apply only to FGARS, SGARS and to Professional Use.
28	This proposed rule is moot and unenforceable. The Board of Pesticides Control does not have the means or authority to effectively monitor or enforce private citizens using rodenticides outside their own homes. Enforcement would depend entirely on reports from other private individuals assuming those citizens even knew this regulation existed. In reality, most homeowners would never be aware of such a rule. While ignorance of the law is not a valid excuse, it is unreasonable to expect compliance with a regulation that is neither visible nor practical to communicate to the public. Rodenticides already have federally mandated labeling that clearly outlines legal and prohibited uses, including specific restrictions on outdoor placement. Those requirements are routinely ignored, which highlights a lack of enforcement and education—not a lack of regulation. Adding another unenforceable layer will not change behavior. The proposed restriction also fails in its own logic. It prohibits exterior use but still allows the same individuals to purchase and apply rodenticides indoors, where exposure risks to children and pets are even higher. The rule assumes that the same people who disregard label directions outdoors will somehow act responsibly indoors, which is careless and inconsistent.

	Ultimately, this measure appears to exist solely for the sake of creating a new rule rather than solving an existing problem. It will not produce measurable benefits, reduce misuse, or improve safety. It simply adds another rule that cannot realistically be enforced and diverts time and resources from more meaningful initiatives, like education, outreach, and enforcement of existing label laws.
29	I believe restricting outdoor pesticide use in residential settings may negatively affect the many small rural farms in the state that manage rodents without professional pesticide application firms. Profit margins on farms is very tight. Requiring them to hire a pesticide applicator for outdoor rodent control will affect their income.
30	RUP/ Certified Applicator comment - rural and low-income communities will be impacted by this change. Licensed applicators may not be widely available in rural areas; additionally low-income families may not be able to afford a certified applicator. Bait stations - the label specifies when a secured station is necessary. This provides the applicator to assess based on the specific site. Outdoor use of rodenticides - burrow baiting (*i.e.*, Norway rats) and field baiting (*i.e.*, for voles) is essential to rodent control

Table 5. Answers to the question related to the fiscal impact of restricting the use of all rodenticides in the rodenticide stakeholder survey.

Question: Would there be a NEGATIVE fiscal impact to you or your business if the Board were to categorize all or some types of rodenticides as "restricted-use" under Maine law?	
Yes	24
No	0
I don’t know	1

Finally, respondents were asked about the fiscal impact on themselves or their company. A total of 24 respondents answered, wherein 88% responded that there would be a negative fiscal impact of greater than $100,000, 8% responded that there would be a negative fiscal impact of $25,000 to $50,000, and 4% responded that “they did not have any revenue in Maine at this time.” There was also a question related to positive fiscal impacts, but no respondents answered that question. The Board has reviewed these answers and continues to weigh its options for rulemaking using this and other stakeholder input.

V. Timeline for Implementation

Timeline for implementation of LD 356

The Board has taken time to solicit stakeholder input and research what other states are currently pursuing for rodenticide-related issues. Official rulemaking must follow the Administrative Procedure Act (APA, 5 MRS § 8001), which can take upwards of 6 months to over a year to complete. While the Board has solicited stakeholder input prior to making its rulemaking proposals, a full public hearing will be held in accordance with the APA to solicit more public comment while developing these rules. The Board will take these rulemaking

comments and make further changes as necessary. BPC anticipates final rulemaking and additional policies supporting new rules will be completed in 2026.

VI. Discussion and Recommendations

Board Discussions

The Board has met five times since the Resolve was passed in June 2025. The Board may pursue rulemaking, but has opted to gather more information, discuss additional actions that can be taken, and to continue its discussions until it finds a solution that addresses its concerns. The major concerns the Board has identified are:

- As proposed, rulemaking that only restricts use in outdoor residential settings could be difficult to implement and may not satisfy the original intent of the Resolve.
- If the Board fully prohibits or restricts the use of FGARs, SGARs, or all ARs, it may be exclusionary to individuals who cannot afford to hire certified applicators or are not in proximity to a serviced area.
- If the Board fully prohibits or restricts the use of FGARs, SGARs, or all ARs, it may increase crop or agricultural injury if growers do not have access to these materials.
- Any prohibition or restriction that is exclusionary to some individuals could also exacerbate rodent populations, as people won't have access to chemical control options.
- Prohibition or restriction of the most potent products, SGARs, could lead to pesticide resistance in rodent populations as more individuals use less potent FGARs more often.
- Currently, many applicators may treat at a level for rats, but do not seek evidence to identify if rats are present. Requiring evidence may be more burdensome for companies and would require more applicator training.
- The Board has identified that the unregulated community, including homeowners, property owners, renters, and the general public, is the group that need the most education when it comes to rodenticides and their risks.
- The Board would like to take an interdisciplinary approach that balances property owner access, reduces secondary exposures to pets and wildlife, and ensures that mistreatments are properly documented and enforced.

The full meeting minutes of the Board discussions are available in Appendix D.

Gaps in Proposed Regulations

The initial ask of this Resolve was to implement rules that would prohibit the use of rodenticides, including rodenticidal baits, in outdoor residential settings with exemptions for

certified (BPC licensed commercial and private) applicators. There are a few hurdles in implementing rules and regulations to satisfy this Resolve as written.

1. "Outdoor Residential Settings" – BPC does not currently have definitions for outdoor residential settings. Staff have been using CMR01-026 Chapter 10: Definitions Sec. CCC (8)(a) "Sensitive Areas Likely to Be Occupied, Residential Buildings" to define this term, but it may not be wholly sufficient.

2. Prohibiting specific rodenticide applications and use types, like "Outdoor Residential Settings," presents a challenge for Board staff. Ensuring an accurate list requires intensive label interpretation and constant surveillance of label updates from product registrants and the EPA. Database tools, like the National Pesticide Information and Registration System (NPIRS), can assist in creating an annual list; however, it may be incomplete if the registrant has not listed all possible use types. Furthermore, restriction of a single-use type would not restrict the language on labels distributed nationally. Products in Maine would still outline instructions for the restricted use in the Directions for Use section of the label, which, without public outreach to educate homeowners, could cause confusion.

3. If, instead of prohibiting based on use types, the Board makes either all or some types of rodenticides restricted use, there may be issues with homeowner and grower access to these materials if they do not have a pesticide license that allows them to apply restricted-use products. While this may be the intent of the Resolve, it may also cause issues since many individuals cannot afford to hire services for rodent control. This may lead to an influx in online purchases of restricted-use products by unauthorized individuals or increases in rodent populations where there is either a lack of services offered or a lack of individuals able to fund services.

Future Recommendations

During their discussions, the Board has considered several paths forward to addressing applicator and public concerns. Applicators, including those who use rodenticides in agricultural settings, have concerns that a lack of access to these products will increase rodent populations, which may present human health hazards. Additionally, lack of access to applicators in rural areas will also mean that rodent populations could increase in people's homes and businesses. If home and property owners can only hire qualified entities for these services, some individuals may not be able to afford these services long term.

As this discussion has continued, the Board has identified the need for multiple tactics to address these issues. Some of the potential solutions to these concerns are listed below and could be implemented as rulemaking or policy.

- Required signage when purchasing rodenticide products that outlines risks and hazards associated with rodenticide use.

- Required educational materials to be handed out to homeowners or property owners that seek rodent control services, including information related to pet-related illness that may result from secondary exposures.

- Restrictions that only pertain to SGARs that are more potent and typically kill rodents in a single use.

- Restrictions that do not just pertain to outdoor residential settings, but across all uses of rodenticides.

- Required use of tamper-resistant bait stations that are anchored to the ground and cannot be moved.

- Requirements for the name, Company, and additional information about the person or company that maintains bait stations to be put on the bait stations externally.

- Requiring that Integrated Pest Management (IPM) be used for rodenticide treatments, including requiring applicators to document types of evidence found for specific rodent types (*i.e.*, mice, rats, voles).

- An overhaul of educational outreach about rodenticides, including the potential creation of Best Management Practices (BMPs) for rodenticides in Maine.

    - Creation of a municipal battle book for rodent populations for towns

As the Board continues to pursue rulemaking to fulfill the Resolve, they will also be considering additional measures that may increase the efficacy of future regulation as they solicit feedback from stakeholders and the public.

Alternatives and IPM

It is essential to note that rodenticides are tools used by homeowners, applicators, and growers to manage rodents, as other management tactics are often insufficient. Oftentimes, these materials are used in conjunction with other tactics, known as IPM, to control rodent populations. IPM programs for rodents often include exclusionary methods to prevent rodents from entering areas in the first place, such as sealing cracks and crevices where they may reside, removing food sources, and using mechanical traps. Additionally, there are new products and technologies on the market that may work to control rodent populations, including birth control products that reduce fertility in mice and rat populations and electric traps that shock rodents to humanely euthanize them.

BPC currently maintains information and resources on rodents and mice on the GotPests.org webpage. While useful, during research for this report, it was determined that there may be a need for a rodent BMP document that can better assist applicators and homeowners who are looking to create a rodent IPM program. The Board will continue to discuss potential development of outreach and educational resources for applicators, growers, and homeowners related to rodent control issues.

Report Considerations

The Board is often tasked with completing legislative reports without additional fiscal support and at the beginning of the next legislative session. Within BPC, work on this Resolve has extensively included the Director, Pesticides Toxicologist, Policy and Regulations Specialist, and also involved the Pesticides Registrar, Manager of Compliance, and Manager of Pesticide

Programs. This has required staff time during busy periods, such as the renewal period for registrations, the renewal period for applicator licensure and spray contracting firms, the obsolete pesticide collection program, and general assistance with inquiries. Future requests for research and legislative reports might consider adding additional resources to complete these tasks.

On January 14, 2026, the Board voted to enter rulemaking to make the four second-generation anticoagulant rodenticides (brodifacoum, bromadiolone, difethialone, difenacoum) restricted-use pesticides in the State of Maine. The addition of these rodenticides to Chapter 40: Maine Restricted and Limited Use Pesticides will mean that they may be only sold to and used by certified/licensed pesticide applicators and may only be sold by licensed restricted-use pesticide dealers.

VII. Appendices

Appendix A: LD 356: Resolve, Directing the Board of Pesticides Control to Prohibit the Use of Rodenticides in Outdoor Residential Settings

Appendix B-1: EPA Biological Evaluations

Appendix B-2: Rodenticide Strategy for 11 Rodenticide Active Ingredients

Appendix C: MDAR Anticoagulant Rodenticides Scientific Review Final Report

Appendix D: Board Meeting Minutes of Rodenticide Discussions

Appendix E: Rules, CMR 01-026 Chapter 50: Record Keeping and Reporting Requirements and Chapter 31: Certification and Licensing Provisions/Commercial Applicators

References

Awoniyi, A. M., Venegas-Vargas, C., Souza, F. N., Zeppelini, C. G., Hacker, K. P., Carvalho-Pereira, T., Marins, C. L., De Santana, M. C., Pertile, A. C., Begon, M., Ko, A. I., Diggle, P. J., Reis, M. G., Childs, J. E., Da Silva, E. M., Costa, F., & Khalil, H. (2022). Population dynamics of synanthropic rodents after a chemical and infrastructural intervention in an urban low-income community. *Scientific Reports*, 12(1), 10109. https://doi.org/10.1038/s41598-022-14474-6

EPA. (2025). *Restrictions on Rodenticide Products*. United States Environmental Protection Agency. https://www.epa.gov/rodenticides/restrictions-rodenticide-products

Kopanke, J. H., Horak, K. E., Musselman, E., Miller, C. A., Bennett, K., Olver, C. S., Volker, S. F., VandeWoude, S., & Bevins, S. N. (2018). Effects of low-level brodifacoum exposure on the feline immune response. *Scientific Reports*, 8(1): 8168. https://doi.org/10.1038/s41598-018-26558-3

Maron, D. F. (2024). Rat poison's long reach. *Science*, *385*(6705), 134–137. https://doi.org/10.1126/science.adr5941

Mercer, M.A., Davis, J.L., Riviere, J.E., Baynes, R.E., Tell, L.A., Jaberi-Douraki, M., Maunsell, F.P. and Lin, Z., (2022). Mechanisms of toxicity and residue considerations of rodenticide exposure in food Animals—a FARAD perspective. *Journal of the American Veterinary Medical Association*, *260*(5), pp.514-523.

Murray, M. (2017). Anticoagulant rodenticide exposure and toxicosis in four species of birds of prey in Massachusetts, USA, 2012–2016, in relation to use of rodenticides by pest management professionals. *Ecotoxicology*. *26*(8), 1041–1050. https://doi.org/10.1007/s10646-017-1832-1

Murray, M. (2020). Continued Anticoagulant Rodenticide Exposure of Red-tailed Hawks (Buteo jamaicensis) in the Northeastern United States with an Evaluation of Serum for Biomonitoring. *Environmental Toxicology and Chemistry*, *39*(11), 2325–2335. https://doi.org/10.1002/etc.4853

New England Wildlife Center. (2023). *Eagle's Death Linked to Rodent Poison.* Maine Public, WMEH, 3 Mar. 2023. https://www.mainepublic.org/2023-03-02/eagles-death-linked-to-rodent-poison

Niedringhaus, K. D., Nemeth, N. M., Gibbs, S., Zimmerman, J., Shender, L., Slankard, K., Fenton, H., Charlie, B., Dalton, M. F., Elsmo, E. J., Poppenga, R., Millsap, B., & Ruder, M. G. (2021). Anticoagulant rodenticide exposure and toxicosis in bald eagles (Haliaeetus leucocephalus) and golden eagles (Aquila chrysaetos) in the United States. *PLoS ONE*, *16*(4), e0246134. https://doi.org/10.1371/journal.pone.0246134

Pertile, A. C., Lustosa, R., Carvalho-Pereira, T., Pedra, G. G., Panti-May, J. A., Oliveira, U., Zeppelini, C. G., Souza, F. N., Oliveira, D. S., Khalil, H., Reis, M. G., Childs, J., Ko,

A. I., Begon, M., & Costa, F. (2022). Evaluation of the impact of chemical control on the ecology of Rattus norvegicus of an urban community in Salvador, Brazil. *PLoS ONE*, *17*(7), e0270568. https://doi.org/10.1371/journal.pone.0270568

Richardson, J. L., McCoy, E. P., Parlavecchio, N., Szykowny, R., Beech-Brown, E., Buijs, J. A., Buckley, J., Corrigan, R. M., Costa, F., DeLaney, R., Denny, R., Helms, L., Lee, W., Murray, M. H., Riegel, C., Souza, F. N., Ulrich, J., Why, A., & Kiyokawa, Y. (2025). Increasing rat numbers in cities are linked to climate warming, urbanization, and human population. *Science Advances*, *11*(5), eads6782. https://doi.org/10.1126/sciadv.ads6782

Shukla, I., & Wilmers, C. C. (2024). Waste reduction decreases rat activity from peri-urban environment. *PLoS ONE*, *19*(11), e0308917. https://doi.org/10.1371/journal.pone.0308917

Serieys, L.E., Armenta, T.C., Moriarty, J.G., Boydston, E.E., Lyren, L.M., Poppenga, R.H., Crooks, K.R., Wayne, R.K. and Riley, S.P., (2015). Anticoagulant rodenticides in urban bobcats: exposure, risk factors and potential effects based on a 16-year study. *Ecotoxicology*, *24*(4), pp.844-862.

Silveira, G., Frair, J. L., Murphy, L., Ellis, J. C., Needle, D., Cunningham, S. A., Watson, A., Facka, A., Tate, P., Webb, S., Royar, K., Bernier, C., Keller, T., & Schuler, K. (2024). Drivers of anticoagulant rodenticide exposure in fishers (Pekania pennanti) across the northeastern United States. *Frontiers in Ecology and Evolution*, *12*. https://doi.org/10.3389/fevo.2024.1304659

USFWS. 2025. *Listed species with spatial current range believed to or known to occur in Maine*. United States Fish and Wildlife Service. https://ecos.fws.gov/ecp/report/species-listings-by-state?stateAbbrev=ME&stateName=Maine&statusCategory=Listed