



**WILDLIFE  
CENTER**  
OF VIRGINIA

## WHITE PAPER

# An Informed Position on Lead Poisoning in Wildlife

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### Background:

Lead is a soft, pliable, elemental metal that is found in naturally occurring deposits around the world. While it has been used for centuries for many purposes, the highly toxic properties of lead have become well-known over the last 100 years through the issues of food contamination in cans sealed with lead solder, the toxic effects of lead-based paints and glazes, the polluting effects of leaded gasoline, the presence of lead in drinking water which passes through pipes connected with lead solder, and, more recently, the toxic effects of lead ingested by wildlife.

In wildlife, lead is most toxic when consumed by an animal, as opposed to lead bullets or shot simply lodging in muscle tissue. Exposure to digestive fluids and stomach acids breaks down the lead, allowing it to be absorbed into the blood stream and distributed to internal organs, the nervous system, the respiratory system, and the renal system. Lead may also leach from lead fragments lodged in joints and in bone marrow.

In 1991, the public became very concerned that nearly four million waterfowl in North America were dying from lead poisoning each year. Ducks and geese were ingesting bits of lead they found while filterfeeding on the bottoms of wetlands, marshes, shallow estuaries, or other bodies of water. The lead fragments the birds ingested were mainly shotgun pellets that had missed their primary target and rained down over the water. The birds would deliberately pick up this shot and swallow it, thinking it to be food or grit they need for digestion. After years of debate, the federal government finally enacted a ban on the use of lead shot for most waterfowl hunting. The use of lead and lead-based projectiles for hunting of so-called upland species of game and nuisance wildlife has remained legal, presumably on the logic that spent shot which falls upon the land is very unlikely to be found and ingested by wildlife.

However, overwhelming scientific evidence now confirms that lead fired at upland game and nuisance animals is also finding its way into non-target wildlife,

but mainly from lead projectiles that actually hit their intended targets. This lead is being ingested by eagles, raptors, scavengers, and non-target species when they prey upon wounded animals that have been shot, or scavenge the remains and entrails of animals that have been shot and left in the field.

While this once unrecognized toxic threat has existed for many decades, there is a dramatically increased awareness of the problem because new technologies and increased surveillance have enabled lead poisoning cases to be more readily identified. Also, the successful recovery and rapid expansion of once-endangered populations of species like Bald Eagles, whose historic habitat is greatly diminished, are forcing the birds to move into sub-optimal habitats where preferred food sources are not readily available. As they move farther away from major bodies of water, like tidal rivers and bays, and are no longer able to find adequate supplies of fish for their normal diet, birds like Bald Eagles resort to scavenging as a primary foraging practice. Especially during and after the hunting season, animals and animal parts that are left in the field become a main food supply. As a result, often tiny fragments of the lead-based ammunition that remain in these dead animals and animal parts are available to be consumed by Bald Eagles and other scavengers.

Between 2011 and 2021, the Wildlife Center of Virginia admitted 360 Bald Eagles, with 55 eagles being admitted in 2017 alone. The majority of these eagles came from the eastern third of Virginia, the Tidewater and Piedmont regions. Almost three out of four of the eagles admitted during those ten years were suffering from measurable lead intoxication, to varying degrees.

Of the 55 birds admitted in 2017, approximately 35 percent had clinically observable indications of lead intoxication, including a general listlessness, inability to maintain balance, refusal to eat, overall weakness, and lack of muscle coordination. In severe cases, lead intoxication can cause a head tilt, blindness, convulsions, and eventually death. In such cases, treatment options are very limited and seldom successful.

Another 35 percent of the eagles admitted in 2017 were found to have elevated but less critical levels of lead in their blood, indicating some degree of intoxication, though the noticeable effects were less obvious. With “sub-clinical” levels of lead in their bloodstream, eagles may appear normal but still suffer damaging effects of the toxicosis. The birds may be able to fly, but with less agility. They may be able to see, but with less precision. They may be able to feed themselves, but not capture live prey. Their reaction time and reflexes may be slowed. Such sub-clinical intoxication is the functional equivalent of driving drunk; the birds are more likely to suffer accidents or injuries that would otherwise be avoidable.

More recent surveys of nocturnal raptors by the Wildlife Center of Virginia now show that the problem is not contained to diurnal raptors only. Of various owl

species recently admitted to the WCV, 69 individuals were tested for lead. Twenty-one (30%) were found to have measurable levels of lead in their bloodstream. Owls have not been widely tested for lead because they are not scavengers, and were thought to be at low risk for ingestion of ammunition shards. But they are getting exposure from some other route – perhaps by their prey scavenging remains of hunted animals.

As in waterfowl, the source of the toxin in eagles is lead shot and bullet fragments that were ingested by the birds as they feed. Frequently, diagnostic radiographs of the eagles show actual lead shot or bullet fragments still in a bird's digestive tract. In some cases, the lead can be surgically removed, but not always. Even if the actual projectile has passed out the digestive tract and no longer remains in the body, dangerous amounts of dissolved lead can still be circulating in the blood or stored in the bones, brain, or internal organs of the body. No level of lead in the body is considered "safe."

Compounding the threat is that, unlike organic toxins, lead is a heavy metal; an eagle's internal organs are not able to easily purge the lead in the bird's bloodstream. Once the lead enters the body, it remains virtually forever, accumulating in the bones of the bird and continuing to have permanent negative impacts. If the bird is exposed to additional lead in its diet, the amount of the toxin will accumulate and increase over time, eventually affecting the bird's ability to survive. The cumulative impacts can last for years, and can only get worse over time.

### The current debate:

The most recent controversy over how to resolve the problem of lead toxicity in wildlife erupted in 2010, when two conservation organizations sought to ban the manufacture, sale, and use of ALL lead-based ammunition components. Over the strong objections of the Wildlife Center of Virginia and many other groups, The Center for Biological Diversity (CBD) and the American Bird Conservancy filed a petition with the Environmental Protection Agency (EPA) to achieve this sweeping prohibition through the Toxic Substances Control Act. They argued that lead is toxic, therefore EPA should simply outlaw its use. As expected, EPA immediately rejected the petition. In addition to being outside the intent of the federal law cited, the requested action would have affected more than just those using lead ammunition for hunting purposes; it would have had crippling effects on military and police agencies, as well as competitive and recreational shooters, in effect eliminating nearly all available ammunition for every firearm currently in use in the United States. Since the overwhelming majority of lead-based ammunition use poses little or no threat to the environment, EPA refused to even consider such an over-reaching approach to a relatively finite problem.

In spite of EPA's prompt rejection of the petition, several organizations representing gun owners and shooting sports, including the National Rifle Association (NRA), denounced what they saw as a deliberate attack on their millions of members. They mounted a national campaign that branded the lead toxicity issue as a backdoor attempt to ban legal hunting and interfere with constitutionally protected gun ownership. Even though this was not the declared intent of the petitioners, it clearly would have been the unintended consequence of their initiative. As a result, the public debate over the issue of the toxicity of lead bullets and shot is now extremely polarized. Even the ability to hold a civil public discussion of the evidence has become far more difficult.

The Wildlife Center of Virginia believes that the real challenge is not to find a way to ban the use of all lead – it is to find a way to eliminate toxic lead fragments available to non-target wildlife, and to do it without unreasonably affecting those whose activities are otherwise legal and acceptable to the public and the environment. It is especially important to focus any proposed solutions on the actual problem – that is, the threats posed by lead fragments in animal carcasses or parts that have been left in the field –without vilifying or unnecessarily alienating people who have not knowingly done anything wrong.

The Wildlife Center has identified some simple voluntary steps that hunters can take to dramatically and immediately reduce the unintentional poisoning of Bald Eagles and other raptors. The Center has also identified some additional steps that wildlife rehabilitators, government wildlife agencies, and interested members of the public can take to help document and publicize the scope of the lead-poisoning problem and promote a swift and equitable resolution.

### So, what can we do to address this problem?

While the political and regulatory aspects of this problem are very complex, the good news is that this problem is relatively straightforward and could be relatively easy to solve. The Wildlife Center of Virginia believes that the solution to this problem can be achieved through information dissemination, education, and voluntary compliance with safety procedures by hunters. The first obstacle that must be overcome is the general lack of awareness of the impacts of lead toxicity on a variety of species, including eagles, and the need for good, dependable information – from credible sources – about both

the true extent of the problem and the range of solutions available to eliminate the threat posed by lead hunting ammunition. Once hunters become aware of how serious this problem is, and understand what they can do to voluntarily reduce or eliminate the problem, the Wildlife Center of Virginia is convinced that the threat to eagles and other non-target wildlife can be immediately reduced.

The Wildlife Center is proposing four very achievable steps which could dramatically improve the situation, with minimal hardship on anyone, and without the need for controversial legislative or regulatory action. They are:

1. Voluntary Efforts by Hunters – The threat of lead poisoning of eagles and other birds of prey can be almost entirely eliminated if hunters will voluntarily switch to non-lead ammunition for hunting, thus eliminating the primary source of lead affecting eagles and other scavengers. For most popular calibers of hunting rifles, ammunition with non-lead projectiles is readily available from many sources. While non-lead ammunition is slightly more expensive than traditional lead ammo, the use of non-lead projectiles eliminates the need for any further attention to the lead-poisoning issue on the part of the hunter. To minimize the burden of the additional cost, lead ammunition can be used at the range to sight-in or practice with hunting weapons, but non-lead ammunition of the same size and ballistic characteristics can be used in actual pursuit of quarry.

If hunters are unwilling or unable to switch from lead bullets and shot, they just need to be sure to recover and remove all animals that have been shot, or bury animal carcasses or parts that may contain lead fragments that are left in the field. Since bullet fragments are regularly found in tissues up to 18 inches away from the bullet wound channel, the entire remains of small animals must be considered contaminated, as should all of the internal organs of big game that are left behind. Any lead left in the field in the remains of animals that have been shot is potentially damaging to non-target wildlife, birds and mammals.

Citizen Action:

- If you are a hunter, personally adopt these practices, and encourage hunting buddies to do the same.
- Members of hunting clubs can promote these actions for adoption as club rules or policy resolutions.
- Owners of private land on which hunting is allowed can require the use of non-lead ammunition and/or the safe disposal/removal of potentially contaminated animal remains.
- Family members or friends of hunters can give non-lead ammunition as a gift to encourage its use.
- Everyone can express appreciation and give positive recognition for those hunters in the community who are using non-toxic ammunition or complying with best practices for the appropriate disposal of carcasses and animal parts in the field. This can be done through

letters to local hunting organizations, letters to the editor of the local paper, or by simply saying thank you.

2. Public Education and Information Campaigns – The issue of lead poisoning from spent bullets and shot is not a new one, but is one that has gotten very little public attention in many areas. The notable exception is the lead poisoning threat identified in the habitat of the highly endangered California condor, and the State of California's subsequent ban on the use of lead-based hunting ammunition statewide, which will go into effect by 2019. Local media in every community needs to be encouraged to report on this issue.

Citizen Action:

- Contact your local media and provide them with copies of this document and links to information about this issue.
- Ask local media to investigate the extent of the problem in your area, and report to the public any issues found.
- Reach out to hunter safety instructors in your community to encourage them to become informed about the issue of lead poisoning related to game and animal parts left in the field. Encourage instructors to add a section to their training course about the proper disposal of animal parts that may contain lead, and to inform their students about the alternatives to lead shot which can eliminate the problem altogether.
- Contact local retailers of firearms and ammunition to encourage them to stock and make available a wide variety of non-lead alternatives for hunters. If hunters are not able to find lead-free ammunition, they cannot use it. Both hunters and non-hunters can work to be sure it is available.

3. Research and Diagnostics – Wildlife hospitals and rehabilitation centers across North America need to make a concerted effort to collect blood samples for testing, according to standardized protocols, to fully diagnose patients suspected of having elevated levels of lead in their blood and then to monitor their patients' responses to various treatment regimens. Even facilities without in-house test equipment need to collect samples for testing elsewhere.

Citizen Action

- Contact your local rehabilitation centers and the veterinarians who support their efforts to determine if they are currently testing for lead in raptors. If not, offer to support and fund efforts to do so or, at least, to

- collect samples for testing by others.
  - If rehabilitation centers need technical advice, encourage them to contact the Wildlife Center of Virginia.
4. Surveillance and Reporting – The U.S. Fish and Wildlife Service (USFWS) and state wildlife agencies need to be encouraged to conduct or sponsor targeted surveillance activities to determine the extent of lead poisoning in priority species, such as Bald and Golden Eagles, other birds of prey, and condors, and then to publish these results

Citizen Action:

- Call or write the Office of Migratory Bird Management of the U.S. Fish and Wildlife Service, or your regional office of the US Fish and Wildlife Service, to encourage the agency to coordinate and compile the activity reports of the more than 1,500 migratory bird rehabilitators across the U.S. and report on the findings.
- Contact your state wildlife agency to request that they require wildlife rehabilitators and veterinarians to collect and test (or submit for testing) blood samples from all Bald and Golden Eagles, and other priority species presented for care, in order to determine the extent of lead poisoning in your state.
- Identify the relevant personnel and specialists within your state wildlife agency who are responsible for wildlife health. Ask what, if any, monitoring exists to identify incidents of lead poisoning in Bald and Golden Eagles, and other priority species.
- Provide active support for such activities, both within the agency and in the public arena. Encourage the agency to establish surveillance if none currently exists.
- Encourage wildlife rehabilitators in your state to coordinate with national data collection and reporting efforts, such as the WILD-ONE database sponsored by the Wildlife Center of Virginia.

Whatever you do, remember: No responsible, ethical hunter wants to kill an eagle or other raptor. Hunters who are not using non-toxic shot, or properly disposing of animal remains, are probably uninformed about the issue, rather than indifferent to the impacts lead ammunition can have on non-target organisms. We must *educate and inform* these hunters, not judge them, condemn them, or preach to them. By keeping it positive, respectful, and focused, we can make a difference.

## Frequently Asked Questions about lead poisoning of raptors:

- If a hunter shoots a deer, doesn't the bullet just pass through the body of the quarry, eliminating any danger of residual lead?

Many hunters using rifles or pistols assume that the presence of an entry wound and an exit wound indicates that the bullet or other projectile has passed through the target animal and is gone.

However, in nearly every case, traditional lead-core bullets (even those jacketed in copper) will fragment or break apart, especially if they hit something hard, like a bone. Hunting bullets leave behind as much as 30 percent of the original bullet mass in the muscles or internal organs of the target animal, even when the largest part of the bullet passes through. Since most of these fragments are very small, their potential significance is easily overlooked or underestimated by hunters. It has been shown that even tiny fragments of lead can be deadly if ingested by scavenging or predatory birds or other animals.

- The federal government banned the use of lead shot over water, but isn't the lead shot that falls on the dry ground an environmental threat? Why don't they just ban all lead ammunition?

The amount of lead from firearms ammunition being deposited in the soil in most areas is miniscule as an environmental threat, with the exception of fields that are heavily and repeatedly used for dove hunting, shooting ranges, skeet and trap fields, and sporting clay courses. While some leaching into ground or surface water occurs where such high concentrations of lead are found, as a rule individual bullets or shot pellets in the soil remain essentially inert. It is mainly the action of digestive acids on lead fragments that have been consumed by eagles and other wildlife that causes lead to break down and be absorbed into their systems.

- What about the "Get The Lead Out Campaign" by the Center for Biological Diversity? Shouldn't we all just join that effort?

NO! Unfortunately, the Center of Biological Diversity chose to go forward with a petition to EPA in 2010 that was seriously flawed. There was a major backlash by groups like the NRA and the National Shooting Sports Foundation. These and other shooting sports and hunting organizations were justifiably outraged that CBD proposed eliminating nearly all firearms ammunition available in the United States. This caused an unnecessary polarization of the debate, essentially pitting



all gun owners against any initiative that was portrayed as the way to protect eagles and other raptors, regardless of the recommendations. Because of this serious strategic error, the Center of Biological Diversity lost all credibility on this issue with many groups, including the Wildlife Center of Virginia. WCV views CBD's continued engagement with this issue to be counterproductive. Their message maybe sound, but their effectiveness as a messenger has been lost.

- Do all types of firearms present the same risk to wildlife?

No, shotgun ammunition generally presents a far greater risk for lead poisoning because each shell contains a lot more lead by weight, and frequently more than a hundred times the number of separate pieces of lead as a rifle cartridge. Rifle and pistol ammunition typically contains only a single projectile in each cartridge. A single round of "bird shot" (#9 or #7½ shot) can contain hundreds of tiny lead pellets, each only slightly larger than the head of a straight pin. Each one of these lead pellets is enough to cause serious harm to an eagle or other scavenger

While even single-projectile rifle and pistol bullets can distribute lead through the body of the quarry (up to 18 inches from the point of impact), the distribution of shotgun pellets can cover a circle several feet in diameter. A few pellets striking an animal – whether big game like deer or elk, or small game like rabbits and squirrels – may not kill it; in fact, shotgun pellets may remain inert in the muscle tissue of such animals for years. However, if the target animal is subsequently killed by a predator, like a hawk or an eagle, is hit by a car, or simply dies of natural causes, those pellets can subsequently kill the predator or scavenger that consumes the remains, even months or years after the original shot was fired. Many heavily populated localities require hunters to use shotguns for hunting deer, since the range of buckshot and shotgun slugs is far less than rifles or pistols. In these areas, it is almost certain that every carcass or pile of discarded internal organs will also contain lead pellets or fragments. In such areas, it is even more critical to eliminate lead-based hunting ammo, or assure proper disposal of what could total thousands of animal carcasses each season!

- Is it true that non-lead bullets are less effective than lead, and can damage firearms?

No! In fact, solid copper rifle and pistol bullets have been shown to be superior to lead-core ammunition, both in terms of ballistics (accuracy) and knock-down power. While it may have been true 20 years ago that so-called "steel shot" used in shotgun shells was less effective than the more-dense lead shot, the technology used in the manufacture of modern non-lead shotgun ammunition has come a long way. Today, non-lead ammunition is as effective as, or more effective than, traditional lead-based ammunition. Most major ammunition manufacturers now offer non-lead alternatives in most popular hunting calibers.

For only a few types of ammunition, such as spherical bullets for antique or reproduction muzzle-loading weapons, are lead alternatives not yet readily available. When hunting with these types of firearms, if the non-toxic alternative is not an option, properly disposing of animal remains is essential.

- Why are groups like the NRA fighting to keep lead bullets on the market if lead is so toxic? Don't they care about eagles and other raptors?

The NRA's job is not to protect eagles; it is to protect the rights and privileges of their gun-owning members. The NRA is not "*fighting to keep lead in bullets*", as such. They are fighting to prevent ill- advised regulatory changes that would harm the interests of gun owners and those who enjoy shooting sports. The 2010 petition filed with EPA would have eliminated nearly all of the ammunition available for any firearm in use across the United States. The NRA fought to stop that initiative, but they are not fighting to allow people to continue poisoning eagles, as some have characterized their stance. This is one reason it is critically important to engage and involve hunters themselves in the effort to eliminate the use of lead ammunition for hunting.

- Isn't it just the irresponsibility of hunters that is causing this problem of lead poisoning of eagles?

No, not really. Hunters are not deliberately killing eagles with the lead in their ammunition any more than parents were deliberately poisoning their children with the lead-based paint used on baby furniture and around the home. Until people know about a problem, it is hard to blame them for not helping to solve it. Most hunters still have no idea at all that their spent bullets and shot could be continuing to kill wild animals, long after the hunters have left the woods and put away their guns. There has been very little real education done on this issue. That needs to change, but the messengers must also have credibility with hunters, or the message won't be well-received.

- This document deals with birds like eagles eating bullet fragments, but don't lead sinkers and fishing lures poison birds as well?

Yes, there are areas where birds like loons and swans suffer a high incidence of lead poisoning from ingesting lead sinkers, lead jig heads, and other molded lead fishing tackle that have been lost or broken off by anglers. It is a very serious problem in some areas, but it is not one frequently seen by the Wildlife Center of Virginia. Therefore, WCV is not able to provide the same type of first-hand documentation of the impacts. Research into the impacts of lost or discarded lead fishing tackle can be found from several other sources, including this published scientific review of lead poisoning from ingestion of fishing gear:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6675807/>

- I have heard that some groups claim that eagles are getting the lead from sources other than bullets. Is this true?

There is a lot of misinformation being published by people on both sides of this issue. In 2010, the National Shooting Sports Foundation (NSSF) challenged the claims that lead hunting ammo was primarily responsible for the lead intoxication of condors, Bald and Golden Eagles, vultures, and other scavengers. The organization asserted that there were many sources of lead in the environment, including leaded gasoline, old paint, discarded car batteries, and contaminated water supplies. While it is true that leaded gas, paint, batteries, and pollution are sources of lead in the environment at large, there is overwhelming evidence that these sources of lead are not those primarily affecting eagles and other scavenging wildlife. Lead recovered from the bodies of poisoned birds has been tested; it is lead from hunting ammo – not lead from car batteries or other sources – that is killing eagles. The NSSF argument failed to point out that lead hunting ammo is the ONLY source of lead to which they referred that is not illegal to discharge into the environment. It is theoretically possible that some eagles may get some lead from sources other than ingesting bullet fragments and lead shot, but the overwhelming scientific evidence collected from poisoned eagles confirms that the primary source of lead killing these animals come from fragments of hunting ammo they ingest.

- I don't like hunting, anyway, so what's the harm if we ban all lead bullets and shot?

Most lead-based firearms ammunition is used for national defense and public safety – by the military and police agencies. Target and competitive shooters, and those who own firearms for self-defense, consume the majority of munitions purchased by the private sector. Hunters use only a small percentage of all ammunition sold in the United States each year. A ban on all lead-based ammo would deal a serious blow to national security and public safety, and would hurt a lot of law-abiding firearms users, who are not contributing to the problem of lead-poisoned wildlife!

- If the ground is frozen, can I just bury the remains of my game harvest in a snow bank?

No! Studies in the upper Midwest found an increase in the number of lead-poisoned eagles in the spring, when hunting seasons were long over. A review of the circumstances revealed that the birds were feeding on carcasses and remains that had been frozen beneath the snow. As the snow melted, these toxic food sources were revealed and utilized by scavengers. The carcasses and body parts

must be covered with material that will not melt, blow away, or be easily removed by scavengers.

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The Wildlife Center of Virginia is a non-profit teaching and research hospital for native wildlife, located in Waynesboro, Virginia. The Center's goal is to rehabilitate the injured and orphaned wild animals admitted for care and return them to the wild. The Center is also committed to identifying and addressing the causes of illness and injury to its patients. Since its founding in 1982, the Center has cared for more than 70,000 wild animals, representing 200 species of birds, mammals, reptiles, and amphibians. The Center's public education programs share insights gained through the care of injured and orphaned wild animals, in hopes of reducing human damage to wildlife. The Center trains veterinary and conservation professionals from all over the world and is actively involved in comprehensive wildlife health studies and the surveillance of emerging diseases.

Additional information about the Wildlife Center is available at [wildlifecenter.org](http://wildlifecenter.org).

Contact the Center at 540-942-9453 or [wildlife@wildlifecenter.org](mailto:wildlife@wildlifecenter.org).