NEW YORK STATE | Department of Environmental Conservation

MINIMIZING RISKS TO WILDLIFE AND PEOPLE FROM LEAD HUNTING AMMUNITION

A Report of the New York State Lead Ammunition Working Group

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Minimizing Risks to Wildlife and People from Lead Hunting Ammunition

Executive Summary

Hunting is a proud and economically important tradition across New York and is essential to advance the state's conservation efforts while providing an important source of food for thousands of state residents. Minimizing risks to wildlife and people from lead hunting ammunition is a high priority for both the New York State Department of Environmental Conservation (DEC) and the New York State Department of Health (DOH). For this reason, and due to the social, political, economic, and ecological complexity of this issue, the New York State "Lead Ammunition Working Group" was formed in December 2020.

The charge to the Working Group, which is comprised of staff from DEC, DOH, Cornell University's Wildlife Health Program, the Venison Donation Coalition, the New York State Conservation Council, and Audubon New York, was to conduct a comprehensive examination of the risks posed by lead hunting ammunition to wildlife and people and recommend actions to minimize those risks. This included identifying and engaging key interest groups and determining how they could contribute to this effort. The damaging effects of lead exposure to humans and wildlife are well studied. Lead fragments left behind after a big game animal is harvested can remain in the meat, carcass, and within the gut pile, potentially exposing people and scavenging wildlife to lead via consumption.

During their examination of this issue, the Working Group conducted research to understand hunters' ammunition use and views on lead ammunition and non-lead alternatives and consulted with experts from state fish and wildlife agencies, state and county health and nutrition programs, non-governmental conservation groups, deer processing and venison donation organizations, and the ammunition manufacturing and retail industry.

Based on the information received from these experts, peer-reviewed literature, and from New York hunters, the Working Group prepared a comprehensive assessment of this issue and developed a suite of prioritized recommendations to minimize risks to wildlife and people from lead hunting ammunition. Recommended actions include:

- Advancing strategic educational outreach to increase public understanding of the potential and realized impacts of lead hunting ammunition on wildlife and people and encourage hunters to use non-lead alternatives;
- Developing and disseminating best management practices to hunters, deer processors, and food pantries to minimize the presence of lead on the landscape and in game meat consumed by people;
- Developing programs to increase supply, availability, and use of non-lead hunting ammunition; and
- Conducting research to further understand the scope and extent of impacts of lead hunting ammunition on people and wildlife.

These recommendations will require collaborative effort from DEC, DOH, and key stakeholders. DEC and DOH are best positioned to take the lead on many of the recommended actions, but some will be more effectively advanced by non-governmental groups, stakeholders, and others.

In addition to a thorough issue assessment and recommended actions to minimize risks, the report describes why several actions were considered but not recommended, including a ban on lead-based ammunition via law or regulation. Such a ban would be challenging to advance and based on research conducted by the Working Group would come with significant social costs, potentially compromising the effectiveness of other conservation efforts.

The Working Group supports implementation of the actions outlined in this report which will minimize the risks to people and wildlife posed by lead hunting ammunition. Success will require state agencies, partners, and stakeholders to work collaboratively and manage adaptively by evaluating the effectiveness of actions, learning from these actions, and making adjustments as needed.

While positive outcomes are anticipated to be realized in the near-term for many of the recommended actions, others will take more time for benefits to be realized.

The Working Group concludes that by embracing non-lead ammunition, New York's hunters will continue their conservation legacy, protecting wildlife and the people who benefit from that resource, as well as the State's longstanding and proud hunting traditions.

Minimizing Risks to Wildlife and People from Lead Hunting Ammunition

Issue Assessment and Recommended Actions

Background

The damaging effects of lead exposure to humans and wildlife are well studied. Lead fragments left behind after a big game animal is harvested can remain in the meat, carcass, and within the gut pile potentially exposing people and scavenging wildlife to lead via consumption. Similarly, lead pellets in small game may be consumed by humans after the animal is prepared or by scavenging wildlife if the animal is wounded or field dressed.

Several states have taken actions to minimize the risks posed by lead ammunition used for hunting ranging from outreach and education encouraging voluntary adoption of non-lead ammunition (e.g., New York), statutory or regulatory approaches that limit when and where lead ammunition can be used, or prohibition on the use of lead ammunition for hunting altogether (e.g., California). Each of the approaches has benefits and costs, and effectiveness varies.

State agencies and others who have studied this complex issue have recognized the importance of bringing together all interest groups to find safe alternatives, develop new educational and policy initiatives, identify ways to reduce or eliminate the risks associated with use of lead-based hunting ammunition, and clean-up existing problems. A comprehensive review of the problems posed by using lead ammunition for hunting in New York and identification of actions to alleviate those problems is needed.

Minimizing risks to wildlife and people from lead hunting ammunition is a high priority for both the New York State Department of Environmental Conservation (DEC) and the New York State Department of Health (DOH). For this reason, and due to the social, political, economic, and ecological complexity of this issue, the New York State (NYS) “Lead Ammunition Working Group” (Working Group) was formed in December 2020 (Appendix 1).

The charge to the Working Group was to conduct a comprehensive examination of the risks posed by lead hunting ammunition to wildlife and people and recommend actions to minimize those risks. This included identifying and engaging key interest groups (both internal and external) and determining how they could contribute to this effort.

While there are concerns about lead exposure to recreational shooters and deposition of spent lead shot from shotgun and target shooting sports, the focus of the Working Group was the risks posed by lead ammunition used by hunters to take game.

The Working Group is comprised of staff from DEC and DOH, Cornell University's Wildlife Health Program, the Venison Donation Coalition, the New York State Conservation Council, and Audubon New York. During their examination of this issue, they consulted with experts from:

- state agencies across the country who have dealt with both the wildlife health and human health aspects of this issue;
- non-governmental conservation groups working to reduce lead exposure to vulnerable wildlife;
- DOH and Cornell Cooperative Extension who work extensively with the public on nutrition, contaminants, toxicology, and human health;
- deer processing industry and venison donation programs; and
- ammunition manufacturing and retail to understand costs, supply, and demand.

Based on what they learned from these experts and the peer-reviewed literature, they developed an "Issue Assessment" summary and sought review and feedback on this document from stakeholders.

Stakeholder Review and Input

Prior to developing recommendations on ways to address the effects of lead hunting ammunition, the Working Group sought review and input from stakeholders to make sure that the diversity of perspectives was captured in the Working Group's assessment of the issue. The draft "Issue Assessment" document was sent to 44 representatives of stakeholder groups reflecting a diverse range of interests including wildlife rehabilitation, wildlife conservation, human health and nutrition, animal health, law enforcement, hunter education, hunting, and shooting sports.

The stakeholder group representatives were asked to review the draft assessment to identify the degree to which the information presented accurately reflected the current understanding of the issue and desired future conditions associated with lead and non-lead hunting ammunition, and to share any clarification questions, offer additions, or suggest other modifications. The Working Group is grateful to all the group representatives that took the time to review the draft issue assessment and provide thoughtful, constructive comments. Their input was invaluable in revising it to better reflect the needs, interests, and concerns of the people and wildlife affected by this issue.

In addition to review of the draft issue assessment, an online survey was sent to 25,000 randomly selected New York State hunting license holders. The goal of the survey was to better understand hunters' ammunition use and views on lead ammunition and non-lead alternatives. Results are incorporated throughout this document and are provided in Appendix 2. The survey also established a baseline against which the effectiveness of actions taken by DEC, DOH, and their partners will be measured.

Issue Assessment

Information about the risks of lead hunting ammunition to wildlife and people is divided into five broad themes:

1) Protect Wildlife Health
2) Protect Human Health
3) Ensure Sufficient Demand & Supply of Non-lead Alternatives

4) Foster Effective Communication and Messaging around Lead and Non-lead Ammunition; and
5) Establish and Maintain Capacity and Support for Efforts to Reduce the Impacts of Lead Ammunition

For each theme, the current knowledge and conditions were identified, as well as the "desired future conditions" that would be achieved if the concerns associated with lead hunting ammunition were addressed. In addition, the Working Group identified challenges and opportunities that would limit or facilitate the ability to achieve the desired future conditions.

This "Issue Assessment" is not a technical analysis. It is a high-level summary of the biological, social, political, and institutional elements associated with the impacts of lead hunting ammunition. Though this is not a technical document, citations are provided for the technical publications and expert elicitation on which the assessment was based so readers can seek out additional information, if so desired.

1. Protect Wildlife Health

Current Conditions

Research in New York has found that lead exposure from bullet fragments has contributed to limiting the population growth of bald eagles[1]. Lead is toxic to all animals, and there is documentation of mortality in individual animals of multiple species [2,3] . However, there currently is insufficient evidence to determine if there are population-level impacts for other wildlife from lead bullet fragments consumed while scavenging gut piles and carcasses of hunter-killed game. The effort and amount of data needed to determine population-level impacts for most species may not be feasible. However, population-level impacts should not be required for action on this issue. DEC's Bald Eagle Conservation Plan indicates goals for breeding pairs of eagles have been met; yet, 14% of bald eagles between 2015 and 2020 and 4 of 7 golden eagles found dead in New York State died from lead poisoning and this percentage should be reduced (NYS Wildlife Health Program data, unpublished). Waterfowl populations demonstrated 64% reduction in lead exposure within the Mississippi flyway five years after the national lead ban[4]. However, bald eagle lead poisoning cases diagnosed by the USGS-National Wildlife Health Center increased in all flyways after the 1991 lead shot ban for waterfowl, suggesting that the lead ammunition used for other game may be responsible and deserves further investigation[5].

More than 90% of hunters who responded to the survey indicated that they had some degree of awareness of the potential impacts of lead hunting ammunition on non-target wildlife and people. However most (61%) never use non-lead ammunition, and half (52%) of hunters are not at all or only slightly concerned about the potential impacts to wildlife.

In general, the public and major stakeholder groups such as hunters, hunter educators [7], and deer processors, exist along a spectrum of issue awareness. At one end, a small portion of the public are knowledgeable about the negative effects of lead and have taken action to minimize these effects such as switching to non-lead ammunition and encouraging others to do so. At the other end, a small portion of the public are skeptical of the scientific evidence of the negative effects of lead or are adamantly opposed to action to minimize the effects due to concerns

about restrictions on ammunition and how they hunt. Most people are "in the middle" – they do not know a lot about this issue and are unaware of recent evidence regarding the effects on wildlife, so they are indifferent about acting. At the same time, they are willing to learn more about the issue and are supportive of communication from agencies and wildlife health experts. They have questions or concerns about price, availability, and performance of non-lead ammunition.

Desired Future Conditions

Risks to wildlife from ingestion of lead hunting ammunition fragments are minimized.

Hunters are aware of the hazards of lead and select non-lead hunting ammunition or adopt other mitigating actions (e.g., proper disposal of carcass and/or gut pile) to minimize the risk of lead exposure to non-target wildlife.

Challenges to and Opportunities for Achieving Desired Future Conditions

Some agencies, conservation partners, and the public may hold that population-level impacts are needed before action should be taken to minimize the effects of lead hunting ammunition. However, identifying population-level consequences may be unrealistic due to the resources required to document such an impact, and some lead reduction actions may be appropriate simply due to the individual-level impacts on non-target wildlife. Bald eagles, a species that has been closely studied for decades, is the exception, and demonstrate both the potential negative effects of lead exposure on individuals, as well as the level of effort and data quantity and quality needed to detect population changes.

Early educational efforts by DEC (since 2012) such as articles in the hunting guide, information on DEC's website and in Hunter Education materials and others have not yet resulted in widespread adoption and use of non-lead ammunition due to lack of awareness or understanding of the complexities of this issue among the public and stakeholders, or lack of concern about potential impacts. The reasons for this vary depending on the audience and their unique concerns and interests, as well as the content of the messages being relayed and whether the messenger is perceived as a valued and trusted source of information.

One tenet of The North American Model of Wildlife Conservation[6] is that wildlife is killed for a legitimate purpose without unnecessarily causing harm or suffering; ingestion of spent lead ammunition can kill non-target species unintended by the hunter. Hunters commonly consider themselves to be conservationists with concern for the vibrancy of wildlife populations and the welfare of individual animals. Indeed, 64% of hunters reported that minimizing the risk to non-target wildlife like eagles was moderately to extremely important. As hunters become more aware of the impacts of lead ammunition on non-target wildlife, this conservation ethic may motivate many hunters to select non-lead ammunition or adopt other mitigating behaviors to protect non-target wildlife.

[1] Hanley, et al. 2022. Environmental lead reduces the resilience of bald eagle populations. Journal of Wildlife Management. https://doi.org/10.1002/jwmg.22177

[2] Golden, et al. 2016. A review and assessment of spent lead ammunition and its exposure and effects to scavenging birds in the United States. Reviews of environmental contamination and toxicology 237. https://www.fws.gov/midwest/refuges/Review%20and%20Assessment%20paper.pdf

[3] Thomas, et al. 2019. The transition to non-lead sporting ammunition and fishing weights: Review of progress and barriers to implementation. Ambio 48. https://pubmed.ncbi.nlm.nih.gov/30607717/
[4] Anderson, et al. 2000. Ingestion of lead and nontoxic shotgun pellets by ducks in the Mississippi flyway. The Journal of Wildlife Management. https://www.jstor.org/stable/3802755
[5] Russell and Franson. 2014. Causes of mortality in eagles submitted to the National Wildlife Health Center 1975–2013. Wildlife Society Bulletin 38. https://wildlife.onlinelibrary.wiley.com/doi/10.1002/wsb.469
[6] Organ, et al. 2012. The North American model of wildlife conservation. The Wildlife Society Technical Review, 12(04). https://wildlife.org/wp-content/uploads/2014/05/North-American-model-of-Wildlife-Conservation.pdf
[7] D. Balog-Way and K. McComas, pers. comm., Cornell University, Dept. of Communication, Study of New York Hunter Education Program instructors' views on lead and non-lead ammunition.

2. Protect Human Health

Current Conditions

The health benefits of hunting are well established. It provides exercise and time outdoors where exposure to nature boosts the immune system, lowers blood pressure, reduces stress, improves mood, and increases the ability to focus. It increases energy level and improves sleep. However, the use of lead ammunition is not without risk to hunters, their families, and those who eat lead-shot game.

Lead is toxic; there is no known safe level of lead exposure for children or adults. Once exposed, lead accumulates in the body over a lifetime, and it is normally released very slowly. For adults, health effects could be occurring from lead at levels as low as 5 micrograms per deciliter with little to no symptoms[1, 2]. Very low levels of lead exposure decrease cognitive function, increase neurological and joint pain, reduce sperm count, increase chances of miscarriage, harm fetal development, decrease kidney function and raise blood pressure and chances of heart attack or stroke[3]. For children, even low levels of lead in blood can affect their health including reduced growth indicators, delayed puberty, lowered IQ, and hyperactivity, attention, behavior, and learning problems according to the NYS DOH[4] and the Centers for Disease Control and Prevention[5].

New York State and the U.S lead abatement programs have made great strides in reducing lead exposures. New York State has robust lead poisoning prevention programs to address lead exposures in adults and children including lead testing in children and adults, testing drinking water for lead, lead line replacement for water service lines, lead in schools, and lead abatement in older housing stock[6].

Exposure concerns always exist whenever a possible source of lead is found because of its well-established health risk. Studies show that hunters are exposed to lead through firing lead ammunition and associated lead dust[7,8]. Research studies have documented that some lead fragments may remain in an animal carcass even after the processor removes visibly impacted meat from the wound channel. For example, lead particles have been found 18-24 inches from the wound site in the carcasses of deer shot with lead bullets[9,10]. Therefore it is not only the hunter that may be exposed but family members, others who share the game meat, and those who may receive donations of game meat through food pantries and venison donation programs. The Food and Drug Administration (FDA) does not recognize any safe limit for lead in

game meat; there has been insufficient research about the direct impact of ingesting lead fragments in game meat on blood lead levels and potential health effects[11].

The use of lead ammunition remains a known source of lead exposure to hunters, their families, and others who eat game shot with lead ammunition. While the risks from lead exposure are well studied, the magnitude of the risk specifically from lead ammunition used for recreational hunting is not well understood. New York State provides advice about reducing exposures when hunting and shooting with lead ammunition and the benefits of using non-lead ammunition[12,13,14]. Despite the known health risks of lead, many hunters may not perceive the risk of health impacts in their continued use of lead ammunition. Nevertheless, hunters are exposed to lead from shooting, lead dust, and eating lead-shot game.

Many factors affect how much lead might be ingested through eating lead-shot game meat. These include the type of ammunition (lead vs. non-lead alternatives), brand/type of shot/bullet, firearm, game species, location of placement of shot/bullets in game, procedures used by the processor of the game meat, and form of the meat consumed (e.g., whole cuts versus ground). Research frameworks exist to better quantify relative contributions from eating lead fragments in game meat but have not been widely applied[15]. A case study of a hunter-fisherman with a subsistence lifestyle in New Zealand and research on native populations in Canada show elevated blood lead levels in these groups[16, 17].

Public awareness about the effects of lead ammunition on human health varies. From surveys of hunters in New York and other states, some hunters have switched from lead to non-lead ammunition when made aware of potential health risks to themselves and their families. Others have continued to use lead ammunition; they perceive risk to be low, indicate skepticism about the scientific evidence, or are concerned about potential restrictions on ammunition. An Oregon survey showed that the majority of the public and hunters are aware of the negative consequences of lead exposure in general, but hunters were not as concerned about lead exposure from ingestion of lead ammunition fragments in game as they were about lead from other sources[18]. However, survey results in NYS show potential to increase use of non-lead ammunition to minimize risk to human health and wildlife. The majority of hunters said it was important to be able to choose what type of ammunition they used and about half are willing to consider using non-lead ammunition to minimize risk to humans and wildlife.

Many New York hunters have their game prepared by a commercial processor whether they plan to eat it themselves or donate it through a participating processor. Deer processors interviewed said they do their best to provide clean and healthy food, but fragmentation of lead bullets makes it almost impossible to remove all traces of lead, particularly in ground meat. Additional work to locate and remove all lead fragments would increase costs and reduce the amount of consumable meat that can be returned to customers.

The donation of lead-harvested game also potentially exposes recipients of that donated game and may be a risk of exposure to lower socio-economic status populations who rely on donated food. Many of these communities in New York face some of the highest blood lead levels in the country and are at greater risk from additional lead exposure[19].

The Venison Donation Coalition in New York State carefully tracks donations. About 70,000 pounds of venison are donated annually. More than half of the venison donated comes from lead-free sources (e.g., deer taken from archery-only areas). About 20% of hunters surveyed in NYS had donated deer in the last five years. Of those surveyed, 77% who shoot and donate deer said they were willing to purchase and use non-lead ammunition. Charitable organizations that distribute donated venison have worked with DOH and the Venison Donation Coalition in the past to make their constituents aware of the potential presence of lead fragments in game meat through labeling and other information. However, outreach may be limited by more immediate demands to provide food and services to those in need.

Desired Future Conditions

Hunters better understand the health risks of using lead ammunition and the health benefits of using new generation non-lead ammunition.

Hunters and shooters select available and affordable non-lead ammunition to minimize the risk of lead exposure to themselves, their family (especially children) and others.

Hunters practicing target shooting and sighting firearms have the knowledge of appropriate PPE and practices to reduce lead exposures during shooting and to prevent carrying lead dust back home.

Hunters are motivated to provide lead-free donations of venison to the Venison Donation Coalition and other donation programs.

Processors are aware that lead bullet fragments pose health risks to consumers and implement "best practices" during processing to provide a high-quality product that minimizes the presence of lead fragments in game meat.

Donated game meat is free of lead fragments/bullets. Processors, food pantries, and other charitable organizations work collaboratively with hunters to provide game meat that does not contain lead fragments/bullets to consumers.

People, including those using food pantries and from vulnerable communities (rural and urban), better understand the risks associated with consuming game meat harvested with lead-based ammunition so they can make informed choices.

Challenges to and Opportunities for Achieving Desired Future Conditions

Current research on the impact of consuming lead-shot game meat on blood lead levels is more definitive for subsistence hunters, but less conclusive for those who eat game meat infrequently[11, 15]. However, many of these studies are limited because they do not consider that hunters frequently participate in multiple activities associated with lead exposure (hunting and shooting with lead ammunition), in addition to consuming lead-shot game. As stated above and despite the known health risks of lead, many hunters may not perceive the risk of health impacts in their continued use of lead ammunition. Opportunities exist for researchers to apply well-established frameworks to better quantify relative contributions from eating lead fragments in game meat but would require a significant commitment of resources to conduct such studies. These efforts would help fill information gaps to help hunters make informed choices about the type of ammunition used.

More information is needed about how to present information about lead exposures to hunters to encourage behavior changes, like choosing non-lead ammunition. Existing outreach programs such as New York State's fish consumption advisories can serve as models for ways to increase awareness and understanding among the public.

Hunters and informed individuals who eat lead-shot game meat have the control to choose whether the risk of potential lead ingestion is acceptable. However, people who rely on donated meat as a primary source of protein may not have the information or have equivalent alternatives. Opportunities exist for incentivizing hunters to use non-lead ammunition, particularly to those providing game meat to vulnerable populations and communities at greater risk of lead exposure from lead-harvested game meat.

Ground venison is a preferred preparation for food pantries due to its ease of use. The act of grinding may also distribute lead fragments throughout the meat. New processors who participate in venison donation programs may not be aware of the issues associated with lead in game meat. Even for those who are aware, there is not much opportunity to change processor practices because ground venison is a preferred preparation. Preparation of ground venison only from deer harvested without the use of lead ammunition (e.g., archery-killed deer, deer killed with non-lead ammunition) could eliminate these issues. However, this could decrease the overall amount of meat available to charitable organizations since most hunters use lead ammunition for deer they donate. Alternately, donated venison can be pre-screened, either by communication with participating hunters prior to donation or by x-ray analysis after donation, but both options present challenges in terms of hunter cooperation and cost, respectively.

Charitable organizations may also have high rates of staff turnover and are challenged by pressing client needs (e.g., food security, evictions, domestic abuse, health emergencies) that often take precedence over the potential lead exposure in donated meat. If charitable organizations only accepted lead-free venison donations it would remove this possible exposure, but this would also reduce the overall amount of meat given to pantries. Currently, it is a challenge for pantries, agencies, and not-for-profits to collaborate on ways to educate hunters about the benefits of non-lead ammunition and to efficiently alert pantry recipients of the potential for lead exposure.

[1] NYS DOH Lead Exposure in Adults, A Guide for Health Care Providers: www.health.ny.gov/publications/2584.pdf
[2] Agency for Toxic Substances and Disease Registry - Lead Toxicity: www.atsdr.cdc.gov/csem/leadtoxicity/physiological_effects.html
[3] NYS DOH Adult Lead Poisoning Prevention www.health.ny.gov/environmental/lead/adult_groups.htm
[4] NYS DOH Childhood Lead Poisoning Prevention: www.health.ny.gov/lead
[5] Centers for Disease Control and Prevention – Childhood Lead Poisoning Prevention Health Effects of Lead Exposure: www.cdc.gov/nceh/lead/prevention/health-effects.htm
[6] NYS DOH Heavy Metals Surveillance: New York State Heavy Metals Registry www.health.ny.gov/environmental/workplace/heavy_metals_registry/
[7] Laidlaw, et al. 2017. Lead exposure at firing ranges—a review. www.ncbi.nlm.nih.gov/pmc/articles/PMC5379568/
[8] Preventing Lead Exposure at Shooting Ranges: epi.dph.ncdhhs.gov/oee/oii/docs/LeadExposureFiringRangeFactsheet.pdf
[9] Green, et al. 2019. Risks to human health from ammunition-derived lead in Europe. doi.org/10.1007/s13280-019-01194-x

[10] Hunt, et al. 2009. Lead Bullet Fragments in Venison from Rifle-Killed Deer: Potential for Human Dietary Exposure. www.ncbi.nlm.nih.gov/pmc/articles/PMC2669501/
[11] Food and Drug Administration - Guidance for Industry: Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed: www.fda.gov/regulatory-information/search-fda-guidance-documents/guidance-industry-action-levels-poisonous-or-deleterious-substances-human-food-and-animal-feed
[12] NYS DEC Choose Non-Lead Ammunition: www.dec.ny.gov/outdoor/48420.html
[13] NYS DOH Advice on Eating Game: www.health.ny.gov/fish/advice_on_eating_game.htm
[14] NYS DOH Lead from Work and Hobbies: www.health.ny.gov/environmental/lead/workers.htm
[15] Buenz, et al. 2017. A prospective observational study assessing the feasibility of measuring blood lead levels in New Zealand hunters eating meat harvested with lead projectiles. www.ncbi.nlm.nih.gov/pmc/articles/PMC5936706/
[16] Buenz, et al. 2017. Chronic Lead Intoxication from Eating Wild-Harvested Game. www.amjmed.com/article/S0002-9343(17)31224-X/fulltext
[17] Fachehoun, et al. 2015. Lead exposure through consumption of big game meat in Québec (Canada): risk assessment and perception. www.researchgate.net/publication/279988723_Lead_exposure_through_consumption_of_big_game_meat_in_Quebec_Canada_risk_assessment_and_perception
[18] Oregon Department of Fish and Wildlife Lead Ammunition Survey Summary digital.osl.state.or.us/islandora/object/osl:19171
[19] NYS Attorney General - Citing Exposure of Children to Lead Poisoning, Attorney General James Files Suit Against Buffalo Group Over Failure to Address Lead-Based Paint Dangers ag.ny.gov/press-release/2020/citing-exposure-children-lead-poisoning-attorney-general-james-files-suit-against

3. Ensure Sufficient Demand & Supply of Non-lead Alternatives

Current Conditions

When asked about non-lead ammunition, hunters' primary concerns are price, performance, and availability[1, 2]. New York hunters ranked "effectiveness at taking game" as the most important factor influencing their choice of ammunition, followed by performance (i.e., accuracy, precision), and availability. Ammunition of any kind is hard to come by right now (winter 2022) due to high demand. High demand and short supply have increased the price of ammunition (including non-lead). Prior to the current ammunition shortage, non-lead ammunition was more expensive than typical lead ammunition of the same caliber, but more similar in price to premium lead-based options.

As for performance, ammunition manufacturers originally developed non-lead alternatives not to reduce or eliminate the use of lead, but to produce a bullet with superior ballistic performance. In most calibers, non-lead bullets now appear to perform as well as or better than their lead counterparts[3,4]. About 17% of survey respondents said they always use non-lead ammunition for deer hunting. Of those hunters, just over half (51%) indicated that non-lead performed equal to or better than lead ammunition, and 43% said they were unsure of the performance of non-lead compared to lead ammunition for deer hunting. However, even among those who were unsure of the performance of non-lead compared to lead, most (62%) said they would continue to use non-lead ammunition for deer hunting in the future.

Even before the current ammunition shortage, non-lead alternatives were less available than lead ammunition. Ammunition manufacturers currently do not have a financial incentive to increase production of non-lead bullets beyond demand. Non-lead bullet manufacturing

requires investment in new infrastructure since existing machinery cannot be modified or retrofitted. Such investment is financially risky unless sales of non-lead increase to the point where it becomes more profitable to make additional investment.

Prior to the current shortage, part of the reason for the lack of availability of non-lead alternatives was low demand from hunters. Hunters make up a relatively small portion of ammunition sales. Only about 25% of ammunition is used by hunters and less than 10% of the total ammunition market is non-lead. There is a "negative feedback loop" whereby manufacturers cite lack of demand from hunters and hunters do not demand it, in part, because alternative ammunition is in short supply and hard to get. Even as general ammunition supplies eventually return to normal levels, market conditions may be inadequate for some time to meet the need of all New York hunters, should all seek non-lead ammunition for big game hunting.

Desired Future Conditions

Non-lead ammunition alternatives are readily available to all hunters who pursue game in New York.

Demand for non-lead alternative hunting ammunition is sufficient to support a market for such products in New York.

Challenges to and Opportunities for Achieving Desired Future Conditions

The higher cost of production and lack of sufficient demand to offset production costs limits the availability of non-lead alternatives.

Hunting demands less ammunition consumption than other ammunition uses like target shooting, so even if hunters increased demand for non-lead alternatives, it may not be sufficient to drive large-scale changes in supply.

Lack of access to ammunition in general and non-lead ammunition in particular was cited as a major obstacle by many survey respondents (Appendix 2), and this concern extended beyond the supply shortages experienced in 2020 and 2021[2,5]. Availability of non-lead ammunition was ranked as the second most important factor influencing hunters' choice of ammunition after having the freedom to select the type of ammunition they use for hunting. Current New York law requires that ammunition be purchased in stores, so motivated hunters seeking non-lead alternatives must search for it at retail outlets or request that a licensed retailer order it for them. Retail outlets typically do not stock the range of ammunition that is otherwise available through online sales. Online purchase is lawful for the components used to handload ammunition, but handloading takes time and specialized equipment and may not be a realistic option for many hunters. These complexities reduce hunters' motivation to make the switch to non-lead ammunition.

A few states and non-profit partners have developed programs to incentivize use of and demand for non-lead alternative ammunition for hunting.

The current ammunition shortage makes any efforts to increase the use of non-lead ammunition, regardless of whether mandatory or voluntary, difficult to implement at this time.

[1] Schulz, et al. 2021. Until it's a regulation it's not my fight: complexities of a voluntary nonlead hunting ammunition program. Journal of Environmental Management 277 https://doi.org/10.1016/j.jenvman.2020.111438

[2] Oregon Department of Fish and Wildlife Lead Ammunition Survey Summary https://digital.osl.state.or.us/islandora/object/osl:19171

[3] Stokke, et al. 2019. Unleaded hunting: Are copper bullets and lead-based bullets equally effective for killing big game? https://link.springer.com/article/10.1007/s13280-019-01171-4

[4] Gremse, et al. 2014. Performance of lead-free versus lead-based hunting ammunition in ballistic soap. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4100882

[5] D. Balog-Way and K. McComas, pers. comm., Cornell University, Dept. of Communication, Study of New York Hunter Education Program instructors' views on lead and non-lead ammunition.

4. Foster Effective Communication and Messaging around Lead and Non-lead Ammunition

Current Conditions

DEC, DOH, and partners have engaged in some outreach and education around this issue through agency websites, the annual hunting regulations guide, popular articles, newsletters, and letters to deer processors and food banks. Surveys done in New York show that the existing communications strategies have been ineffective, or the effect has been relatively small in terms of large-scale awareness and change in behaviors.

About 50% of hunters believe they are well informed on the potential impacts of lead hunting ammunition on non-target wildlife and people, yet many others are unaware that lead ammunition can negatively affect people or wildlife, and others may be aware of the issue but do not believe it is a problem or are willing to accept the potential risks. Some feel that evidence is lacking or is biased, while others are more concerned about potential restrictions on use of lead ammunition. For many hunters, the negative effects of lead hunting ammunition on wildlife or people are not a "visible issue" and they are unaware of recent evidence. They are willing to learn more about the issue and are supportive of communication from DEC and other experts, but because of their low level of awareness, they are mostly indifferent about switching from lead to non-lead ammunition.

Desired Future Conditions

State agencies and partners understand, develop, and deliver effective information, education, promotional materials, and messaging tailored to specific audiences and venues.

Hunters, hunter education instructors, deer processors, and charitable organizations and their constituents are aware of and understand risks associated with lead hunting ammunition.

Hunter education instructors and other environmental educators use effective educational materials describing the impacts of lead ammunition and how hunters may minimize those impacts.

Challenges to and Opportunities for Achieving Desired Future Conditions

Most of the agencies and organizations involved in this issue are not communications specialists, but some tools, materials, and messaging campaigns do exist and can be used as

models or leveraged. Outside communication and marketing expertise is available but would require commitment of additional resources.

Message content, delivery method, and messenger all influence the effectiveness of communication efforts and vary by target audience. Unless content, method, and messenger are identified for those audiences, outreach efforts will continue to lack effectiveness.

Hunters surveyed indicated they would be more likely to turn to DEC for information on the effects of lead hunting ammunition on wildlife and people than to other state or local agencies or organizations. Messaging and outreach can be leveraged with national organizations, such as the North American Non-lead Partnership, as well as local and state-level organizations, such as Cornell Cooperative Extension, and state agencies, such as DOH.

Misinformation about current bullet performance, ballistics, and expansion may cause some hunters to reject non-lead ammunition options.

The cost of non-lead ammunition has traditionally been higher than equivalent lead ammunition and that cost difference can result in a barrier to the greater adoption of non-lead ammunition. While the price is decreasing as the demand for and production of non-lead ammunition increases, the cost difference may be a barrier for hunters who want to use non-lead ammunition unless communication and messaging about performance and benefits of non-lead ammunition can overcome concerns about higher cost.

Most hunters surveyed (about 80%) indicated that they would be moderately to very willing to purchase and use non-lead ammunition but based on current levels of use, most are not motivated to do so either because of concerns about price, performance, and availability, and/or they are not significantly concerned about the potential impacts of lead ammunition. There is opportunity to work with New York hunters, hunting groups, rod and gun clubs, hunter influencers, and non-governmental organizations to address hunters' concerns and educate them on the benefits of non-lead ammunition.

In-person and online hunter education courses reach tens of thousands of new hunters each year and could be an effective way to share information about risks associated with lead ammunition and the benefits of non-lead ammunition.

The transition from lead shot to steel shot for waterfowl hunting can be used as a case study to review successes and failures and help guide decisions and programs to increase the use of non-lead ammunition.

5. Establish and Maintain Capacity and Support for Efforts to Reduce the Impacts of Lead Ammunition

Current Conditions

Social, political, and material support for minimizing the risks from lead hunting ammunition are variable among agencies, partners, and stakeholders.

In general, state agency staff and conservation partners understand the potential impacts of lead ammunition, but uncertainty exists about the relative importance compared to other conservation priorities and how best to address the issue. Currently, there is no dedicated funding or staff time to develop and implement management actions, and state agencies lack expertise in some areas like messaging and marketing so would need to develop partnerships to increase capacity in these areas.

Recent bill proposals in the New York State Legislature are a signal of the importance of this issue to some elected officials but are also a focal point of distrust among some hunters and recreational shooters due to concerns about restrictions on the types of ammunition they can use.

In general, studies show that the public trusts DEC as a reliable source of information and trusts the agency to manage the state's wildlife resources on their behalf. New Yorkers trust DOH as a respected source for information about healthy eating and contaminant risks. It is currently unknown who are the trusted sources for information about hunting ammunition use and ballistics, but it may not be state agencies.

As described above, awareness of and understanding about this issue is variable among the hunting community ranging from advocacy for non-lead alternatives to opposition to any efforts regarding ammunition use. Many hunters lack awareness of this issue but are willing and interested in learning more. Overall, hunters favor educational and incentive-based approaches rather than regulatory or statutory approaches.

Desired Future Conditions

State agencies and partners have the material support (funding, staff time, expertise) necessary to develop and implement management actions to minimize risks from lead hunting ammunition.

State agency staff, conservation organization representatives, and elected and appointed officials are supportive of state agency and partner efforts to minimize the impacts of lead hunting ammunition on people and wildlife.

Hunters, hunter education instructors, and deer processors are supportive of state agency and partner efforts to minimize risks to people and wildlife from lead hunting ammunition.

Challenges to and Opportunities for Achieving Desired Future Conditions

A lack of a sense of urgency around this issue among the public may limit receptiveness to messages from state agencies and partners.

Competing priorities for agency staff and partners, differing perceptions of the acceptability of management approaches, and concerns about cost and availability of non-lead ammunition all add to the complexity and make development and implementation of management actions difficult.

Some stakeholders may view statutory prohibitions as an expeditious and immediate solution to a complex issue.

Agencies and partners lack capacity so cannot dedicate time and resources needed to adequately address the issue. The lack of time or resources dedicated to mitigating the effects of lead hunting ammunition signals to others that this is not a high priority issue; however, the multi-agency, multi-organization "Lead Ammunition Working Group" representing diverse interests can help generate support among stakeholders and elected officials. Capacity could be increased through legislative appropriations, and agencies and partners may also have opportunity to reprioritize existing resources.

Hunters and others who perceive that promotion of the use of non-lead ammunitions are anti-hunting initiatives, may not be supportive regardless of the type of approach used. This was noted in a few comments submitted by survey respondents.

Hunters and hunting organizations who are well versed in this issue and supportive of the increased use of non-lead ammunition can provide social and political support for agency and partner efforts.

Recommended Actions

After conducting a thorough evaluation of this issue, the Working Group developed a list of actions that they feel will be the most effective at minimizing risks to wildlife and people from lead hunting ammunition. Those actions revolve around the following themes:

1) strategic educational outreach to increase understanding of the potential and realized impacts of lead hunting ammunition on wildlife and people and encourage adoption of non-lead alternatives;
2) developing and disseminating best management practices to hunters, deer processors, and food pantries to minimize the presence of lead in game meat and on the landscape;
3) programs to increase supply, availability, and use of non-lead hunting ammunition; and
4) conducting research to further understand the scope and extent of impacts of lead hunting ammunition on people and wildlife.

The Working Group categorized the recommended actions as "High Priority Actions" and "Important Actions" based on criteria such as immediacy of impact, relative return on investment, and feasibility (i.e., whether there was a lead agency or group that had the capacity and capability to implement an action). While "High Priority Actions" should be carried out in the near term, all actions listed would help achieve the desired future conditions and could be undertaken by state or local government agencies, non-government organizations, and others to help minimize risks to wildlife and people from lead hunting ammunition.

The Working Group will continue to convene periodically to assess progress on implementation of recommended actions and propose changes, as necessary, to achieve the desired future conditions.

Develop and implement information and education programs and a strategic marketing campaign to increase understanding of the impacts of lead hunting ammunition on wildlife and people, encourage adoption of non-lead alternatives, and minimize the presence of lead bullet fragments in hunter-killed deer

High Priority Actions	Primary Lead(s)
1. Develop outreach materials and a distribution plan to educate hunters on the performance and benefits of using non-lead ammunition, as well as risks associated with lead ammunition 1.1. Develop a marketing campaign including social media and other venues to increase understanding and awareness and increase use of lead alternatives including: (1) identifying and securing funding opportunities to support communications efforts; (2) identifying and aligning the "right message" with the "right messenger" and the "right audience"; and (3) working with a retailer or manufacturer to test market ammunition that is “wildlife friendly” (e.g., "eagle safe" ammunition) 1.2. Increase availability of hands-on demonstrations of non-lead ammunition ballistics and performance in communities around the state at various venues such as the Hunter Education Program courses, outdoor fairs, and sportsmen expos 1.3. Communicate to hunters the hierarchy of options they can choose from to reduce availability of lead bullet fragments to scavenging wildlife from most effective to least effective and from greatest effort to least effort (e.g., bury or pack out gut piles/butchered carcass parts, frangibility of different caliber/gauge bullets/slugs, purchase and use non-lead ammunition) 1.4. Develop educational materials that target households of hunters and people who prepare and consume game meat	DEC and DOH
2. Incorporate a lesson plan around lead ammunition and non-lead alternatives into the Hunter Education Program online and in-person courses	DEC
3. Join the North American Non-Lead Partnership as part of a comprehensive non-lead ammunition educational program in New York with a focus on outreach to hunters	DEC
4. Share information on the potential presence of lead in hunter-killed deer with processors that participate in venison donation programs and ways they can minimize or eliminate the presence of lead (i.e., “Best Management Practices”)	DEC and DOH
5. Provide information to retailers about the differences between lead (including copper-jacketed or copper-bonded bullets) and non-lead ammunition and the benefits of non-lead ammunition and encourage them to stock and promote non-lead ammunition	DEC
6. Identify preferred sources of information for hunters and work with state agency press offices to establish partnerships with outdoor writers and other media-based influencers to help them understand and disseminate messages regarding lead and non-lead ammunition	DEC

7. Provide briefings/education to elected officials and stakeholders on this document and its recommendations to raise awareness of the problem and to explain what the Working Group and partners are doing to address the problem 7.1. Work with Audubon and other conservation partners to coordinate and deliver webinars to environmental organizations, elected officials, and other publics on the Non-lead Ammunition Issue Assessment and recommendations	DEC and DOH

Important Actions	**Primary Lead(s)**
Hunter Education Program	
1. Develop and deliver a "next step" or "Hunting 201" advanced interactive in-person hunter education course discussing the benefits of non-lead ammunition	DEC
Deer Processors, Foodbanks, and Pantries	
2. Reinitiate communication with state (Feeding NY) and key regional and local foodbanks and pantries to better understand processes associated with game donations, preferences for foodbanks and pantries, and relative importance of donated game compared to other protein sources	DOH and Venison Donation Coalition
3. Partner with social services organizations to distribute information about potential for presence of lead in game meat and ways to minimize risks 4. Assess feasibility of a small grants program for foodbanks and pantries so they can provide educational materials to their constituents	

Develop and disseminate "Best Management Practices" (BMPs) for hunters, deer processors, foodbanks and pantries, and state agency personnel to minimize presence of lead in game and on the landscape

High Priority Actions	**Primary Lead(s)**
1. Develop BMPs for culls or euthanasia where animals may end up in human food stream or are left on the landscape (e.g., use non-lead ammo, specify shot placement, remove carcasses from field)	DEC and DOH
2. Work with staff from DEC's Division of Law Enforcement, USDA Wildlife Services, licensed Nuisance Wildlife Control Operators (NWCOs), local law enforcement, and other partners to raise awareness and encourage best practices to minimize risks from wildlife euthanized with a firearm using lead ammunition	DEC
3. Establish standard conditions under which deer are donated to charitable organizations (e.g., labeling, shot placement, select cuts of meat) to reduce lead consumption risk and share this information with processors and foodbanks/pantries	DEC and DOH
4. Work with deer processors to develop cost effective BMPs for processors (e.g., don't mix bow-killed and gun-killed deer or different labeling for bow and gun-killed deer) 4.1. Assess feasibility for processors to use stickers or other	DEC, DOH, and the Venison Donation Coalition

labeling prior to donation differentiating between bow-killed and game killed with lead and non-lead ammunition	

Important Actions	Primary Lead(s)
Hunters	
1. Incentivize other measures hunters may take to reduce the presence of lead in game and on the landscape, such as packing out gut piles (e.g., participating hunters are entered into a raffle)	DEC
Deer Processors, Foodbanks, and Pantries	
2. Certify "BMP Practitioners" and provide a "BMP practitioner sticker" or other advertising materials to processors as an incentive to promote lead-free game processing to hunters and others who receive game meat	DEC, DOH, and the Venison Donation Coalition
3. Assess feasibility of a small grants program for foodbanks and pantries so they can offset costs associated with acquiring lead-free donations	
4. Identify incentives that can be provided to deer processors to offset additional workload and cost of altering processing practices to reduce presence of lead fragments in donated game (e.g., increase price paid per pound of venison processed for donation)	

Develop and implement incentive programs to increase supply of and demand for non-lead ammunition

High Priority Actions	Primary Lead(s)
1. Work with partners to explore both state and private opportunities for incentive-based approaches to provide non-lead ammunition to hunters including funding for potential raffles, exchanges, free boxes of trial ammunition, or other proposed buy-in strategies	DEC and DOH
2. Work with the legislature to assess the feasibility and advisability of incentive programs and facilitation of non-lead ammunition purchases	DEC and DOH
3. Explore incentives for manufacturers and retailers to produce and sell non-lead hunting ammunition (e.g., coupons to offer non-lead ammunition at a discount, provide a subsidy to retailers to offset higher cost of non-lead ammunition)	DEC

Important Actions	Primary Lead(s)
Firearms and Ammunition Manufacturers and Retailers	
1. Conduct outreach to and partner directly with manufacturers to identify obstacles to and opportunities for increasing supply of non-lead ammunition alternatives in New York	DEC
2. Provide outreach materials (e.g., flyers, signage) at gun shops and other ammunition retailers with messages about hunting, conservation, and related benefits of non-lead ammunition	

3. Explore the feasibility for DEC and/or other partners to facilitate the partial conversion of a local retailer's lead ammunition inventory to non-lead to create a test market and demonstrate the outcome for other retailers	
New York State Government	
4. Develop a standing intrastate non-lead partnership to carry out the recommendations listed herein	DEC and DOH
5. Explore mechanisms and opportunities to establish state-private partnerships to facilitate incentive-based approaches including funding, roles and responsibilities of state agencies and private entities, and other considerations	DEC and DOH
6. Explore the feasibility for DEC and/or other state agency partners to serve as a local supplier for retail purchase and distribution of non-lead ammunition	DEC
7. Determine if additional agency staffing will be necessary to undertake and implement programs to increase use of non-lead ammunition and minimize risks to people and wildlife from lead hunting ammunition	DEC and DOH
8. Identify all action items that require funding and identify potential funding sources (existing sources, new funding sources, funding from private sector/partners/NGOs) including: a marketing campaign; incentives for hunters (e.g., ammo coupons, buy-backs, raffles); incentives for processors or pantries (e.g., small grants, gift cards)	

Conduct research and surveys to understand impacts of lead hunting ammunition on wildlife and people

High Priority Actions	**Primary Lead(s)**
1. Conduct a survey of hunters to understand their awareness of the side-effects of lead ammunition and willingness to change, their trusted sources for information about wildlife health, human health, and ammunition, and to establish a baseline to evaluate the effectiveness of future efforts to increase the use of non-lead ammunition	DEC
2. X-ray a random sample of game meat killed with lead ammunition prior to donation to foodbanks/pantries to assess presence of bullet fragments, examine regional differences, and compare New York data to other states. 2.1. Reassess presence of lead fragments before and after issuance of processing BMPs to evaluate effectiveness 2.2. Use this information for outreach to hunters to increase hunter awareness of the presence of lead fragments in game meat	DEC and DOH
3. Based on the information collected by DEC and its research partners, identify "focus areas" in New York State for study and where reducing the use of lead hunting ammunition may have the greatest impact on wildlife health	DEC and Cornell University
4. Conduct a survey of foodbank and pantry recipients to assess their awareness of the potential risks associated with consuming lead in game meat and information they need to make well-informed choices	DOH and DEC

Important Actions	Primary Lead(s)
Wildlife Health	
1. Investigate mitigation options for ways to offset losses of eagles (e.g., rehabilitation support, wind power subsidies) 1.1. Explore feasibility of a potential research project with DEC and Cornell University's New York Cooperative Fish and Wildlife Research Unit on lead ammunition and eagles	DEC and Cornell University
2. Document lead levels in archived samples from wildlife that consume deer or may scavenge deer carcasses/gut piles (e.g., fisher and other furbearers, raptors, avian scavengers)	
3. Use game camera photos to identify scavengers (e.g., Northern Zone and Southern Zone fisher projects; Audubon camera-trap work on fall/winter raptor migration) to prioritize species for lead analysis	
Human Health	
4. Evaluate and improve existing study designs and initiate a study to better evaluate the contribution of lead from lead-shot game meat to hunters' blood-lead levels	DOH

Other Actions Considered

The general toxicity of lead is well documented and has been acknowledged for centuries. However, the realized impacts of lead specifically from hunting ammunition on the health and well-being of people and non-target wildlife are highly nuanced and, in some cases, may be avoided through practices not associated with the type of ammunition used. All approaches have advantages and disadvantages, but after careful study and deliberation, the Working Group felt the following actions are premature and thus are not recommended at this time:

1) Legislative or regulatory prohibition on the use of lead hunting ammunition in general or on/in specific locations/properties

The Working Group considered all options for promoting increased use of non-lead ammunition in hunting including the passage of legislation and regulation mandating its use. Benefits of this approach include being a conclusive and universal means of affecting the change from use of lead to non-lead. Forcing hunters to switch to non-lead ammunition would also ensure a guaranteed market for ammunition manufacturers and retailers. This market exists currently at a small but slowly increasing scale.

The Working Group believes legislative action is premature at this time. Legislation would immediately create additional costs and challenges for hunters and agencies and the same desired future conditions may be phased-in through other programmatic actions. Voluntary and incentivized programs promoting the use of non-lead ammunition in other areas of the country have had high rates of conversion and success at minimizing secondary mortality of scavenging wildlife that ingest lead fragments from gut piles of harvested big game animals[1]. At the same time, in California, where the ban on lead ammunition for hunting took full effect in 2019 realization of a benefit to California condors has not yet been measurable[2]. Implementing

statutory or regulatory prohibitions ahead of the findings of this report come with the significant risk of the state agency losing social trust from the hunting community and may reduce support for future conservation efforts.

In the past few years there have been bills in the New York State Legislature proposing a ban on the use of lead ammunition when hunting on state lands and New York City watershed lands (managed by New York City Department of Environmental Protection; DEP) citing concerns about wildlife health, human health, and contamination of the water supply. Prohibiting the use of lead ammunition on these lands at this time would immediately create additional costs and challenges for hunters due to availability issues. Also, the use of lead hunting ammunition for upland game is not a documented source of water contamination.

Waterfowl hunting activity is concentrated at specific locations perennially and spent shot pellets accumulate in the water substrate and may be ingested by feeding ducks and geese, so waterfowl hunters have been required to use non-lead shot since 1991. In contrast, big game and small game (e.g., grouse, rabbits) hunting occurs in upland habitats so bullets, bullet fragments, or shot pellets are never or very rarely deposited in the water. Additionally, hunters pursuing small game in uplands are relatively few and spread out in very low densities. Because of this and the nature of this activity where hunters are traversing the landscape (as opposed to sitting in one place), lead shot pellets are scattered in their deposition, making the likelihood of environmental contamination or ingestion by wildlife very low.

A lead ammunition ban coupled with hunter concerns about higher cost and limited product availability and the option to hunt on private land may reduce hunting activity on public lands and may impact deer population management on these properties. In addition, because 85-90% of the land in New York is privately held and most deer hunting occurs on private lands, the effect of requiring non-lead ammunition only on state and watershed lands would have minimal impact on the goal of protecting wildlife and human health statewide.

Compelling hunters to immediately use non-lead ammunition would entail substantial social cost to DEC and DOH, potentially disenfranchising an important constituent group for both agencies (see #3 and #4 below for impacts to DOH). Hunters are an important tool for managing deer populations, so measures that decrease hunting effort and harvest may result in an increase in deer-related conflicts and damage to habitats. If deer hunting participation diminishes as a result, DEC may have to seek other management options in some areas for controlling deer populations and protecting forest health, which would be less cost effective than hunting. In addition, hunters have strongly held views about firearms and ammunition, and restrictions on their use may cause a loss of trust and may reduce support for future agency-led conservation initiatives. As noted in our recommended actions, there are several best practices that hunters and others can adopt on a voluntary basis that could significantly minimize both human and wildlife health concerns.

Enforcement of a legislative and regulatory mandate to use non-lead ammunition for big game hunting would be a challenge for our Environmental Conservation Officers and Forest Rangers to administer and add to an already sizable workload for each unit. Unlike when lead shot for waterfowl hunting was banned in the early 1990s, there is no easy field check law enforcement staff can utilize to determine compliance. When lead shot was banned, the available alternative

at the time was steel shot which could be easily ascertained using a magnet. No similar method exists to differentiate between lead and non-lead big game hunting ammunition and many options for each bullet type are virtually identical in appearance.

Current ammunition availability of any type is severely limited and non-lead options are even more limited. Inventories were likely impacted initially by the COVID-19 pandemic and then additionally by supply chain issues. Ammunition manufacturers have been at peak production, but demand has been surpassing their ability to meet it for some time. Even before this bottleneck, availability of non-lead ammunition options at retail outlets were not universal nor likely broad enough to satisfy demand if all hunters had to use this type of ammunition. Prohibitions to online sales of ammunition present another challenge. Online sales are a potential avenue for hunters to obtain non-lead ammunition, particularly for less common firearm calibers. Though purchase and shipment to a Federal Firearms License holder is allowed, many hunters are hesitant to take that extra step and additional cost in procurement of ammunition.

2) Mandating non-lead ammunition use for small game (other than waterfowl and migratory waterbirds)

Use of non-lead ammunition for all game types (big game and small game) was reviewed by the Working Group. New York has 60,000 small game hunters and 85,000 spring turkey hunters using shot pellets and removing the entire carcass of the harvested animal from the field. By comparison, over 550,000 big game hunters take more than 225,000 deer each year in New York, and almost all gut piles from field dressed deer are left on the landscape. The group chose to focus efforts and recommendations specifically on big game hunting due to the number of license holders involved in this activity and the greater secondary risks to both humans (via personal consumption and venison donation programs) and wildlife (via gut piles and discarded carcass parts on the landscape).

Minimizing exposure to lead in small game is much easier than with big game given small game species tend to be prepared whole or in larger portions of the carcass versus being ground as is common with significant portions of meat from a big game animal carcass.

Education and outreach efforts about the benefits of non-lead ammunition will be geared toward hunters more generally and will include messages about non-lead shot types for all game including small game and turkey hunting. However, because of the scope and scale at which deer hunting and associated harvest occurs, focusing on reducing lead ammunition use for deer hunting will be the most effective strategy for limiting exposure of people and wildlife to lead bullet fragments.

3) Prohibition on donation of game harvested with lead ammunition

Consideration was given to prohibiting donation of any animal harvested with lead ammunition. This presents a challenge as the recipients of donated venison may be unaware of the potential for lead contamination and may have limited alternative sources of protein, forcing them to make hard choices between overall health and nutrition. Studies have documented lead contamination of venison in donation programs of other states making it reasonable to assume

that some donated venison in New York contains lead fragments. However, it is estimated that approximately 50% of the 70,000 lbs. of venison donated in New York are harvested using archery equipment and therefore are lead-free. Some additional percentage of donated deer harvested with a firearm were killed using non-lead ammunition, but the exact amount is not known. Beyond these estimates, the frequency at which lead fragments may be present in donated venison is unknown. About 10% of surveyed hunters said they donated a deer to a charitable organization in the last 5 years. Of those hunters, about 20% indicated that the donated deer was killed with non-lead ammunition. Only allowing deer killed with archery or non-lead ammunition would immediately eliminate 20,000 lbs. of venison sent to foodbanks and pantries. Requiring processors to only submit whole cuts (instead of ground meat) would mitigate some of this loss, but due to bullet fragmentation, whole cuts may still contain tiny lead fragments that are not visible or easily removed.

Coupled with educating hunters, meat processors, food pantries, and donated meat recipients on best practices they can employ to minimize the presence of lead in donated game and the potential for consumption of lead contaminated venison, the Working Group does not believe a ban on donation of deer killed with lead ammunition is necessary at this time.

4) Screening for ammunition fragments in all donated venison

At least one state, Minnesota, screens all donated venison for lead ammunition fragments. This is done by use of x-ray imaging for every package of venison to be donated. Those packages found to contain lead are removed from the program and discarded. Meat processors found to have repeated and significant issues with lead contamination in their venison may be removed from the program.

While this technology offers a comprehensive means to screen donated venison for possible lead contamination, the logistics and associated costs of such an approach in New York State are prohibitive. New York's venison donation program provides an estimated 70,000 pounds of donated meat to families in need each year. Processors who participate in the program are well distributed across the entire state. Transporting all donated venison to a central location for screening and then subsequently back out to the food pantries for distribution would present significant challenges. Program budgets do not currently include funding for x-ray screening which is expensive. In addition, a significant percentage of deer donated in New York are harvested with archery equipment which presents no concerns regarding potential lead contamination.

[1] Chase and Rabe.2015. Reducing lead on the landscape: anticipating hunter behavior in absence of a free nonlead ammunition program. PloS one 10. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0128355

[2] United States Department of Interior. 2020. California Condor Recovery Program 2020 Annual Population Status. U.S. Fish and Wildlife Service, California Condor Recovery Program. https://www.fws.gov/cno/es/CalCondor/PDF_files/2020/2020-California-Condor-Population-Status.pdf

Conclusion and Next Steps

The harmful effects of lead are well-known and in efforts to reduce exposure to people and wildlife, the federal government has banned the use of lead in paints, gasoline, plumbing materials, and migratory

gamebird hunting ammunition. Deer hunting is enjoyed by over a half million New Yorkers each year and lead ammunition used for this activity remains a pathway for lead exposure to humans and non-target wildlife. Both DEC and DOH staff have identified risks posed by lead ammunition to wildlife and people over the last 20 years, but thus far efforts to enact change or educate the hunting public have not resulted in a significant reduction in the use of lead-based ammunition. A recent survey demonstrated 17% of New York deer hunters always use non-lead ammunition for hunting, while 61% have never used non-lead alternatives. Lack of awareness about the impacts of lead hunting ammunition on people and wildlife, skepticism or doubt about risk among those who are aware of this issue, lack of availability and concerns about price and performance of non-lead alternatives, and deeply held values around freedom of choice have all contributed to the relatively slow adoption of the use of non-lead ammunition.

More recently, this issue is garnering increased legislative attention with a 2019 lead ammunition ban for all hunting in California, a short-lived lead ammunition and fishing tackle ban on Federal Lands in 2017, and legislative proposals to limit the use of lead ammunition for hunting in several states including a proposed prohibition of lead ammunition for hunting on public lands in New York. Since there are effective non-lead hunting ammunition alternatives, the simple and immediate solution may seem to be a ban on lead-based ammunition via law or regulation; however, the Working Group members learned over the last year of investigation and review that this issue is complex and legislative action at this time may not be the most effective or practical approach as it comes with significant costs and complexities.

After careful thought and discussion, the Working Group developed this issue assessment, drafted and ranked these recommended actions, and described why several actions were considered but not recommended. These recommendations will require collaborative effort from DEC, DOH, and key stakeholder groups. DEC and DOH are best positioned to take the lead on many of the recommended actions but significant commitment will be required to deliver them. Therefore, some actions will be more effectively advanced by non-governmental groups or stakeholders.

The Working Group feels strongly that implementation of the actions outlined in this report will minimize the risks to people and wildlife posed by lead hunting ammunition. Success will require state agencies, partners, and stakeholders working collaboratively and managing adaptively by evaluating the effectiveness of actions taken, learning from them, and making changes, as needed. Positive outcomes will be realized in the near term for many of the actions listed, but for other actions that target widespread change of attitudes or culture, such outcomes may not be realized for a few years. By embracing non-lead ammunition, New York's hunters will continue their conservation legacy by protecting not just wildlife and the people who benefit from that resource, but their hunting tradition as well.

Appendix 1. Lead Ammunition Working Group Charge and Roster

By the end of 2021, staff from the Division of Fish and Wildlife and government and non-government partners will conduct a comprehensive examination of the risk posed by lead hunting ammunition to wildlife and people and recommend actions to minimize that risk. This includes identifying and engaging the key interest groups (both internal and external) in this issue and determining how they can contribute to this effort.

While there are concerns about lead exposure of recreational shooters and deposition of spent lead shot from shotgun and target shooting sports, the focus of this working group is the risks posed by lead ammunition used by hunters to take game.

Upon convening, the working group will determine the frequency of and format for meetings and the process that will be used to guide their deliberations and arrive at recommendations.

Goal

Minimize the risk posed by lead in the environment from hunting ammunition by identifying the biological, social, economic, political, and administrative considerations that need to be addressed and recommending solutions.

Approaches to be explored include, but are not limited to:

- outreach to and education for the public, new and experienced hunters, deer processors, food pantry/charitable organizations, food pantry recipients, and others;
- Department and interagency policies and/or position statements about use of lead and non-lead ammunition;
- methods to increase use of non-lead alternative ammunition for hunting;
- an exploration of the economics of ammunition production and distribution and costs (for manufacturers, retailers, hunters) of switching from lead to non-lead alternatives;
- tactics to minimize exposure of non-target wildlife to spent lead ammunition;
- strategies to minimize lead in meat being processed or distributed;
- ways to ensure non-lead alternatives are available; and
- statutory and/or regulatory approaches.

Working Group Members

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Greg Heffner, Venison Donation Coalition
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Appendix 2. Survey of Ammunition Used by Hunters and Views on Lead and Non-lead Ammunition and Summary of Results

New York State Hunting Ammunition Survey

Objectives:

1. Assess hunter use and experience with non-lead ammunition
2. Assess hunter understanding and concerns related to potential impacts of lead ammunition on non-target wildlife and humans
3. Assess importance of various potential factors that influence hunter choice of ammunition
4. Assess hunter willingness to use non-lead ammunition
5. Identify preferred sources of information regarding potential impacts of lead ammunition

Methodology

We emailed an electronic survey to a random sample of 25,000 resident adult (≥18 years old) hunters who held a license in 2020 and provided their email address. Of the 588,054 licensed hunters in 2020, 508,637 were resident adults, and 201,977 had submitted email addresses. The survey was distributed using a 4-wave email campaign beginning November 29, 2021 and closing on December 12, 2021.

Results

The email campaign was successfully distributed to 23,428 hunters, as some email addresses were invalid. The response rate was 22.9% with 4,296 fully completed surveys and 1,075 partially completed surveys.

Summary of results:

- 83.5% of respondents hunted each of the past 3 years.
- 80.7% of respondents purchased ammunition primarily for hunting.
- Of those respondents who hunted in the past 3 years, 96.1% hunted at least 1 day on average for deer with a firearm and 41.3% hunted an average of more than 10 days for deer with a firearm.
- 73.1% of respondent firearms deer hunters primarily hunted with rifle; 22.8% used a shotgun and 4.1% used a muzzleloader or handgun.
- 5 rifle calibers accounted for 76% of rifle use: .30-06, .308, .270, .30-30, and .243.
- 92.4% of hunters said accuracy and precision are very or extremely important when considering which ammunition to purchase for hunting, and 90.2% of hunters said effectiveness at taking game was very or extremely important; ammunition cost was less important with nearly equal portions of hunters indicating that cost was moderately important (36.8%) compared to very or extremely important (36.2%).
- 61.2% of respondent firearms deer hunters report never using non-lead ammunition; 17.8% reported always using non-lead ammunition and 21% said they sometimes using non-lead ammunition.

- 47.5% of respondent firearms deer hunters who used non-lead ammunition were unsure when asked to compare the performance of non-lead ammunition and lead ammunition. Of those with an opinion, about 29.7% said non-lead ammunition performed better than lead ammunition, 53.3% said it performed equally, and 17% said it performed worse.
- 51.1% of respondents believed they are well informed on the potential impacts of lead hunting ammunition on non-target wildlife and people.
- 28.8% of respondents were not at all concerned about impact of lead ammunition on non-target wildlife; 15.2% were very concerned.
- 38.0% of respondents were not at all concerned about impacts of lead ammunition on people; 15.2% were very concerned.
- Having the freedom to choose what type of ammunition to use was the highest ranked factor influencing hunter use of non-lead ammunition and was identified as very or extremely important by 74.8% of respondents.
- Most deer hunters (80.3%) have never donated deer to a charitable organization, but of those that did, 59.9% donated deer taken with lead ammunition.
- Though cost was not the most important factor for hunters when purchasing ammunition, a majority of hunters (54-66%) indicated they would use non-lead ammunition if programs were established to provide for free or at a reduced cost; 12% indicated they would not use non-lead ammunition if it were provided for free.
- 38.7% of respondents were not willing to bury gut piles in the field and 71% were not willing to pack out entrails for disposal in a landfill to reduce lead exposure to non-target wildlife.

New York State Hunting Ammunition Survey Results

1. Which category below best describes your involvement in hunting in New York State? (Check one box.)

Value	Percent	Responses
I do not hunt	1.9%	97
I have hunted, but not in the last 3 years (2018-2020)	3.0%	152
I have hunted in the last 3 years (2018-2020) but not every year	11.7%	599
I have hunted every year for the past 3 years (2018-2020)	83.5%	4,286
	Totals:	5,134

2. During the years when you hunted, how many days per year, on average, did you hunt deer with a firearm (shotgun, rifle, muzzleloader, handgun)

Value	Percent	Responses
0 days	3.9%	198
1-2 days	4.6%	232
3-5 days	21.0%	1,056
6-10 days	29.1%	1,460
>10 days	41.3%	2,076
		Totals: 5,022

3. During the years when you hunted, how many days per year, on average, did you hunt deer with a bow or crossbow

Value	Percent	Responses
0 days	34.4%	1,726
1-2 days	4.6%	231
3-5 days	14.9%	750
6-10 days	17.2%	865
> 10 days	28.8%	1,445
		Totals: 5,017

4. During the years when you hunted, how many days per year, on average, did you hunt bear with a Firearm

Value	Percent	Responses
0 days	74.5%	3,737
1-2 days	4.0%	201
3-5 days	6.4%	320
6-10 days	6.1%	306
> 10 days	9.0%	454
		Totals: 5,018

5. During the years when you hunted, how many days per year, on average, did you hunt bear with a bow or crossbow

Value	Percent	Responses
0 days	86.7%	4,346
1-2 days	1.7%	84
3-5 days	2.8%	142
6-10 days	3.1%	153
> 10 days	5.8%	290
		Totals: 5,015

6. During the years when you hunted, how many days per year, on average, did you hunt spring wild turkey

Value	Percent	Responses
0 days	49.3%	2,476
1-2 days	11.7%	589
3-5 days	20.4%	1,024
6-10 days	9.8%	492
> 10 days	8.7%	438
		Totals: 5,019

7. During the years when you hunted, how many days per year, on average, did you hunt fall wild turkey

Value	Percent	Responses
0 days	69.9%	3,506
1-2 days	10.5%	529
3-5 days	13.2%	664
6-10 days	3.5%	176
> 10 days	2.9%	144
		Totals: 5,019

8. During the years when you hunted, how many days per year, on average, did you hunt ducks or geese

Value	Percent	Responses
0 days	76.9%	3,860
1-2 days	4.4%	223
3-5 days	7.3%	365
6-10 days	4.7%	237
> 10 days	6.7%	334
		Totals: 5,019

9. During the years when you hunted, how many days per year, on average, did you hunt upland game birds (grouse, woodcock, pheasant)

Value	Percent	Responses
0 days	68.6%	3,442
1-2 days	8.7%	435
3-5 days	11.3%	569
6-10 days	5.6%	283
> 10 days	5.8%	291
		Totals: 5,020

10. During the years when you hunted, how many days per year, on average, did you hunt small game mammals (rabbit, hare, squirrel)

Value	Percent	Responses
0 days	53.8%	2,701
1-2 days	10.0%	501
3-5 days	17.2%	866
6-10 days	8.3%	416
> 10 days	10.7%	538
		Totals: 5,022

11. During the years when you hunted, how many days per year, on average, did you hunt furbearers (fox, coyote, raccoon, bobcat)

Value	Percent	Responses
0 days	72.8%	3,652
1-2 days	6.0%	302
3-5 days	9.8%	492
6-10 days	4.8%	239
> 10 days	6.7%	334

Totals: 5,019

12. When you purchase ammunition, what is its primary purpose?

Value	Percent	Responses
Hunting	80.7%	3,894
Shooting	15.1%	727
Self-defense	1.4%	68
Other - Write In	2.9%	138

Totals: 4,827

13. What is the primary type of firearm you use(d) for deer hunting?

Value	Percent	Responses
Rifle	73.1%	3,394
Shotgun	22.8%	1,061
Muzzleloader	2.8%	128
Handgun	1.3%	62

Totals: 4,645

14. What gauge of shotgun do you use most often for deer hunting? (asked of those who indicated hunting deer primarily with a shotgun)

Value	Percent	Responses
12-gauge shotgun	74.2%	786
16-gauge shotgun	2.7%	29
20-gauge shotgun	22.8%	242
Other	0.3%	3

Totals: 1,060

15. What caliber of rifle do you use most often for deer hunting? (asked of those who indicated hunting deer primarily with a rifle))

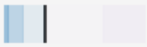
Value	Percent	Responses
Other	14.6%	494
.30-06 Springfield	25.6%	868
.308 Winchester	16.8%	571
.270 Winchester	14.1%	478
.30-30 Winchester	8.8%	299
.243 Winchester	5.8%	197
7mm-08	4.6%	156
6.5 Creedmoor	3.9%	132
.300 Winchester Magnum	2.4%	82
35 Remington	2.4%	82
.223 Remington	1.0%	33

Totals: 3,392

16. How important are the following considerations when buying ammunition for hunting?

	Not at all Important	Slightly Important	Moderately Important	Very Important	Extremely Important	Responses
Cost Count Row %	439 9.1%	865 17.9%	1,776 36.8%	1,094 22.7%	649 13.5%	4,823
Effectiveness and efficiency at taking game (bullet expansion; a quick, clean kill; ease of retrieving game) Count Row %	55 1.1%	86 1.8%	333 6.9%	1,720 35.7%	2,630 54.5%	4,824
Performance (accuracy, precision) Count Row %	36 0.7%	48 1.0%	284 5.9%	1,707 35.4%	2,747 57.0%	4,822
Readily available at retailers Count Row %	130 2.7%	237 4.9%	910 18.9%	1,701 35.3%	1,844 38.2%	4,822
Familiarity (I've used it in the past) Count Row %	184 3.8%	407 8.4%	1,318 27.3%	1,713 35.5%	1,200 24.9%	4,822
Totals Total Responses						4824

17. Rank the following considerations in order of importance when you buy hunting ammunition, placing the most important item at the top of the list and least important item at the bottom.

Item	Overall Rank	Rank Distribution	Score	No. of Rankings
Effectiveness and efficiency at taking game	1		18,767	4,780
Performance (accuracy, precision)	2		18,304	4,779
Readily available at retailers	3		12,748	4,782
Cost	4		11,790	4,777
Familiarity (I've used it in the past)	5		10,128	4,780

18. How often do you use non-lead ammunition for Deer? (of those who indicated hunting deer with a firearm)

Value	Percent	Responses
Always	17.8%	827
Sometimes	21.0%	972
Never	61.2%	2,839
	Totals: 4,638	

19. How often do you use non-lead ammunition for Bear? (of those who indicated hunting bear with a firearm)

Value	Percent	Responses
Always	14.2%	175
Sometimes	18.0%	221
Never	67.8%	835
	Totals: 1,231	

20. How often do you use non-lead ammunition for Turkey? (of those who indicated hunting turkey with a firearm)

Value	Percent	Responses
Always	23.9%	623
Sometimes	23.3%	605
Never	52.8%	1,374
	Totals: 2,602	

21. How often do you use non-lead ammunition for Upland game birds ? (of those who indicated hunting Upland game birds)

Value	Percent	Responses
Always	16.1%	246
Sometimes	24.5%	374
Never	59.3%	905
	Totals: 1,525	

22. How often do you use non-lead ammunition for Small game mammals? (of those who indicated hunting for small game mammals)

Value	Percent	Responses
Always	11.6%	260
Sometimes	25.6%	573
Never	62.8%	1,404
	Totals: 2,237	

23. How often do you use non-lead ammunition for furbearers? (of those who indicated hunting for furbearers)

Value	Percent	Responses
Always	11.6%	152
Sometimes	24.1%	317
Never	64.3%	845
	Totals: 1,314	

24. How do you feel about the performance of non-lead ammunition for Deer? (of those who indicated hunting deer and using non-lead ammo)

Value	Percent	Responses
Performed Better than Lead	15.6%	280
Performed Equal to Lead	28.0%	504
Performed Worse than Lead	8.9%	160
Unsure	47.5%	854
	Totals: 1,798	

25. How do you feel about the performance of non-lead ammunition for Bear? (of those who indicated hunting bear and using non-lead ammo)

Value	Percent	Responses
Performed Better than Lead	14.5%	57
Performed Equal to Lead	22.1%	87
Performed Worse than Lead	6.6%	26
Unsure	56.7%	223
	Totals: 393	

26. How do you feel about the performance of non-lead ammunition for Turkey? (of those who indicated hunting turkey and using non-lead ammo)

Value	Percent	Responses
Performed Better than Lead	17.6%	216
Performed Equal to Lead	24.2%	297
Performed Worse than Lead	14.7%	180
Unsure	43.4%	532
	Totals: 1,225	

27. How do you feel about the performance of non-lead ammunition for Upland game birds? (of those who indicated hunting upland game birds and using non-lead ammo)

Value	Percent	Responses
Performed Better than Lead	5.8%	36
Performed Equal to Lead	28.5%	177
Performed Worse than Lead	27.3%	169
Unsure	38.4%	238
	Totals: 620	

28. How do you feel about the performance of non-lead ammunition for Small game mammals? (of those who indicated hunting small game mammals and using non-lead ammo)

Value	Percent	Responses
Performed Better than Lead	7.8%	65
Performed Equal to Lead	31.3%	260
Performed Worse than Lead	16.2%	135
Unsure	44.7%	372
	Totals: 832	

29. How do you feel about the performance of non-lead ammunition for Furbearers? (of those who indicated hunting furbearers and using nonlead ammo)

Value	Percent	Responses
Performed Better than Lead	13.0%	61
Performed Equal to Lead	27.5%	129
Performed Worse than Lead	11.9%	56
Unsure	47.5%	223
	Totals: 469	

30. Based on your experience with the performance of non-lead ammunition, will you use it in the future for hunting?

Value	Percent	Responses
Yes	55.8%	1,455
No	9.2%	239
Unsure	35.0%	913
		Totals: 2,607

31. How would you characterize your awareness of the potential impacts of lead hunting ammunition on non-target wildlife and people? (all respondents)

Value	Percent	Responses
I am not at all aware	8.5%	372
I am slightly aware	40.4%	1,772
I am well informed	51.1%	2,239
		Totals: 4,383

32. How concerned are you about lead ammunition used to harvest game negatively affecting other wildlife? (all respondents)

Value	Percent	Responses
Not at all concerned	28.8%	1,262
Slightly concerned	22.7%	996
Moderately concerned	27.6%	1,211
Very concerned	15.2%	667
Unsure	5.6%	244
		Totals: 4,380

33. How concerned are you about lead ammunition used to harvest game negatively affecting people? (all respondents)

Value	Percent	Responses
Not at all concerned	38.0%	1,665
Slightly concerned	20.5%	900
Moderately concerned	20.8%	911
Very concerned	15.2%	665
Unsure	5.5%	239

Totals: 4,380

34. In your opinion, how important are each of the following factors that may influence your use of non-lead ammunition for hunting? (all respondents)

	Not at all Important	Slightly Important	Moderately Important	Very Important	Extremely Important	Responses
Minimizing the risks to non-target wildlife like eagles Count Row %	690 16.1%	843 19.6%	1,062 24.7%	1,055 24.6%	645 15.0%	4,295
Minimizing risks to people in need who eat donated game meat Count Row %	1,163 27.1%	879 20.5%	931 21.7%	837 19.5%	487 11.3%	4,297
Eating and sharing lead-free game meat with family and friends Count Row %	1,257 29.3%	759 17.7%	859 20.0%	853 19.9%	569 13.2%	4,297

	Not at all Important	Slightly Important	Moderately Important	Very Important	Extremely Important	Responses
Having the freedom to choose the type of ammunition I use for hunting Count Row %	166 3.9%	259 6.0%	660 15.4%	1,173 27.3%	2,039 47.5%	4,297
Having non-lead ammunition options that are widely available Count Row %	526 12.2%	542 12.6%	1,151 26.8%	1,146 26.7%	931 21.7%	4,296
Non-lead ammunition that is similar in price to lead ammunition Count Row %	501 11.7%	404 9.4%	1,029 23.9%	1,206 28.1%	1,158 26.9%	4,298
Access to up-to-date information on the effects of lead hunting ammunition on people Count Row %	704 16.4%	715 16.6%	1,237 28.8%	1,023 23.8%	619 14.4%	4,298
Access to up-to-date information on the effects of lead hunting ammunition on wildlife Count Row %	617 14.4%	753 17.5%	1,220 28.4%	1,070 24.9%	638 14.8%	4,298
Totals Total Responses						4298

35. Rank each of the following factors that may influence your use of non-lead ammunition for hunting in order of their importance to you, placing the most important item at the top of the list and least important item at the bottom? (all respondents)

Item	Overall Rank	Rank Distribution	Score	No. of Rankings
Having the freedom to choose the type of ammunition I use for hunting	1		24,765	4,289
Having non-lead ammunition options that are widely available	2		21,805	4,280
Eating and sharing lead-free game meat with family and friends	3		21,685	4,282
Minimizing the risks to non-target wildlife like eagles	4		20,391	4,280
Non-lead ammunition that is similar in price to lead ammunition	5		19,688	4,271
Minimizing risks to people in need who eat donated game meat	6		19,031	4,278
Access to up-to-date information on the effects of lead hunting ammunition on people	7		14,448	4,264
Access to up-to-date information on the effects of lead hunting ammunition on wildlife	8		12,314	4,258

36. If you were to seek information on the effects of lead hunting ammunition on wildlife and non-lead alternatives, how likely would you be to look to the following sources? (all respondents)

	Not at all likely	Somewhat likely	Very likely	Responses
New York State Dept. of Environmental Conservation Count Row %	636 14.6%	1,811 41.4%	1,923 44.0%	4,370
U.S. Fish and Wildlife Service Count Row %	786 18.0%	2,088 47.8%	1,496 34.2%	4,370
Non-governmental wildlife conservation organization Count Row %	1,196 27.4%	2,186 50.1%	985 22.6%	4,367
University or similar research entity Count Row %	1,592 36.4%	2,009 46.0%	767 17.6%	4,368
Hunting organization Count Row %	692 15.9%	2,209 50.6%	1,464 33.5%	4,365
Recreational shooting organization Count Row %	1,439 33.0%	2,010 46.0%	916 21.0%	4,365
Hunting magazines, websites, and associated social media Count Row %	915 21.0%	2,251 51.6%	1,199 27.5%	4,365
Local newspaper or other local media Count Row %	2,658 60.9%	1,422 32.6%	285 6.5%	4,365
Totals Total Responses				4370

37. If you were to seek information on the effects of lead hunting ammunition on people and non-lead alternatives, how likely would you be to look to the following sources? (all respondents)

	Not at all likely	Somewhat likely	Very likely	Responses
New York State Dept. of Health Count Row %	1,682 38.5%	1,785 40.9%	902 20.6%	4,369
U.S. Food and Drug Administration Count Row %	2,027 46.4%	1,608 36.8%	733 16.8%	4,368
County or local health department Count Row %	1,997 45.7%	1,798 41.2%	573 13.1%	4,368
Personal or family primary care physician Count Row %	2,077 47.6%	1,690 38.7%	599 13.7%	4,366
New York State Dept. of Environmental Conservation Count Row %	745 17.0%	2,034 46.5%	1,591 36.4%	4,370
University or county cooperative extension Count Row %	1,843 42.2%	1,914 43.8%	609 13.9%	4,366
Local newspaper or other local media Count Row %	2,889 66.2%	1,242 28.4%	235 5.4%	4,366
Totals Total Responses				4370

38. If you were to seek information on hunting ammunition, including performance and cost, how likely would you be to look to the following sources? (all respondents)

	Not at all likely	Somewhat likely	Very likely	Responses
Local firearms and ammunition retailer Count Row %	807 18.5%	1,897 43.4%	1,663 38.1%	4,367
Hunting organization Count Row %	788 18.0%	2,187 50.0%	1,396 31.9%	4,371
Recreational shooting organization Count Row %	1,201 27.5%	2,066 47.4%	1,096 25.1%	4,363
Hunting magazines, websites, and associated social media Count Row %	733 16.8%	2,145 49.1%	1,489 34.1%	4,367
Recommendations from friends and family Count Row %	715 16.4%	2,232 51.2%	1,416 32.5%	4,363
Totals Total Responses				4371

39. Which category below best describes your involvement in donating deer or other game to charitable organizations (not friends or family) in New York State? (of those who hunted deer)

Value	Percent	Responses
I have never donated deer or other game to a charitable organization	80.3%	2,213
I have donated deer or other game to a charitable organization, but not in the last 5 years (2016-2020)	9.3%	256
I have donated deer or other game to a charitable organization in the last 5 years (2016-2020), but not every year	8.7%	239
I have donated deer or other game to a charitable organization every year for the last 5 years (2016-2020)	1.7%	48

Totals: 2,756

40. How did you harvest the deer that you donated to a charitable organization? (check all that apply if you donated multiple deer)

Value	Percent	Responses
Firearm using lead ammunition	59.9%	325
Firearm using non-lead ammunition	19.0%	103
Bow or Crossbow	46.2%	251

41. What prevented you from donating deer to a charitable organization? (of respondents who indicated having hunted deer but never having donated any)

Value	Percent	Responses
My family, friends, and I consume all the game I harvest.	81.2%	2,200
I did not harvest a deer	8.9%	240
I do not know how to donate game.	4.3%	116
I cannot find a cooperating deer processor.	2.8%	75
Other - Write In	2.8%	77
		Totals: 2,708

42. Would you use non-lead ammunition for hunting if a coupon or similar program provided the ammunition for... (all respondents)

	Yes	No	Unsure	Responses
No Cost Count Row %	2,873 65.7%	530 12.1%	968 22.1%	4,371
Lower cost than basic lead ammunition Count Row %	2,684 61.4%	610 14.0%	1,076 24.6%	4,370
Equivalent cost to basic lead ammunition Count Row %	2,309 52.9%	826 18.9%	1,230 28.2%	4,365
Lower cost than premium lead ammunition Count Row %	2,360 54.0%	744 17.0%	1,265 29.0%	4,369
Equivalent cost to premium lead ammunition Count Row %	2,060 47.2%	966 22.1%	1,338 30.7%	4,364
Totals Total Responses				4371

43. How willing are you to take each of the following steps to reduce the possibility of lead exposure to people or wildlife? (all respondents

	Very Willing	Moderately Willing	Not Willing	Responses
Purchase and use non-lead ammunition Count Row %	1,472 33.7%	2,074 47.4%	827 18.9%	4,373
Bury gut pile/entrails discarded in field Count Row %	1,019 23.3%	1,660 38.0%	1,689 38.7%	4,368
Pack out gut pile/entrails and dispose of it in a landfill Count Row %	366 8.4%	894 20.5%	3,107 71.1%	4,367
Participate in a program to obtain and use non-lead ammunition at a reduced cost Count Row %	1,435 32.9%	1,955 44.8%	978 22.4%	4,368
Donate only game killed with bow, crossbow, or non-lead ammunition Count Row %	1,099 25.2%	1,472 33.7%	1,791 41.1%	4,362
Participate in a program to obtain and use non-lead ammunition for free Count Row %	2,074 47.5%	1,470 33.7%	821 18.8%	4,365
Totals Total Responses				4373