

BEFORE THE UNITED STATES DEPARTMENT OF INTERIOR

THE HUMANE SOCIETY OF THE UNITED STATES,
THE FUND FOR ANIMALS,
DEFENDERS OF WILDLIFE,
NATURAL RESOURCES DEFENSE COUNCIL,
WILDLIFE CONSERVATION SOCIETY
THE INTERNATIONAL WILDLIFE REHABILITATION COUNCIL,
NATIONAL WILDLIFE REHABILITATORS ASSOCIATION,
SOUTH FLORIDA WILDLIFE CENTER,
CHOCOLAY RAPTOR CENTER,
UPPER PENINSULA ENVIRONMENTAL COALITION,
NORTHWOOD ALLIANCE,
NATIONAL WOLFWATCHER COALITION
JUDD HANNA,
JASON MALBAURN,
PETER STENT,
RENE TATRO,
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PETITIONERS

**PETITION FOR RULEMAKING TO REQUIRE THE USE
OF NONTOXIC AMMUNITION**

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I. INTRODUCTION

This petition is submitted on behalf of The Humane Society of the United States, the Fund for Animals, Defenders of Wildlife, the Natural Resources Defense Council, Wildlife Conservation Society, the International Wildlife Rehabilitation Council, the National Wildlife Rehabilitators Association, the South Florida Wildlife Center, the Chocoy Raptor Center, the Upper Peninsula Environmental Coalition, Northwood Alliance, National Wolfwatcher Coalition, Judd Hanna, Jason Malbaurn, Peter Stent, Rene Tatro, and Al Warren (collectively, “Petitioners”) and requests action by the U.S. Department of the Interior (“DOI”) regarding the use of lead ammunition.¹ Specifically, Petitioners request that the DOI promulgate a regulation requiring the use of nontoxic ammunition on all lands owned, managed, or otherwise controlled by the National Park Service (“NPS”) and the U.S. Fish and Wildlife Service (“FWS”) – bureaus within the DOI charged with protecting, conserving, and recovering the nation’s wildlife and wild lands.

In contrast to readily available nontoxic alternatives, lead ammunition continues to kill long after it leaves the gun barrel. The use of lead ammunition releases an extremely toxic substance into the environment, presenting a considerable threat to many living organisms. Indeed, more than 130 species of animals, including birds, mammals, and reptiles, have been documented being exposed to lead by inadvertently ingesting lead ammunition directly, or by feeding on prey contaminated with lead ammunition. Such exposure has been linked to a number of adverse effects, including anemia, inability of birds to fly, blindness, seizures, and death. Lead exposure also causes a number of dangerous health problems and disorders in humans, including anemia, high blood pressure, neurological and renal disease, and increased risk of death from heart attack and stroke.

Due to these deleterious impacts, the FWS instituted a nationwide ban on the use of lead shot for hunting waterfowl,² and a number of states mandate the use of nontoxic ammunition beyond the FWS’s waterfowl regulations. Moreover, because of the devastating effects of lead exposure, current federal law also prohibits the use of lead in paint, children’s toys, gasoline, and a myriad of other commercial products.

¹ As used in this petition, “lead ammunition” refers to lead shot, bullet, pellet, ball, sabot, slug, buckshot or other device that is designed to be expelled from any firearm through a barrel by force.

² 50 C.F.R. §§ 20.21(j), 20.108.

Nevertheless, lead ammunition continues to be widely used. Yet, as noted by the FWS, because lead ammunition is typically concentrated in areas of high wildlife activity where hunting occurs, “it is a far more dangerous and insidious form of pollution than is lead entering the environment from atmospheric or other sources.”³ Each year, hunters deposit thousands of tons of lead ammunition into the environment, exposing millions of animals and the environments on which they depend to its significant and often deadly threats. Indeed, the U.S. Geological Survey estimates that hunters and anglers release six to ten thousand tons of lead into the environment of the United States each year.⁴ Much of this ammunition finds its way onto lands managed by the NPS and FWS despite state, federal, and international laws in place that seek to minimize the amount of lead released into the environment.

As the nation’s principal conservation agency, the DOI has ample legal authority to issue a regulation requiring the use of nontoxic ammunition on NPS and FWS lands. Together with its bureaus, including the NPS and the FWS, the DOI currently manages 500 million acres of surface land, approximately one-fifth of all the land in the United States.⁵ While the DOI and its bureaus retain their own specific functions, they each manage federal land for conservation purposes. As the former Secretary of the Interior recognized, “[i]n an increasingly developed world,” many public lands “provide social, cultural, economic, scientific, and ecological benefits for present and future generations” and serve to “further our understanding of human and natural history, the functions of healthy ecosystems, and how human activities change our world.”⁶

The DOI can no longer ignore the reality that hunting with lead ammunition is a human activity that changes our world in a significantly detrimental way by causing the death or injury of millions of animals and threatening the ecological integrity of the lands the DOI is charged with protecting. As such, a regulation requiring the use of nontoxic ammunition on NPS and FWS lands is necessary for the DOI to satisfy its statutory obligations.

³ 50 Fed. Reg. 30,849, 30,851 (July 30, 1985) (FWS’s Guidelines on Minimum Criteria for Identification of Nontoxic Shot Zones for Waterfowl Hunting).

⁴ D.J. Ross-Winslow & T.L. Teel, *Understanding Audiences to Eliminate Lead in NPS Environments: Literature Synthesis Report*, NATURAL RESOURCE REPORT NPS/NRPC/BRMD/NRR-2011/398, at 1 (NPS, ed. 2011).

⁵ DOI, *Semiannual Report to Congress* (October 2013) at ii.

⁶ Ken Salazar, Secretary of Interior, Order No. 3310, *Protecting Wilderness Characteristics on Lands Managed by the Bureau of Land Management* (Dec. 22, 2010).

Requiring the use of nontoxic ammunition on NPS and FWS lands would not burden agency management or hunting activities in these areas. Rather, such a requirement would help eliminate a significant environmental stressor while allowing current management and recreational activities on NPS and FWS lands to continue in a safer environment through the use of readily-available nontoxic alternatives. Moreover, a regulation requiring the use of nontoxic ammunition on NPS and FWS lands would enable the DOI to comply with its express affirmation that wildlife “be maintained for their ecological, cultural, educational, historical, aesthetic, scientific, recreational, economic, and social values to the people of the United States.”⁷ Such a regulation would also ensure that these lands, which represent some of the most unique, pristine, and culturally significant environments in our nation would be adequately protected from contamination by lead ammunition for the benefit of present and future generations.⁸

II. INTERESTS OF THE PETITIONERS

Petitioner The Humane Society of the United States (“HSUS”) is a nonprofit charitable organization that promotes the protection of all animals. It maintains its headquarters in Washington, D.C., and is the largest animal protection organization in the United States. Since its inception in 1954, The HSUS has worked to foster the humane treatment of animals through various program initiatives, including the protection of wildlife. The HSUS actively advocates against practices that introduce harmful substances into the environment that may have a detrimental effect on wildlife and the habitats on which they depend, including the use of lead-based ammunition.

Petitioner The Fund for Animals (“the Fund”) is a national nonprofit membership organization that advocates for preserving wild populations of animals, preventing their abuse, and protecting their environments. The Fund is headquartered in New York City, with a majority of its workforce in the Washington, D.C. metro region, and has nine regional offices and various animal care centers located throughout the country. One of its animal care centers – the Cape Wildlife Center in Barnstable, Massachusetts – works to protect and promote

⁷ 43 C.F.R. § 24.1(b).

⁸ *See id.* (“[t]he Secretary of Interior reaffirms...wildlife...resources are held in public trust by the Federal...government[] for the benefit of present and future generations of Americans.”). Such a regulation would also enable the DOI to comply with Goal Number One of its Strategic Plan for Fiscal Years 2011-2016. *See* DOI, *Strategic Plan for Fiscal Years 2011-2016*, Goal #1 (“ensure that America’s natural endowment – America’s Great Outdoors – is protected for the benefit and enjoyment of current and future generations”).

the health and well-being of native wildlife and their habitats by providing emergency care and wildlife rehabilitation. The staff of the Cape Wildlife Center routinely works to rehabilitate animals suffering from exposure to lead ammunition.

Petitioner Defenders of Wildlife (“Defenders”) is a national, member-based, nonprofit group founded in 1947, and headquartered in Washington, D.C. Defenders is dedicated to the protection and restoration of all native wild animals and plants in their natural communities. In support of its mission, Defenders advocates for an end to lead ammunition for hunting on all public lands, and on national wildlife refuges in particular.

Petitioner Natural Resources Defense Council (“NRDC”) is a national nonprofit environmental protection and conservation organization with more than one million members and activists. It maintains its headquarters in New York, NY. NRDC’s organizational goals include protecting endangered wildlife, safeguarding human health, and preserving our national biodiversity. NRDC and its members have a direct interest in removing lead from the environment and in ensuring that wildlife are protected from unintended environmental impacts, such as lead poisoning.

Petitioner Wildlife Conservation Society (“WCS”) is a nonprofit organization whose mission is to save wildlife and wild places worldwide. WCS does so through science, global conservation, education and the management of the world's largest system of urban wildlife parks, led by the flagship Bronx Zoo. Together these activities change attitudes towards nature and help people imagine wildlife and humans living in harmony. WCS is committed to this mission because it is essential to the integrity of life on Earth.

Petitioner The International Wildlife Rehabilitation Council (“IWRC”) is a nonprofit organization headquartered in Eugene, Oregon whose mission is to provide science-based education and resources to wildlife rehabilitators and the public to promote wildlife conservation and welfare worldwide. IWRC’s Basic Wildlife Rehabilitation Course has been delivered to wildlife rehabilitators in eleven countries including Guatemala, Honduras, Greece, Turkey, Mexico, Ireland, Poland, England, and South Africa, and is held 15 to 20 times a year in locations throughout the United States and Canada. IWRC also hosts an annual symposium, and publishes the *Journal of Wildlife Rehabilitation* three times a year, which is

distributed to approximately 1,500 individuals, organizations, and libraries in North America and abroad.

Petitioner National Wildlife Rehabilitators Association (“NWRA”) is a nonprofit organization headquartered in St. Cloud, Minnesota that is dedicated to improving and promoting the profession of wildlife rehabilitation and its contributions to preserving natural ecosystems. The NWRA hosts an annual symposium that offers hands-on workshops, comprehensive lectures, roundtables, and panel discussions with acknowledged experts in the field of wildlife rehabilitation. NWRA also publishes the *Wildlife Rehabilitation Bulletin*, a peer-reviewed journal.

Petitioner South Florida Wildlife Center (“SFWC”) seeks to protect wildlife through rescue, rehabilitation, and education that serves the tri-county area of Palm Beach, Broward, and Miami-Dade, Florida. SFWC admits nearly 13,000 injured, orphaned, or imperiled animals annually, making it one of the largest wildlife hospitals, trauma centers, and rehabilitation facilities in the nation in intake numbers. SFWC provides field rescue, clinic triage, state-of-the-art diagnostics, and expert veterinary treatment and surgery, as well as pediatric and rehabilitative care to its wildlife patients. SFWC’s patients include animals poisoned by lead.

Petitioner the Chocoy Raptor Center (“CRC”) is a nonprofit organization, registered in Michigan. The CRC is dedicated to the rescue, rehabilitation of and education about birds, primarily birds of prey. As part of this mission, the CRC educates the public about lead ammunition and the significant threat it is to birds, including those on the endangered species list. The CRC also treats birds poisoned with lead ammunition at great financial expense.

Petitioner Upper Peninsula Environmental Coalition is a nonprofit organization registered in Michigan whose mission is to protect and maintain the unique environmental qualities of the Upper Peninsula of Michigan by educating the public and acting as a watchdog to industry and government.

Petitioner Northwood Alliance is a nonprofit organization registered in Wisconsin. The primary focus of the organization is the conservation of land and the protection of water in the Border Lakes Region and the Lake Superior Watershed. The Northwood Alliance believes in land conservation for the economic, social, and intrinsic values it provides to the public. It also believes that society

must embrace sustainable forest management, appreciate wilderness and wildlife habitat, and strive for safe public recreational opportunities.

Petitioner National Wolfwatcher Coalition (“NWC”) is a nonprofit, all volunteer organization, registered in Montana, dedicated to the long term recovery and preservation of wolves. NWC educates the public, advocates for science-based decision making at every level of government, and participates in activities that promote citizens’ awareness and participation in the decision-making process about wolves. NWC seeks to find common ground among all stakeholders and encourage solutions to roadblocks that challenge wolf recovery. NWC has serious concerns about the use of lead ammunition and its impact on predators and scavengers that may consume animals killed with lead ammunition and left in the field.

Individual Petitioners Judd Hanna, Jason Malbourn, Peter Stent, Rene Tatro, and Al Warren are current hunters who believe in managing the effects of their activities in the field. They have all easily made the switch from using lead ammunition to using non-toxic alternatives, or are in the process of doing so.

As explained in detail below, the use of lead ammunition causes an unnecessary addition of a highly toxic substance to the environment, threatening wildlife, wild lands, and human populations. Petitioners and their members observe, study, advocate for, and work to rehabilitate and reintroduce wildlife negatively affected by lead ammunition. In addition, Petitioners have many members who visit NPS and FWS lands to recreate and observe wildlife in their natural habitats, including those negatively affected by lead ammunition. The use of lead ammunition also presents a potential threat to the personal health of Petitioners’ members and the environments they seek to enjoy. Consequently, Petitioners and their members are significantly affected by the use of lead ammunition and maintain a substantial interest in a regulation requiring the use of nontoxic ammunition on NPS and FWS lands.

III. ACTION REQUESTED

Pursuant to the Right to Petition Clause of the First Amendment of the U.S. Constitution,⁹ the Administrative Procedure Act,¹⁰ and the DOI’s regulations,¹¹

⁹ The First Amendment confers “the right of the people. . .to petition the Government for a redress of grievances” and specifies that Congress shall make no law abridging that right. U.S. CONST., AMEND. I. The Supreme Court has long held that the right to petition is logically implicit in, and

Petitioners submit this petition for rulemaking requesting that the DOI take action to comply with the express intent of Congress in numerous federal statutes that the DOI safeguard the nation's wildlife and public lands. Specifically, Petitioners request that the DOI promulgate a regulation stating:

The use of nontoxic ammunition shall be required when discharging any firearm on any land owned, managed, administered, or otherwise controlled by the National Park Service or the U.S. Fish and Wildlife Service.

Because of the significant hazards posed by the use of lead ammunition, Petitioners respectfully request that the DOI promulgate such regulation immediately.

IV. SCIENTIFIC AND FACTUAL SUPPORT FOR THE PETITIONED ACTION

As extensively documented by scientific research, and discussed in detail below, lead ammunition has an undeniably detrimental and often lethal effect on wildlife and the environment, as well as public health and welfare. Consequently, the use of lead ammunition is denounced by a broad coalition of conservation and animal welfare organizations, birders, scientists, veterinarians, and conscientious hunters.¹² Moreover, several state and federal agencies have recognized the threats from lead ammunition and taken important, proactive steps in guarding against such threats; prohibiting the use of lead ammunition is also a growing international trend.¹³ Nevertheless, lead continues to be used in a wide variety of ammunition used for sport shooting and hunting, despite the existence of readily available and effective nontoxic alternatives,¹⁴ and wildlife, public health, and the environment continue to be threatened by its use.

fundamental to, the very idea of a republican form of government. *E.g.*, *United States v. Cruikshank*, 92 U.S. 542, 552 (1875); *United Mine Workers of America, Dist. 12 v. Illinois State Bar Ass'n*, 389 U.S. 217, 222 (1967); *Thomas v. Collins*, 323 U.S. 516, 530 (1945).

¹⁰ 5 U.S.C. § 553(e) ("Each agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule.").

¹¹ 43 C.F.R. § 14.2 ("Under the Administrative Procedure Act, any person may petition [the DOI] for the issuance, amendment, or repeal of a rule").

¹² At least 117 organizations in 30 states representing birders, conservationists, hunters, scientists, veterinarians, American Indians, and public employees have expressed their support for a federal prohibition on the use of lead ammunition to protect wildlife and public health.

¹³ *See infra*, notes 192-242 and accompanying text (discussing federal, state, and international efforts to protect wildlife from the dangers of lead ammunition).

¹⁴ *E.g.*, Winchester .38 Special Ammunition; Fiocchi Golden Pheasant 12 Gauge; Ultramax 9mm 125-Grain Lead Round Nose Ammunition; *see also* M.A. Pokras & M.R. Kneeland, *Understanding Lead Uptake and Effects Across Species Lines: A Conservation Medicine Approach*, in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 7, 17 (R.T. Watson *et al.*

A. Toxicity of Lead:

Lead (Pb, atomic number 82, atomic mass 207.19) is an “odorless, silver-bluish-white metal that is insoluble in water. . .soft [and] highly malleable.”¹⁵ Because of its abundance, relative ease of mining and smelting, density, and versatility, lead has been used in numerous consumer goods, including paint, inks, solder, batteries, cosmetics, pesticides, PVC plastics, gasoline, as well as in building construction and various other industrial activities.¹⁶ Hunters began using lead ammunition as early as the 14th century.¹⁷ Despite its utility, lead is a biological poison, known to cause a variety of harmful chronic conditions in humans and wildlife.¹⁸

Lead exposure has been linked to a number of serious health problems and disorders in humans, including high blood pressure, neurological disease, gastrointestinal problems, and increased risk of death from heart attack and stroke,¹⁹ and a number of dangerous effects in wildlife, including inability of birds to fly, anemia, blindness, seizures, and death.²⁰ Many scientists find the deposition of lead into the environment especially disturbing because, unlike many other metals, lead has no beneficial biological function and is not needed by any living organism.²¹ The toxicity of lead is not new information – the harmful effects of lead have been documented for thousands of years. Lead had numerous uses in ancient Egypt, and its biocidal properties were well-known at that time.²² The Romans used lead in

eds., 2009) (stating that “despite the fact that lead poisoning is well understood, it still threatens the health of millions of people, domestic animals and wildlife worldwide”); V.G. Thomas, *The Policy and Legislative Dimensions of Nontoxic Shot and Bullet Use in North America*, in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 351, 352 (R.T. Watson *et al.* eds., 2009) (stating that poisoning from lead shot occurs “despite scientific evidence of the need to adopt consistent policy on lead reduction across different user groups”); M.A. Tranel & R.O. Kimmel, *Impacts of Lead Ammunition on Wildlife, the Environment, and Human Health – A Literature Review and Implications for Minnesota*, in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 318 (R.T. Watson *et al.* eds., 2009) (stating that “there is considerable evidence that the use of lead ammunition impacts the health of wildlife, humans and the environment”).

¹⁵ U.S. Dept. of Health and Human Services, *Lead and Lead Compounds*, in *REPORT ON CARCINOGENS*, TWELFTH EDITION, 251 (2011).

¹⁶ U.S. Dept. of Health & Human Service, National Institutes of Health, *Lead*, <http://www.niehs.nih.gov/health/topics/agents/lead/> (last updated Sept. 9, 2013).

¹⁷ Ross-Winslow & Teel, *supra* note 4, at 1.

¹⁸ Pokras & Kneeland, *supra* note 14, at 7.

¹⁹ *See infra*, notes 142-167 and accompanying text (describing toxic effects to humans).

²⁰ *See infra*, notes 34-141 and accompanying text (describing toxic effects to wildlife).

²¹ Pokras & Kneeland, *supra* note 14, at 7.

²² S. Hernberg, *Lead Poisoning in a Historical Perspective*, 38 *AMER. J. INDUSTR. MED.* 244 (2000).

water pipes, cosmetics, pottery, and in wine preparation, and its heavy use has been hypothesized as contributing to the fall of the Roman Empire.²³

Currently, lead is considered to be a toxic chemical as defined by the U.S. Environmental Protection Agency (“EPA”).²⁴ Because of the significant dangers posed by lead, a number of existing laws seek to prevent or minimize its toxic effects. For example, lead and lead compounds are considered “persistent, bioaccumulative toxic (PBT) chemicals” and “chemicals of special concern” under the Emergency Planning and Community Right to Know Act (“EPCRA”).²⁵ Therefore, facilities that release a certain amount of lead or lead-based compounds into the environment must file a report describing and providing notice of the emission.²⁶ Moreover, lead is listed as one of six criteria pollutants for which the EPA has set National Ambient Air Quality Standards (“NAAQS”) under the Clean Air Act (“CAA”) to protect public health from the toxic effects of these emissions.²⁷

In addition, in order to eliminate lead exposure from vehicle emissions, the 1990 Amendments to the CAA mandated the elimination of lead in gasoline for motor vehicles by 1996, thereby completing the leaded-gasoline phase-out program that the EPA had started via regulation in the early 1970s.²⁸ Then, in 1992, Congress enacted the Residential Lead Based Paint Hazard Reduction Act to ban the manufacture and use of lead-based paint, after finding that “the health and development of children. . . is endangered by. . . lead paint, or excessive amounts of lead-contaminated dust in their homes” and that the danger posed by lead-based paint could be significantly reduced by “abating lead-based paint” and “taking. . . measures to. . . limit children’s exposure to lead.”²⁹ In 2008, in order to “provide increased protection for children and other at-risk populations against an array of adverse health effects,” the EPA strengthened the NAAQS for lead, limiting emissions to an average of 0.15 micrograms per cubic meter over a three-month period.³⁰

²³ *Id.* at 244-245.

²⁴ EPA, Region 5, *Ecological Toxicity Information*, <http://www.epa.gov/R5Super/ecology/toxprofiles.htm#pb> (last updated Dec. 28, 2011).

²⁵ 40 C.F.R. § 372.28(a); 66 Fed. Reg. 4,500 (Jan. 17, 2001).

²⁶ 42 U.S.C. § 11023.

²⁷ 42 U.S.C. § 7408; 40 C.F.R. § 50.12.

²⁸ Pub. Law 101-549, § 220(n), 104 Stat 2399, 2500 (Nov. 15, 1990); *see also* 47 Fed. Reg. 49,322 (Oct. 29, 1982) (EPA final rule setting revised standards for lead content of gasoline and discussing old standards).

²⁹ 42 U.S.C. § 4851(5), (6).

³⁰ 73 Fed. Reg. 66,964, 66,965 (Nov. 12, 2008) (final rule amending NAAQS for lead); *codified at* 40 C.F.R. § 50.16.

Finally, and as particularly relevant to this petition, spent lead shot and lead bullets are considered “solid waste” under the Resource Conservation and Recovery Act (“RCRA”).³¹ Accordingly, the EPA recommends that shooting ranges implement a series of Best Management Practices (“BMPs”), including the removal of lead from the soil to, *inter alia*, “avoid contamination of the range and potential impacts to human health and the environment.”³²

These are but a few of the federal laws restricting the use or discharge of lead. The breadth of these statutory and regulatory requirements and prohibitions illustrate the overall concern regarding lead and its effect on human and animal health, and recognize that the best treatment for lead poisoning is the elimination of lead contamination at the source.³³ Nevertheless, lead ammunition continues to be used in many areas across the United States, including on NPS and FWS lands.

1. Lead Ammunition’s Harmful Effect on Wildlife

Lead is undeniably toxic to wildlife. As the FWS has stated, “lead poisoning, resulting from the ingestion of spent lead shotgun pellets is widespread in the coterminous 48 states, and is *likely to occur anywhere that shot is used for [] hunting...*”³⁴ The ingestion of lead from lead ammunition leads to deleterious health conditions in a wide range of wildlife species, including the loss of the ability of birds to fly, behavioral changes, anemia, seizures, and death.³⁵ As also recognized by the FWS, lead poisoning causes some animals to “die a painful death. . .while others suffer for years from its debilitating effects.”³⁶ The earliest known documentation of lead poisoning in wild birds is from a paper published in Germany in 1842.³⁷ Many subsequent field observations and scientific studies have reported

³¹ 42 U.S.C. § 6903(27); 40 C.F.R. §§ 260.10, 261.2; EPA, *Best Management Practices for Lead at Outdoor Shooting Ranges*, EPA-902-B-01-001 at I-8 (Jan. 2001).

³² EPA, *supra* note 31.

³³ Other federal regulations also restrict the use of lead in a variety of circumstances. *See e.g.*, 40 C.F.R. §§ 141.80–141.91 (regulating lead under the Safe Water Drinking Act); 40 C.F.R. § 401.15 (declaring lead a “toxic pollutant” under the Clean Water Act); 21 C.F.R. § 189.240 (FDA’s ban on the use of lead solder in food packing and cans pursuant to its authority under the Food, Drug, and Cosmetic Act).

³⁴ FWS, *Supplemental Environmental Impact Statement: Proposed Use of Steel Shot for Hunting Waterfowl in the United States* at III-44 (U.S. Department of the Interior, 1986) (emphasis added).

³⁵ *Id.* at III-1–III-15; Tranel & Kimmel, *supra* note 14, at 319.

³⁶ 76 Fed. Reg. 3,938, 3,939 (Jan. 21, 2011) (FWS Final Rule: 2010-2011 Refuge-Specific Hunting and Sport Fishing Regulations).

³⁷ *See e.g.*, M. Friend, *et al.*, *Biological and Societal Dimensions of Lead Poisoning in Birds in the USA*, in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 34, 35 (R.T. Watson, *et al.*, eds., 2009) (referencing Von Fuchs, C. J. 1842. Die schädlinchen Einflüsse

the harmful, and often deadly, effects on wildlife after incorporation of lead from lead ammunition into their bodies.³⁸ Although many early accounts involved ducks poisoned by ingesting lead shot, as early as 1876 and 1882 scientists found that upland species, such as pheasants, are also poisoned by swallowing lead pellets.³⁹

In 1919, American scientist Alexander Wetmore conducted a landmark study demonstrating lead shot's harmful effect on waterfowl. Wetmore reported that lead poisoning contributed to the annual deaths of considerable numbers of waterfowl, including mallards, black ducks, pintails, canvasbacks, and whistling swans.⁴⁰ In lead poisoning-related deaths, lead ammunition remained the clear culprit for most waterfowl.⁴¹ Later studies by other wildlife biologists revealed a similar fate for a wide variety of species of waterfowl and provided the impetus for the nationwide prohibition on the use of lead shot in waterfowl hunting enacted by the FWS.⁴² Today, more than 500 peer-reviewed articles detailing the toxic effects of lead ammunition on wildlife exist, the more recent of which depict a much more serious situation than originally thought.⁴³ These studies reveal that lead ammunition particularly impacts wildlife in “heavily hunted areas,” including wetlands, woodlands, and agricultural fields.⁴⁴ The list of species documented to have been detrimentally impacted by lead ammunition is vast and diverse – an estimated 134 species have been exposed to and/or killed by lead ammunition by ingesting lead shot, bullet fragments, or prey contaminated with lead ammunition, including

der Bleibergwerke auf die Gesundheit der Haustiere, insbesondere des Rindviehes [The Detrimental Effect of Lead Mines on the Health of Animals, Especially those with Horns]).

³⁸ See J.C. Jones, *On the occurrence of lead shot in the stomachs of North American Gruiformes*, 3 J. WILDL. MANAGE. 353–357 (1939) (referencing subsequent studies in the late 19th and early 20th centuries, including: G.B. Grinnell, *Lead Poisoning*, 42 FOREST AND STREAM 117–118 (1894); J.H. Bowles, *Lead poisoning in ducks*, 25 AUK 312–313 (1908); W.L. McAtee, *Lead Poisoning in Ducks*, 25 Auk 472 (1908); E. Hough, *Lead-Poisoned Ducks*, 42 Forest and Stream 117 (1894)); Friend, *et al.*, *supra* note 37 (same).

³⁹ Jones, *supra* note 38 (referencing J.H. Calvert, *Pheasants Poisoned By Swallowing Shot*, 47 THE FIELD 189 (1876) and G. Holland, *Pheasant Poisoned by Swallowing Shot*, 59 THE FIELD 232 (1882)).

⁴⁰ A. Wetmore, *Lead poisoning in waterfowl*, UNITED STATES DEPARTMENT OF AGRICULTURE BULLETIN NO. 793 (1919); see also FWS, *Final Environmental Statement: Proposed Use of Steel Shot for Hunting Waterfowl in the United States*. (U.S. Department of the Interior, 1976) (citing to the Wetmore study).

⁴¹ See FWS, *supra* note 40, at 35 (“[a]vailable information indicates that spent lead pellets constitute the principle source of lead available to waterfowl.”).

⁴² See *id.* at 1; see also 51 Fed. Reg. 23,444 (June 27, 1986) (FWS, Proposed Rule: Criteria and Schedule for Implementing Nontoxic Shot Zones for 1987–88 and Subsequent Waterfowl Hunting Seasons) (“By the 1960s and 1970s it became obvious to wildlife managers that there was a need to find an alternative to lead shot because of its toxicity.”); *infra* notes 192–206 and accompanying text (discussing the ban).

⁴³ Ross-Winslow & Teel, *supra* note 4; Rattner, *et al.*, *Sources and Implications of Lead Ammunition and Fishing Tackle on Natural Resources*, THE WILDLIFE SOCIETY TECH. REVIEW 8-01, 62 (2008).

⁴⁴ Tranel & Kimmel, *supra* note 14, at 319.

numerous birds, amphibians, as well as domestic dogs and cats, free-ranging cattle, sheep, horses, prairie dogs, foxes, bears, coyotes, and other mammals.⁴⁵ As a result, many of these studies call for the implementation of measures to further limit the amount of lead in the environment from hunting or conclude that the findings support the need for the use of nontoxic alternatives to lead ammunition.⁴⁶

Lead ammunition is toxic to wildlife in one of two ways: primary or secondary poisoning. Primary poisoning occurs when the animal consumes the ammunition (or fragments of ammunition) directly, mistaking it for food or ingesting it accidentally during feeding.⁴⁷ Secondary poisoning occurs when animals consume wounded or dead prey or scavenge gut piles from animals that have been exposed to or killed by lead and abandoned by hunters.⁴⁸ Following digestion of lead ammunition by animals, the lead can be regurgitated quickly, retained for a period of time, or dissolved completely and absorbed into the bloodstream.⁴⁹ Lead concentrations typically are highest in the blood immediately following absorption, and can remain in the liver and kidneys for days to months after absorption; lead deposited in bone can remain for years, reflecting a lifetime of exposure.⁵⁰

The likelihood and degree of lead poisoning depends on the dose and length of exposure as well as the animal's diet, age, frequency and history of exposure to lead, and other environmental factors.⁵¹ For example, calves are more susceptible than adult cattle to being killed by lead poisoning,⁵² and hatchlings of altricial⁵³ bird

⁴⁵ D.J. Pain, *et al.*, *A Global Update of Lead Poisoning in Terrestrial Birds from Ammunition Sources*, in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 99, 102-04 (R.T. Watson, *et al.*, eds., 2009); Tranel & Kimmel, *supra* note 14, at Table 1; Pokras and Kneeland, *supra* note 14, at 14.

⁴⁶ See *e.g.*, Ross-Winslow & Teel, *supra* note 4; Tranel & Kimmel, *supra* note 14; Thomas, *supra* note 14.

⁴⁷ W.G. Hunt, *et al.* *Bullet Fragments in Deer Remains: Implications for Lead Exposure in Avian Scavengers*, in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 254 (R.T. Watson, *et al.*, eds., 2009); J.N. Pauli & S.W. Buskirk, *Recreational Shooting of Prairie Dogs: A Portal for Lead Entering Wildlife Food Chains*, 71 *J. WILDL. MANAGE.* 103–108 (2007). Moreover, studies have found that it is possible that animals who have not ingested lead from ammunition, but have lead ammunition in their tissue (such as from non-kill shots) may also have elevated blood lead concentrations. *E.g.*, Pain *et al.*, *supra* note 45.

⁴⁸ Hunt, *et al.*, *supra* note 47; Pauli & Buskirk, *supra* note 47.

⁴⁹ I.J. Fisher, *et al.*, *A Review of Lead Poisoning from Ammunition Sources in Terrestrial Birds*, 131 *BIOL. CONS.* 421, 422 (2006).

⁵⁰ *Id.*

⁵¹ *Id.*; J.R. Longcore, *et al.*, *Toxicity of Lead and Proposed Substitute Shot to Mallards*, SPECIAL SCIENTIFIC REPORT—WILDLIFE NO. 183, 6 (United States Department of Interior 1974).

⁵² J. Zmudzki, *et al.*, *Lead Poisoning in Cattle: Reassessment of the Minimum Toxic Oral Dose*, 30 *BULL. ENVIRON. CONTAM. TOXICOL.* 435–441 (1983).

species are more vulnerable to lower levels of lead than are those of precocial bird species.⁵⁴ The amount of lead needed to cause death is proportional to the body size of the animal. A single, 7.5 size lead pellet – of which there can be up to 500 in a single shotgun shell – contains enough lead to kill a songbird within 24 hours of exposure.⁵⁵ Sensitivity to lead toxicity (both acute and chronic) also varies somewhat between species.⁵⁶

Animals also can suffer from sublethal effects of lead poisoning. Lead has been found to impact an animal's nervous, urinary, and circulatory systems, causing a variety of biochemical, behavioral, and physiological changes.⁵⁷ Lead concentrations of over 4 µg/g in different tissues cause behavioral, physiological, and nutritional disorders in many species of birds⁵⁸ and a single shotgun pellet is sufficient to cause brain damage in ducks, resulting in inhibition of critical neuromuscular, auditory, and visual responses.⁵⁹ Lead exposure can cause decreased food intake, progressive loss of body weight, weakness and fatigue, wasting of internal organs, and an absence of normal fatty deposits.⁶⁰ Even these sublethal effects can result in death for animals that depend on quick action and precise movements to navigate their environments and evade predators, and by making them more susceptible to disease by suppressing their immune systems.⁶¹

i. Lead Ammunition Poisons Upland Game Bird Species

Although lead poisoning historically has been studied and documented in waterfowl species, upland game bird species also are exposed to lead-based

⁵³ “Altricial” refers to a species that is hatched or born in an undeveloped state that requires feeding by a parent, while “precocial” young are hatched or born able to feed themselves almost immediately.

⁵⁴ D.J. Hoffman, *et al.*, *Biochemical and Hematological Effects of Lead Ingestion in Nestling American Kestrels (Falco Sparverius)*, 80 COMP BIOCHEM. PHYSIOL., PART C: TOXICOL. & PHARMACOL. 431–439 (1985).

⁵⁵ N.B. Vyas, *et al.*, *Lead Shot Toxicity to Passerines*, 111 ENVIRON. POLLUT. 135, 137 (2001).

⁵⁶ D. J. Humphreys, *Effects of Exposure to Excessive Quantities of Lead on Animals*, 147 BRITISH VET. JOUR. 18-30 (1991).

⁵⁷ A.M. Scheuhammer, *The Chronic Toxicity of Aluminum, Cadmium, Mercury, and Lead in Birds: A Review*, 46 ENVIRON. POLLUT. 263–295 (1987).

⁵⁸ S.A. Lamertucci, *et al.*, *Widening the Problem of Lead Poisoning to South-American Top Scavenger: Lead Concentrations in Feathers of Wild Andean Condors*, 144 BIOL. CONS. 1464–1471 (2011).

⁵⁹ M.P. Dieter & M.T. Hohman, *δ-Aminolevulinic Acid Dehydratase Enzyme Activity in Blood, Brain, and Liver of Lead-Dosed Ducks*, 19 ENVIRON. RES. 127–135 (1979).

⁶⁰ J.S. Jordan & F.C. Bellrose, *Lead Poisoning in Wild Waterfowl*, ILLINOIS NATURAL HISTORY SURVEY BIOLOGICAL NOTES No. 26 (1951).

⁶¹ A.M. Scheuhammer & S.L. Norris, *The Ecotoxicology of Lead Shot and Lead Fishing Weights*, 5 ECOTOXICOLOGY 279–295 (1996); J.C. Franson, *Immunosuppressive Effects of Lead, in LEAD POISONING IN WILDLIFE WATERFOWL – A WORKSHOP: NATIONAL WILDLIFE FEDERATION*, 106-109 (J.S. Feierabend & A.B. Russell, eds.,1986).

ammunition.⁶² Because upland game species are by definition found in areas where hunting is common, they are particularly vulnerable.⁶³ For birds in the United States, these species include mourning dove, pheasant,⁶⁴ northern bobwhite,⁶⁵ scaled quail,⁶⁶ American woodcock,⁶⁷ and sandhill crane.⁶⁸

The annual harvest of mourning doves (*Zenaida macroura*) is large, with 16 to 70 million birds shot by hunters each year.⁶⁹ The quantity of lead used for this hunt is immense. According to studies, hunters may use five to eight shotgun shells to kill a single dove.⁷⁰ Assuming that each shell contains one ounce of lead, this activity can result in the deposition of up to 10,937 tons of lead on dove hunting grounds across the United States every year.⁷¹ Many of the doves killed by hunters have previously been exposed to lead from hunting.⁷² Blood tests of mourning doves in New Mexico revealed that 6.5 percent of scaled quail and 14.6 percent of northern bobwhites had blood lead levels of three parts per million or greater, which indicates lead exposure, and could impact behavior and subsequent survival probability.⁷³ In a study conducted in the Mid-Atlantic, five percent of doves

⁶² Fisher, *supra* note 49.

⁶³ See 50 Fed. Reg. at 30,851 (the “continued use of lead shot shells can result in a concentrated source of lead in many of the areas where waterfowl feed”).

⁶⁴ B.F. Hunter & M.N. Rosen, *Occurrence of Lead Poisoning in a Wild Pheasant (Phasianus colchicus)*, 51 CALIF. FISH GAME 207 (1965).

⁶⁵ Lynn A. Lewis & Sarah H. Schweitzer, *Lead Poisoning in a Northern Bobwhite in Georgia*, 36 J. WILDL. DISEASE 180–183 (2000).

⁶⁶ T.L. Best, *et al.*, *Ingestion of Lead Pellets by Scaled Quail (Callipepla squamata) and Northern Bobwhite (Colinus virginianus) in Southeastern New Mexico*, 44 TEXAS J. SCIENCE 99–107 (1992).

⁶⁷ A.L. Stevenson, *et al.*, *Effects of Nontoxic Shot Regulations on Lead Accumulation in Ducks and American Woodcock in Canada*, 48 ARCH. ENVIRON. CONTAM. TOXICOL. 405–413 (2005); S.M. Strom, *et al.*, *Lead contamination in American Woodcock (Scolopax minor) from Wisconsin*, 49 ARCH. ENVIRON. CONTAM. TOXICOL. 396–402 (2005); A.M. Scheuhammer, *et al.*, *Lead and Stable Lead Isotope Ratios in Soil, Earthworms, and Bones of American Woodcock (Scolopax minor) from Eastern Canada*, 22 ENVIRON. TOXICOL. CHEM. 2585, 2590 (2003); A.M. Scheuhammer, *et al.*, *Elevated Lead Exposure in American Woodcock (Scolopax minor) in Eastern Canada*, 36 ARCH. ENVIRON. CONTAM. TOXICOL. 334–340 (1999).

⁶⁸ S. Kennedy, *et al.*, *Lead Poisoning in Sandhill Cranes*, 171 J. AM. VET. MED. ASSOC. 955–958 (1977)

⁶⁹ K.C. Sadler, *Mourning Dove Harvest*, in *ECOLOGY AND MANAGEMENT OF THE MOURNING DOVE*, 449–458 (T.S. Baskett, *et al.*, eds., 1993); FWS, *Mourning Dove: Population Status, 2012* (U.S. Department of Interior, 2012).

⁷⁰ J.C. Lewis & E. Legler, Jr., *Lead shot ingestion by Mourning Doves and incidence in soil*, 32 J. WILDL. MANAGEMENT 476–482 (1968).

⁷¹ Methodology to estimate total lead from dove hunting follows Best, *et al. supra* note 66.

⁷² R.J. Kendall & P.F. Scanlon, *Lead Concentrations in Mourning Doves Collected from Middle Atlantic Game Management Areas*, 33 PROC. ANN. CONF. SEAFWA 165–172 (1979); L.N. Locke & G.E. Bagley, *Lead poisoning in a sample of Maryland Mourning Doves*, 31 J. WILDL. MANAGE. 515–518 (1967).

⁷³ Best, *et al.*, *supra* note 66, at 105.

analyzed had elevated lead levels associated with lead ammunition exposure and shot was confirmed in 2.4 percent of gizzards,⁷⁴ a result that was consistent with earlier research.⁷⁵ While finding pellets can confirm lead shot exposure for an individual bird, not finding pellets does not rule out exposure.⁷⁶ Doves ingest large numbers of pellets present in the environment⁷⁷ and are likely killed by predators as a result of sublethal effects from lead poisoning impacting their ability to evade predators.⁷⁸ Moreover, because lead poisoning can be a slow, debilitating process, it may give the animal time to disperse, hide in high vegetation, and die unnoticed days later.⁷⁹ This will inevitably result in an underestimate of lead exposure for studies that depend on doves killed by hunters as a sampling method. It also increases the opportunity for mammalian scavengers to feed on carcasses and die from secondary poisoning.

American woodcock (*Scolopax minor*), is an upland game bird that forages extensively in the soil by probing with a long and flexible bill. In Canada, researchers have identified increased lead levels in this species and provided evidence that the source of this contamination is lead pellets from hunting.⁸⁰ The study revealed that 52 percent of adults and 29 percent of young also had elevated lead levels.⁸¹ This research compared the stable isotope ratio of lead from the wing bones of woodcock to other potential sources, including the soil and earthworms.⁸² The lead in the wings of woodcock sampled in Ontario, Quebec, Nova Scotia, and New Brunswick had an isotope ratio that was similar to shotgun pellets, thereby ruling out other possible sources.⁸³ Researchers in the United States have found that lead exposure in woodcock is “common and begins shortly after hatch.”⁸⁴ A

⁷⁴ Kendall & Scanlon, *supra* note 72.

⁷⁵ G.E. Bagley & L.N. Locke, *The Occurrence of Lead in Tissues of Wild Birds*, 2 BULL. ENVIRON. CONTAM. TOXICOL. 297–305 (1967).

⁷⁶ Kendall & Scanlon, *supra* note 72; Locke & Bagley, *supra* note 72.

⁷⁷ J.H. Schulz, *et al.*, *Spent-shot Availability and Ingestion on Areas Managed for Mourning Doves*, 30 WILDL. SOC. BULL. 112–120 (2002).

⁷⁸ J.H. Schulz, *et al.*, *Acute Lead Toxicosis in Mourning Doves*. 70 J. WILDL. MANAGE, 413–421 (2006).

⁷⁹ FWS, *supra* note 40; 50 Fed. Reg. 51,752, 51,753 (Dec. 19, 1985) (Notice of Availability of Draft Environmental Impact Statement on the Use of Lead Shot for Hunting Migratory Birds in the United States) (“[g]iven the difficulty in finding lead-poisoned birds, no accurate estimates can be made of annual losses” but “[w]hat is known is that losses are occurring every year and across the nation” and are “controllable as a reasonable and nontoxic substitute for lead shot is available”).

⁸⁰ Scheuhammer, *et al.* *supra* note 67.

⁸¹ *Id.*

⁸² The stable isotope ratio is the proportion of one type of elemental lead ²⁰⁶Pb with a slightly heavier elemental version ²⁰⁷Pb.

⁸³ Stevenson, *et al.*, *supra* note 67, at 409.

⁸⁴ Strom, *et al.* *supra* note 67, at 396.

study in Wisconsin found that 42 percent of young-of-year woodcock and 70 percent of chicks had elevated lead levels in their bones.⁸⁵ This is of special concern to hunters and conservationists alike because American woodcock are declining across their range and lead poisoning may exacerbate existing losses of breeding and wintering habitat.⁸⁶

ii. Lead Ammunition Harms Scavengers

Evidence demonstrates that avian and mammalian scavengers also suffer from the use of lead ammunition. One recently completed study found that “[t]he surprisingly high incidence of metal retention in carcasses as a result of fragmentation, and the density and distribution of fragments within them, suggest a high potential exposure of scavengers to lead.”⁸⁷ This conclusion points to several pathways by which scavengers are exposed to different types of lead ammunition, including: (1) consumption of an animal that has been killed or crippled with lead pellets;⁸⁸ (2) consumption of an animal that has been killed by lead bullets, which fragment in the carcass;⁸⁹ and (3) consumption of an animal that has eaten lead ammunition, or otherwise incorporated lead into the body.⁹⁰ While it is unclear whether direct consumption of lead bullets is a significant pathway, given the larger size of the bullets relative to the size of many scavengers, fragments thereof can certainly be consumed and contribute to lead exposure.⁹¹

Through these pathways, lead exposure has a variety of severe consequences for many species that might scavenge carcasses carrying lead. As with direct exposure, secondary exposure to lead “can impair blood synthesis, immune function and reproduction.”⁹² Moreover, scavengers that are exposed to lead will likely become weakened as well, and become “more susceptible to disease, starvation, and predation, and increased probability of death from other causes.”⁹³

⁸⁵ *Id.*

⁸⁶ Strom, *et al.*, *supra* note 67.

⁸⁷ Hunt, *et al.*, *supra* note 47, at 256.

⁸⁸ L.N. Locke, *et al.* *Lead Poisoning and Aspergillosis in an Andean Condor*, 155 J. AM. VET. MED. ASSOC. 1052–1056 (1969); W.W. Benson, *et al.*, *Lead Poisoning in Birds of Prey*, 11 BULL. ENVIRON. CONTAM. TOXICOL. 105–108 (1974).

⁸⁹ Pauli & Buskirk, *supra* note 47.

⁹⁰ R.C. Stendell, *Dietary exposure of kestrels to lead*, 44 J. WILDL. MANAGE. 527–530 (1980); T.W. Custer, *et al.*, *Tissue Lead Distribution and Hematologic Effects in American Kestrels (*Falco sparverius*) Fed Biologically Incorporated Lead*, 20 J. WILDL. DIS. 39–43 (1984).

⁹¹ S. Iqbal, *et al.*, *Hunting with Lead: Association between Blood Lead Levels and Wild Game Consumption*, 109 ENVIRON. RES. 952–959 (2009); Hunt, *et al.*, *Lead Bullet Fragments in Venison from Rifle-Killed Deer: Potential for Human Dietary Exposure*, PLOS ONE, 4: e5330 (2009).

⁹² Pain, *et al.*, *supra* note 45, at 107.

⁹³ *Id.*

California condors (*Gymnogyps californianus*) present an excellent, albeit devastating, example of the effects of lead on scavengers.⁹⁴ Recognizing the dramatic decline in the California condor population caused, in part, by lead poisoning, the FWS originally listed the California condor as an endangered species in 1967 under the Endangered Species Preservation Act⁹⁵ – the precursor to the Endangered Species Act.⁹⁶ The International Union for the Conservation of Nature (“IUCN”) attributes the drastic population decline of this species in the late 20th century primarily “to persecution and accidental ingestion of fragments from lead bullets and lead shot from carcasses.”⁹⁷ The species failed to recover, however, and by 1981, the population had declined to just 22 individuals.⁹⁸ In 1987, the bird became extinct in the wild after the remaining six birds were captured to join a captive-breeding recovery program.⁹⁹ By 1991, a sufficient number of birds had been bred in captivity to begin releasing the birds to reestablish a wild population.¹⁰⁰ Nevertheless, in 1994, the IUCN raised the designation of the California condor from endangered to critically endangered, where it remains today.¹⁰¹ Despite almost 45 years of federal protection and decades of international protection, the California condor remains one of the world’s most endangered species and its recovery seriously threatened by the effects of lead ammunition.

As a species on the brink of extinction, California condors have been studied extensively. This body of research provides incontrovertible evidence that lead-based ammunition from hunting poisons and kills individual birds and threatens

⁹⁴ See e.g., T.J. Cade, *Exposure of California Condors to Lead from Spent Ammunition*, 71 J. WILDL. MANAGE. 2125, 2131 (2007) (“the California condor has become a powerful symbol of the problems that spent ammunition lead poses to a variety of wildlife and to human beings.”).

⁹⁵ See 32 Fed. Reg. 4,001 (March 11, 1967) (Final Rule listing the California condor as endangered under the precursor to the ESA); see also 50 C.F.R. § 17.11 (listing the California condor as endangered under the ESA).

⁹⁶ T.R. Kelly, et al., *Impact of the California Lead Ammunition Ban on Reducing Lead Exposure in Golden Eagles and Turkey Vultures*, PLOS ONE, 6(4):e17656 (2011).

⁹⁷ IUCN, *Gymnogyps californianus*. IUCN Red List of Threatened Species. Version 2013.2, at <http://www.iucnredlist.org/details/22697636/0> (last accessed Apr. 24, 2014); see also R. Green, et al., *Effectiveness of Action to Reduce Exposure of Free-Ranging California Condors in Arizona and Utah to Lead from Spent Ammunition*, PLOS ONE, 3:e4022 (2008).

⁹⁸ IUCN, *supra* note 97.

⁹⁹ *Id.*

¹⁰⁰ See 61 Fed. Reg. 54,044, 54,047 (Oct. 16, 1996) (FWS Final Rule; Establishment of a Nonessential Experimental Population of California Condors in Northern Arizona) (describing the experimental release program).

¹⁰¹ IUCN, *supra* note 97.

the recovery of this species in the wild.¹⁰² While not specifically targeted by hunters, many California condors began dying of lead poisoning shortly after their reintroduction to the wild.¹⁰³ In fact, research comparing the lead levels of captive condors with those of free-flying condors documented that lead levels in wild condors were almost *ten times* higher than those in captivity.¹⁰⁴ Researchers realized that the released condors became poisoned by lead in ammunition. As scavengers, condors typically feed on carcasses of dead animals or animal remains, including gut piles from animals that died after being shot with lead ammunition or animals that died from secondary lead poisoning.¹⁰⁵ Studies found that “the only identified source of lead in exposed condors in California. . .[is] from spent [lead] ammunition.”¹⁰⁶ Poisoning from lead ammunition causes a particularly painful death for condors – elevated lead levels paralyze a condor’s digestive tract, effectively causing the animal to starve to death.¹⁰⁷

Recently completed studies demonstrate that laws and regulations prohibiting the use of lead ammunition have had tangible, beneficial effects by reducing lead in the environment in certain areas inhabited by California condors, thereby decreasing the threat of lead ammunition to the California condor and other birds.¹⁰⁸ However, conservation organizations caution that the birds are still jeopardized by lingering effects of lead ammunition. For instance, the Peregrine Fund estimates that the reintroduced California condor population could go extinct in a few years without intervention to aid condors suffering from acute lead poisoning through methods such as chelation therapy, which involves a four-week long process of cleaning their blood.¹⁰⁹ In 2012, scientists warned that the recovery of California condors was “deceptive” and that without further action to reduce lead

¹⁰² S.R. Beissinger *et al.*, *Science Links Lead Ammunition to Lead Exposure in California Condors (Gymnogyps californianus): Statement of Scientific Agreement* at 1-6 (2007); C.P. Woods, *et al.*, *Survival and Reproduction of California Condors Released in Arizona*, CALIFORNIA CONDORS IN THE 21ST CENTURY SERIES IN ORNITHOLOGY NO 2 at 57-78 (A. Mee & L.S. Hall, eds., 2007).

¹⁰³ *Id.* Blood samples confirmed that many of the birds succumbed to lead poisoning. J. Chesley, *et al.*, *Evidence for the source of lead contamination within the California Condor* [abstract], in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 265 (R.T. Watson, *et al.*, eds., 2009).

¹⁰⁴ M.E. Finkelstein, *Feather lead concentrations and ²⁰⁷Pb/²⁰⁶Pb ratios reveal lead exposure history of California Condors*, 44 ENVIRON. SCI. TECHNOL. 2639–2647 (2010).

¹⁰⁵ V.J. Meretsky, *et al.*, *Demography of the California Condor: Implications for Reestablishment*, 14 CONSERV. BIOL. 957–967 (2000).

¹⁰⁶ K. Keller-Lynn, *Spent Lead Ammunition Poisons California Condors*, 25 PARK SCIENCE 1, 21 (2008); O.H. Pattee, *et al.*, *Lead Poisoning in Captive Andean Condors (Vultur gryphus)*, 42 J. WILDL. DIS. 772–779 (2006).

¹⁰⁷ Hunt, *et al.*, *supra* note 47.

¹⁰⁸ Kelly, *et al.* *supra* note 96.

¹⁰⁹ M.L. Miller, *Get the Lead Out*, 19 LIVING BIRD 25 (Autumn, 2009).

poisoning, the species would not recover.¹¹⁰ The study, published by the National Academy of Sciences, concluded:

condors in California remain chronically exposed to harmful levels of lead; 30% of the annual blood samples collected from condors indicate lead exposure (blood lead \geq 200 ng/mL) that causes significant subclinical health effects, measured as $>60\%$ inhibition of the heme biosynthetic enzyme δ -aminolevulinic acid dehydratase. Furthermore, each year, $\sim 20\%$ of free-flying birds have blood lead levels (≥ 450 ng/mL) that indicate the need for clinical intervention to avert morbidity and mortality. Lead isotopic analysis shows that lead-based ammunition is the principle source of lead poisoning in condors. Finally, *population models based on condor demographic data show that the condor's apparent recovery is solely because of intensive ongoing management, with the only hope of achieving true recovery dependent on the elimination or substantial reduction of lead poisoning rates.*¹¹¹

Other avian scavengers are thought to be harmed by spent lead ammunition. For example, evidence suggests that turkey vultures (*Cathartes aura*) may be vulnerable to lead poisoning from spent ammunition.¹¹² Scientists estimate that lead poisoning affects up to one third of the entire population.¹¹³ Ornithologists also believe that lead poisoning is common in the black vulture (*Coragyps atratus*), a species found in the southeastern United States, though the extent of the threat has not yet been fully assessed.¹¹⁴

Vulnerability to lead poisoning is not limited to avian scavengers. Mammalian scavengers also are exposed to lead from eating the carcasses of small animals killed for sport such as prairie dogs,¹¹⁵ or gut piles or other portions of

¹¹⁰ M.E. Finkelstein, *et al.*, *Lead Poisoning and the Deceptive Recovery of the Critically Endangered California Condor*, 109 PROC. NAT. ACAD. SCI. USA 11449–11454 (2012).

¹¹¹ *Id.* (emphasis added).

¹¹² M.H. Reiser & S.A. Temple, *Effects of Chronic Lead Ingestion on Birds of Prey*, in RECENT ADVANCES IN THE STUDY OF RAPTOR DISEASES, 21–25, (J.E. Cooper & A.G. Greenwoode, eds., 1981); S. A. Lambertucci, *et al.*, *Widening the Problem of Lead Poisoning to a South-American Top Scavenger: Lead Concentrations in Feathers of Wild Andean Condors*. 144 BIOL. CONSERV. 1464–1471 (2011).

¹¹³ D.A. Kirk & M.J. Mossman, *Turkey Vulture (Cathartes aura)*, in THE BIRDS OF NORTH AMERICA ONLINE, (A. Poole, ed., 1998), <http://bna.birds.cornell.edu/bna/species/339>; Kelley *et al.*, *supra* note 96.

¹¹⁴ M.J. Mossman, *Black and Turkey Vultures*, in PROCEEDINGS OF THE MIDWEST RAPTOR MANAGEMENT SYMPOSIUM AND WORKSHOP, 3–22. Washington, D.C.: National Wildlife Federation; D. Craighead & B. Bedrosian, *Blood Lead Levels of Common Ravens with Access to Big-Game Offal*, 72 J. WILDL. MANAGE. 240–245 (2008).

¹¹⁵ Pauli & Buskirk, *supra* note 47.

carcasses left by hunters in the field.¹¹⁶ Researchers have shown that grizzly bears sampled in the Yellowstone ecosystem have elevated lead levels in their blood (average 5.5 µg/dL, maximum 18 µg/dL), although the physiological effects of such exposure, which exceed some standards set for human exposure (2 µg/dL), are as yet unknown.¹¹⁷ Black bears in this ecosystem also had elevated lead levels (average 1.6 µg/dL, maximum 6.9 µg/dL).¹¹⁸

iii. Lead Ammunition Harms Avian Predators

Lead ammunition also has detrimental effects on avian predators. Animals shot with lead ammunition, but not retrieved by hunters, can retain lead in their tissue and embedded lead can be ingested by avian predators when they consume these crippled or dead animals, or feed on prey that has assimilated lead in their bodies.¹¹⁹ Nearly all predatory birds will be susceptible to lead poisoning if they consume such prey. In the United States, lead poisoning is a documented mortality source for bald eagles, red-tailed hawks,¹²⁰ peregrine falcons,¹²¹ prairie falcons,¹²² American kestrels,¹²³ and aplomado falcons,¹²⁴ among others.¹²⁵ Effects on these species do not need to be lethal to adults to be significant. Dietary lead as low as one part per million can thin eggshells in kestrels, a process that will lead to decreased reproductive output.¹²⁶ Relatively low exposure to lead increases the risk of

¹¹⁶ T. Rogers, *et al.*, *Lead Ingestion By Scavenging Mammalian Carnivores in the Yellowstone Ecosystem*, in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 206 (R.T. Watson, *et al.*, eds., 2009).

¹¹⁷ T.A. Rogers, *Lead Exposure in Large Carnivores in the Greater Yellowstone Ecosystem*. 76 *J. WILD. MANAGE.* 575–582 (2011); C.C. Wilmers, *et al.*, *Resource Dispersion and Consumer Dominance: Scavenging at Wolf- and Hunter-Killed Carcasses in Greater Yellowstone, USA*, 6 *ECOL. LETT.* 996–1003 (2003).

¹¹⁸ Rogers, *supra* note 116.

¹¹⁹ Locke, *et al.*, *supra* note 88; Benson, *et al.*, *supra* note 88; E. Jacobson, *et al.*, *Suspected Lead Toxicosis in a Bald Eagle*, 171 *J. AM. VET. MED. ASSOC.* 952–954 (1977).

¹²⁰ C.R. Preston & R.D. Beane, *Red-tailed Hawk (Buteo jamaicensis)*, in *THE BIRDS OF NORTH AMERICA ONLINE*, <http://bna.birds.cornell.edu/bna/species/052> (A. Poole, ed. 2009).

¹²¹ Pain, *et al.*, *supra* note 45.

¹²² *Id.*

¹²³ P. Grandjean, *Possible Effect of Lead on Egg-Shell Thickness in Kestrels, 1874–1974*, 16 *BULL. ENVIRON. CONTAM. TOXICOL.* 101–106 (1976); J.C. Franson, *et al.*, *Effects of Chronic Dietary Lead in American Kestrels (Falco sparverius)*, 19 *J. WILDL. DIS.* 110–113 (1983).

¹²⁴ D.P. Keddy-Hector, *Aplomado Falcon (Falco femoralis)*, in *THE BIRDS OF NORTH AMERICA ONLINE*, (A. Poole, ed., 2000), <http://bna.birds.cornell.edu/bna/species/549>.

¹²⁵ Pain, *et al.* *supra* note 45; Fisher, *et al.*, *supra* note 49.

¹²⁶ Grandjean, *supra* note 123, at 103.

bacterial infection in raptors.¹²⁷ For species that have diets that include prey frequently hunted by humans, exposure to lead is a serious risk.¹²⁸

For example, golden eagles (*Aquila chrysaetos*) frequently feed on carrion and are therefore exposed to lead from hunting.¹²⁹ Bald eagles (*Haliaeetus leucocephalus*) also scavenge on carrion, exposing themselves to lead from spent ammunition.¹³⁰ Such exposure correlated with mortality of bald eagles in the field, as well as deleterious sublethal effects under experimental conditions.¹³¹ This is a widespread problem: 36 percent of birds in southern California studied prior to state action to limit lead ammunition,¹³² 48 percent of birds in Idaho sampled from 1990–1997,¹³³ and 56 percent of sampled migrant birds in Montana had elevated lead levels in their blood.¹³⁴ Further, 44 percent of golden eagles necropsied in Idaho from 1977–1986 suffered from lead poisoning.¹³⁵ Of golden eagles sampled in the range of California condor in the 1980s, 39 percent showed blood lead levels indicating environmental exposure, five percent were clinically ill from lead poisoning, and 1.5 percent (or 1 of 64) had acute lead toxicosis.¹³⁶ In Canadian Prairie Provinces, 12 percent of necropsied birds had lead poisoning and another four percent had elevated levels of lead in their blood.¹³⁷ Researchers agree that the

¹²⁷ Reiser & Temple, *supra* note 112. A Peregrine Falcon was also apparently killed from infection caused by lead poisoning. S.H. DeMent, *et al.* *Lead Exposure in an "Urban" Peregrine Falcon and its Avian Prey*, 22 J. WILDL. DIS. 238–244 (1986).

¹²⁸ Keddy-Hector, *supra* note 124.

¹²⁹ P.H. Bloom, *et al.*, *Lead Contamination of Golden Eagles Aquila Chrysaetos Within the Range of California Condor Gymnogyps Californianus*, in *RAPTORS IN THE MODERN WORLD*, 481–482 (B.-U. Meyburg & R.D. Chancellor eds., 1989).

¹³⁰ L. Cruz-Martinez, *et al.*, *Lead From Spent Ammunition: A Source of Exposure and Poisoning in Bald Eagles*, 6 HUMAN-WILDLIFE INTERACTIONS 94-104 (2012); E. Stauber *et al.*, *Lead Poisoning of Bald (Haliaeetus leucocephalus) and Golden (Aquila chrysaetos) Eagles in the US Inland Pacific Northwest Region – An 18-year Retrospective Study: 1991-2008*, 24 J. AVIAN MED. SURG. 279-287 (2010); J.E. Pagel *et al.*, *Exposure of Bald Eagles to Lead in the Northern Channel Islands, California*, 46 J. RAPTOR RES. 168-176 (2012).

¹³¹ O.H. Pattee, *et al.*, *Experimental Lead-Shot Poisoning in Bald Eagles*. 45 J. WILDL. MANAGE. 806–810 (1981).

¹³² O.H. Pattee, *et al.*, *Lead Hazards Within the Range of the California Condor*, 92 CONDOR 931, 936 (1990).

¹³³ E.H. Craig & T.H. Craig, *Lead and Mercury Levels in Golden and Bald Eagles and Annual Movements of Golden Eagles Wintering in East Central Idaho 1990–1997* (U.S. Department of Interior, 1998).

¹³⁴ Robert Domenech & Heiko Langner, *Blood-lead Levels of Fall Migrant Golden Eagles in West-Central Montana*, Extended abstract in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 221-22 (R.T. Watson *et al.* eds., 2009).

¹³⁵ T.H. Craig, *et al.*, *Lead Concentrations in Golden and Bald Eagles*, 102 WILSON BULL 130–133 (1990).

¹³⁶ Bloom, *et al.*, *supra* note 129.

¹³⁷ M. Wayland & T. Bollinger, *Lead Exposure and Poisoning in Bald Eagles and Golden Eagles in the Canadian Prairie Provinces*, 104 ENVIRON. POLLUT. 341–350 (1999).

sources of lead consumed by eagles are from upland hunting,¹³⁸ especially of deer¹³⁹ and ground squirrels.¹⁴⁰ As with other birds, chronic exposure leads to injury, predation, starvation, disease, and reproductive failure.¹⁴¹

2. Lead Ammunition's Harmful Effect on Humans

Not only does the use of lead ammunition have a substantial negative effect on wildlife, it poses a threat to public health – lead's toxic effects on humans are broad, well-documented, and universally negative. Lead is a potent neurotoxin,¹⁴² for which no safe exposure level exists for humans.¹⁴³ As such, researchers have concluded that “[f]rom a public health perspective, use of lead cartridges shotguns (to hunt migratory birds and other small game) *should be replaced internationally with a non-toxic metal or alloy.*”¹⁴⁴ Lead exposure may initiate a variety of debilitating conditions, including high blood pressure, hearing loss, anemia, and kidney disease,¹⁴⁵ as well as decreased fertility, cataracts, nerve disorders, muscle and joint pain, and memory or concentration problems in humans.¹⁴⁶ Extensive lead exposure has been attributed to a variety of neurological disorders, including a lack of muscular coordination, convulsions, and coma.¹⁴⁷

The effects of lead ammunition on human populations are not evenly distributed. Women and children are more vulnerable; exposure to small amounts can affect brain development in unborn children and result in behavioral problems.¹⁴⁸ Low levels of lead exposure have a range of neurological, behavioral, and developmental effects on children.¹⁴⁹ These adverse effects include

¹³⁸ *Id.*

¹³⁹ Pattee, *et al.*, *supra* note 131.

¹⁴⁰ Domenech & Langner, *supra* note 134.

¹⁴¹ FWS, *supra* note 34, at III-1–III-15; Tranel & Kimmel, *supra* note 14, at 319.

¹⁴² R.L. Canfield, *et al.*, *Intellectual Impairment in Children with Blood Lead Concentrations Below 10 Ug Per Deciliter*, 348 NEW ENGL. J. MED. 1517–1526 (2003); H.L. Needleman, *et al.*, *The Long-Term Effects of Exposure to Low Doses of Lead in Childhood: An 11-year Follow-Up Report*, 322 NEW ENGL. J. MED. 83–88 (1990).

¹⁴³ Canfield, *et al.* *supra* note 142; B.P. Lanphear, *et al.* *Low-level Environmental Lead Exposure and Children's Intellectual Function: An International Pooled Analysis*, 113 ENVIRON. HEALTH PERSPECT. 894–899 (2005).

¹⁴⁴ B. Lévesque, *et al.*, *Monitoring of Umbilical Cord Blood Lead Levels and Sources Assessment Among the Inuit*, 60 OCCUP. ENVIRON. MED. 693, 695 (2003) (emphasis added).

¹⁴⁵ See e.g., M.J. Kosnett, *Health Effects of Low Dose Lead Exposure in Adults and Children, And Preventable Risk Posed by the Consumption of Game Meat Harvested with Lead Ammunition, in* INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS, 24-31 (R. T. Watson, *et al.*, eds. 2009).

¹⁴⁶ National Institutes of Health, *supra* note 16.

¹⁴⁷ *Id.*

¹⁴⁸ Kosnett, *supra* note 145.

¹⁴⁹ Canfield, *et al.* *supra* note 143; Lanphear, *et al.*, *supra* note 143; Kosnett, *supra* note 145.

hyperactivity,¹⁵⁰ lowered performance on intelligence tests,¹⁵¹ and increased aggressiveness and delinquency.¹⁵² Individuals who eat large amounts of game meat and hunters who use lead ammunition also can be disproportionately affected.¹⁵³

Despite a long held belief that lead ammunition remained intact upon contact in animal tissue, new evidence demonstrates that lead bullets fragment upon impact.¹⁵⁴ In Canada, prior to the restrictions on lead shot, 4,000 edible birds killed by hunters were collected and analyzed for lead content.¹⁵⁵ The researchers found that lead levels varied widely within individual birds, meaning that fragments of lead ammunition were retained in tissues, even as larger, visible pieces of lead were removed prior to analysis. These small particles retained in tissues are especially dangerous because they are more quickly absorbed in the digestive system when consumed by humans.¹⁵⁶ Thus, even if the main part of a bullet is removed from an animal, fragments of lead will likely still exist in the meat ingested by humans.¹⁵⁷

Many of these fragments are too small to see or even feel, increasing the possibility that individuals will unknowingly consume pieces of lead. Metal fragments have been found in both ground meat packets and in packages of venison; however, because it is often impossible to tell which packages contain lead without lab tests, individuals have no way of knowing whether they are ingesting meat contaminated with lead.¹⁵⁸ Additionally, many hunters donate game meat to local shelters for needy or homeless individuals. If the donated carcass was exposed to or killed by lead ammunition, the individuals at the shelters may unknowingly become

¹⁵⁰ J.M. Braun, *et al.*, *Exposures to Environmental Toxicants and Attention Deficit Hyperactivity Disorder in U.S. Children*, 114 ENVIRON. HEALTH PERSPECT. 1904–1909 (2006).

¹⁵¹ Canfield, *et al. supra* note 143; Lanphear, *et al.*, *supra* note 143.

¹⁵² K.P.K. Olympio, *et al.*, *Neurotoxicity and Aggressiveness Triggered by Low-Level lead in Children: A Review*, 26 PAN. AM. J. PUB. HEALTH 266–275 (2009).

¹⁵³ P. Johansen, *et al.*, *Lead Shot from Hunting as a Source of Lead in Human Blood*, 142 ENVIRON POLLUT. 93-97 (2006); P. Johansen, *et al.*, *High Human Exposure to Lead Through Consumption of Birds Hunted with Lead Shot*, 127 ENVIRON. POLLUT. 125-129 (2004); D.J. Pain, *et al.*, *Potential Hazard to Human Health from Exposure to Fragments of Lead Bullets and Shot in the Tissues of Game Animals*, PLOS ONE, 5: e10315 (2010).

¹⁵⁴ Hunt, *et al.*, *supra* note 47.

¹⁵⁵ A.M. Scheuhammer, *et al.*, *Elevated Lead Concentrations in Edible Portions of Game Birds Harvested with Lead Shot*, 102 ENVIRON POLLUT 251–257 (1998).

¹⁵⁶ D. Bartrop & F. Meek, *Effect of particle size on lead absorption from the gut*, 34 ARCH ENVIRON HEALTH 280–285 (1979).

¹⁵⁷ A.M. Scheuhammer, *et al.*, *Elevated Lead Concentrations in Edible Portions of Game Birds Harvested with Lead Shot*, 102 ENVIRON. POLLUT. 251–257 (1998).

¹⁵⁸ Hunt, *et al.*, *supra* note 47; Hunt, *et al.*, *supra* note 91.

exposed to lead.¹⁵⁹ The exposure of sensitive populations, such as those who are not in a position to refuse a meal, to a hazardous substance such as lead is a particularly egregious outcome of the use of lead ammunition.

Several studies have investigated the effect of lead ammunition on humans who consume meat contaminated by lead ammunition and have concluded that people who eat game harvested with lead ammunition face a high degree of risk to their health.¹⁶⁰ Similarly, doctors have concluded that individuals who consume game species harvested with lead shot risk exposure to this metal by way of ingestion of tissue-embedded lead pellets and fragments.¹⁶¹ In 1998, two patients diagnosed with lead poisoning (after symptoms of fatigue, abdominal pain, and constipation) acknowledged frequently consuming lead shot from game birds.¹⁶² Medical literature documents many instances of the presence of lead ammunition in human digestive tracts.¹⁶³

Lead ammunition's negative effects on humans prompted the Minnesota Department of Natural Resources to declare that "with alternatives to lead shot readily available, human exposure to lead through game meat is unnecessary."¹⁶⁴ Also concerned about lead ammunition's detrimental effects on public health, the North Dakota Department of Health commissioned a study to research the health implications for individuals who consumed animals killed with lead ammunition. The study concluded that people who consume a significant amount of wild game tended to have higher lead levels than those who ate little or none.¹⁶⁵ In fact, the study reported "there is a growing concern that the use of lead ammunition for the hunting of wild game, *a nonessential use of lead*, may increase the lead exposure of adults and children who consume the harvested meat."¹⁶⁶ Requiring the use of nontoxic ammunition would be an effective way to address such concerns – a study of the umbilical cord blood in Inuits following a public health effort to reduce the

¹⁵⁹ Grund, *et al.*, *Bullet Fragmentation and Lead Deposition in White-Tailed Deer and Domestic Sheep*, 4 HUMAN-WILDLIFE INTERACTIONS 257-266 (2010); Press Release, North Dakota Dept. of Health, *State Health Department Announces Preliminary Findings in Blood Lead Level Study* (Nov. 5, 2008).

¹⁶⁰ Pain, *et al.*, *supra* note 153.

¹⁶¹ L.J.S. Tsuji & E. Nieboer, *Lead Pellet Ingestion in First Nation Cree of Western James Bay Region of Northern Ontario, Canada: Implications for Nontoxic Shot Alternative*, 3 ECOSYST. HEALTH 54–61 (1997).

¹⁶² Tranel & Kimmel, *supra* note 14.

¹⁶³ *Id.*

¹⁶⁴ Tranel & Kimmel, *supra* note 14, at 326 (citations omitted).

¹⁶⁵ North Dakota Dept. of Health, *supra* note 159; Kosnett, *supra* note 145.

¹⁶⁶ Kosnett, *supra* note 145, at 28 (emphasis added).

use of lead ammunition found reduced lead levels.¹⁶⁷

3. Lead Ammunition’s Harmful Environmental Effects

Hunting with lead ammunition also presents a substantial risk because it causes lead to accumulate in the environment. Lead contamination may occur in any area where hunting with lead ammunition is permitted, including woodlands, wetlands, and agricultural fields.¹⁶⁸ Extensive lead contamination also has been documented in areas next to shooting ranges.¹⁶⁹ Post-hunt surveys across different habitats show that up to hundreds of thousands of pellets per acre can be found in the top layers of soil:

| Location | Pellets per hectare or acre |
|---|---|
| Area for dove hunting (Mo.) ¹⁷⁰ | 64,775 – 1,086,000 (per hectare) |
| Fields managed for dove hunting (Ind.) ¹⁷¹ | 2,200 – 84,000 (per hectare, in top 1/2-inch of soil) |
| Field managed for dove hunting (Tenn.) ¹⁷² | 14,000 – 43,500 (per acre, in top 3/8-inch of soil) |
| Dove and quail hunting area (N.M.) ¹⁷³ | 167,500 – 860,000 (per hectare in top 1/2-inch of soil) |
| Pheasant release site (Wash.) ¹⁷⁴ | 188,000 (per acre, in top 5 inches of soil) |
| Pheasant release site (Wash.) ¹⁷⁵ | 344,000 (per acre, in top 4 inches of soil) |
| Grizzly Island wildlife area (Calif.) ¹⁷⁶ | 348,000 (per acre) |

¹⁶⁷ Lévesque, *et al.*, *supra* note 144; Hunt, *et al.*, *supra* note 91; Iqbal, *et al.*, *supra* note 91; Pain, *et al.*, *supra* note 153.

¹⁶⁸ V.G. Thomas, *The Environmental and Ethical Implications of Lead Shot Contamination of Rural Lands in North America*, 10 J. AG. ENV. ETHICS 41–54 (1997).

¹⁶⁹ X. Cao, *et al.*, *Lead Transformation and Distribution in the Soils of Shooting Ranges in Florida, USA*, 307 SCI TOTAL ENVIRON 179–189 (2003); D.I. Bannon, *et al. Evaluation of Small Arms Range Soils for Metal Contamination and Lead Bioavailability*, 43 ENVIRON SCI. TECHNOL. 9071–9076 (2009); *see also* Thomas, *supra* note 168. The amount of spent ammunition at shooting ranges is better understood than that of other areas of land on which hunting occurs, in part because the spent ammunition is considered a “solid waste” under RCRA and shooting ranges often clean up and document such waste as a result, *see supra* notes 31–32 and accompanying text, and because shooting ranges have been the subject of environmental litigation.

¹⁷⁰ J.H. Schulz, *et al.*, *supra* note 77, at 116.

¹⁷¹ J.S. Castrale, *Availability of Spent Lead Shot in Fields Managed for Mourning Dove Hunting*, 17 WILDL. SOC. BULL. 184, 186-87 (1989).

¹⁷² J.C. Lewis & E. Legler, Jr., *Lead Shot Ingestion by Mourning Doves and Incidence in Soil*, 32 WILDL. SOC. BULL. 476–482 (1968).

¹⁷³ T.L. Best, *et al. Availability and Ingestion of Lead Shot by Mourning Doves (Zenaida macroura) in Southeastern New Mexico*, 37 SOUTHWEST NAT. 287–292 (1992).

¹⁷⁴ Washington Department of Fish and Wildlife Nontoxic Shot Working Group, *Report to the Washington Fish and Wildlife Commission: the Use of Nontoxic Shot for Hunting in Washington* at 7 (2001).

¹⁷⁵ *Id.*

Numerous scientific studies have documented the detrimental environmental effects that result from the dispersal of lead ammunition. Spent, or discharged, lead ammunition may remain intact for decades.¹⁷⁷ In fact, “lead shot can take 100 to 300 years to disappear from a site, allowing for concentrations of large amounts of lead in areas of heavy hunting pressure.”¹⁷⁸ Once lead ammunition starts to degrade, it releases particulate compounds that may contaminate soil, surface water, and ground water.¹⁷⁹ One research report concluded that the use of lead ammunition “can result in local lead concentrations in soils and water far in excess of normal concentrations.”¹⁸⁰ Lead ammunition contamination is particularly high in areas with hardpan clay layers because the shot pellets cannot settle beyond the impermeable layer, leading to greater instances of lead poisoning in those areas.¹⁸¹ Similarly, in the tundra, where downward movement is limited, lead stays more readily available to organisms for many years.¹⁸² Cultivation, where feasible, can reduce the amount of lead near the surface,¹⁸³ but the lead can still harm the environment through other pathways.

One study found that lead that is deposited in the soil can be transferred from the soil into the leaves, stems, and roots of six species of native tree species in North America.¹⁸⁴ This transfer is proportional to the concentration of lead in the soil, and thus is a cumulative effect that will only increase with time.¹⁸⁵ Through this process, lead can contaminate small mammals and other organisms in the vicinity of sites where pellets or bullets are left in the environment in substantial numbers. For example, tadpoles died after being exposed to water contaminated by lead ammunition from a shooting range,¹⁸⁶ and lead was elevated in the kidneys,

¹⁷⁶ FWS, *supra* note 34.

¹⁷⁷ Thomas, *supra* note 168, at 42.

¹⁷⁸ Tranel & Kimmel, *supra* note 14, at 325.

¹⁷⁹ Thomas, *supra* note 168, at 44.

¹⁸⁰ A.M. Scheuhammer & S.L. Norris, *A Review of the Environmental Impact of Lead Shotshell Ammunition and Lead Fishing Weights in Canada*, CANADIAN WILDLIFE SERVICE, No. 88 at 18 (1995).

¹⁸¹ C.M. Thomas, *et al.*, *Effects of Tillage on Lead Shot Distribution in Wetland Sediments*, 65 J. WILDL. MANAGE. 40–46 (2001).

¹⁸² P.L. Flint, *Settlement Rate of Lead Shot in Tundra Wetlands*, 62 J. WILDL. MANAGE. 1099–1102 (1998).

¹⁸³ L.H. Fredrickson, *et al.*, *Evaluating cultivation near duck blinds to reduce lead poisoning hazard*, 41 J. WILDL. MANAGE. 624–631 (1977).

¹⁸⁴ G.L. Rolfe, *Lead Uptake by Selected Tree Seedlings*, 2 J. ENV. QUAL. 153–157 (1973).

¹⁸⁵ *Id.*

¹⁸⁶ W. Stansley, *et al.*, *Effects of Lead-Contaminated Surface Water from a Trap and Skeet Range on Frog Hatching and Development*, 96 ENVIRON. POLLUT. 69–74 (1997).

liver, and bones of wood mice, bank voles, and shrews found at a shooting range.¹⁸⁷ These results are confirmed at other ranges with dramatically elevated lead levels measured in white-footed mice, short-tailed shrew, and green frogs.¹⁸⁸

Crops can also become contaminated if grown in areas where the potential exists for heavy accumulation of lead ammunition.¹⁸⁹ For instance, researchers have suggested that high lead levels in rice in Spain results from cultivation in or next to fields where hunting with lead ammunition occurs.¹⁹⁰ Moreover, dairy and beef cattle also have developed lead poisoning after feeding in areas where spent lead ammunition accumulated.¹⁹¹

B. Current Programs Restricting the Use of Lead Ammunition

In recognition of the numerous threats posed by lead, a number of prohibitions on the use of lead ammunition at the federal, state, and international levels have already been instituted. Some of these restrictions were implemented pursuant to regulatory schemes that phased-out the use of lead-based ammunition, while others were implemented pursuant to single actions. Studies conducted after implementation of the various restrictions confirm that they have been successful in reducing lead poisoning in the species targeted for protection. However, because these regulations only apply to particular species or in certain areas, serious threats to a wide variety of wildlife and their habitats remain. A DOI-instituted requirement for the use of nontoxic ammunition on NPS and FWS lands would provide additional, necessary protections and serve to harmonize existing practices intended to safeguard wildlife, federal land, and public health.

1. The FWS Requirement for Nontoxic Shot for Hunting Waterfowl

In 1986, in light of “the preponderance of scientific evidence” demonstrating that “the loss of waterfowl to lead poisoning was a serious problem,” the FWS

¹⁸⁷ Wei-chun Ma, *Effect of Soil Pollution with Metallic Lead Pellets on Lead Bioaccumulation and Organ/Body Weight Alterations in Small Mammals*, 18 ARCH. ENVIRON. CONTAM. TOXICOL. 617–622 (1989).

¹⁸⁸ W. Stansley & D.E. Roscoe, *The Uptake and Effects of Lead in Small Mammals and Frogs at a Trap and Skest Range*, 20 ARCH. ENVIRON. CONTAM. TOXICOL. 220–226 (1996).

¹⁸⁹ Tranel & Kimmel, *supra* note 14; Thomas, *supra* note 168, at 46.

¹⁹⁰ See R. Guitart, *et al.*, *Lead-Poisoned Wildfowl in Spain: A Significant Threat for Human Consumers*, 12 INT. J. ENVIRON. HEALTH RES. 301, 305 (2002).

¹⁹¹ K. Bischoff *et al.*, *Declines in Blood Lead Concentrations in Clinically Affected and Unaffected Cattle Accidentally Exposed to Lead*, 24 J. VET. DIAG. INVESTIG. 182–187 (2012); D.A. Rice, *et al.*, *Chronic Lead Poisoning in Steers Eating Silage Contaminated with Lead Shot—Diagnostic Criteria*, 39 BULL ENVIRON CONTAM TOXICOL 622–629 (1987).

implemented a nationwide phase-in program requiring the use of nontoxic shot for all hunting of waterfowl by the 1991-1992 hunting season.¹⁹² The program concluded on September 1, 1991, when the FWS instituted a nationwide ban on the use of lead shot for the hunting of waterfowl.¹⁹³ When summarizing the action, the FWS noted that, “the use of lead shot in waterfowl hunting *poses an unnecessary risk* to certain migratory birds because when the spent shot is consumed it often produces lead poisoning and death.”¹⁹⁴ The FWS also expressed concern that lead shot not only poisoned the hunted birds, but that it might also kill their predators.¹⁹⁵

The FWS codified the requirement in its regulations covering legal hunting methods for migratory birds. Specifically, the FWS designated the contiguous 48 states, Hawai'i, Alaska, and the territories of Puerto Rico and the Virgin Islands as “nontoxic shot zones for hunting waterfowl, coots, and certain other species.”¹⁹⁶ The rule defines “certain other species” as “those species, other than waterfowl or coots, that are affected by reason of being included in aggregate bags and concurrent seasons.”¹⁹⁷ The FWS regulation provides a list of approved nontoxic shot permitted for hunting waterfowl and coots in lieu of lead shot,¹⁹⁸ which it updates as new nontoxic shot becomes available.¹⁹⁹

Scientific research conducted in the years following the nontoxic shot requirement has revealed that the rule has resulted in a dramatic reduction of fatal lead poisoning of waterfowl and has been “an extremely successful management approach. . .”²⁰⁰ Indeed, one study found that the “evidence, to date, has favored the

¹⁹² 56 Fed. Reg. 22,100, 22,101 (May 13, 1991) (Final Rule: Nationwide Requirement To Use Nontoxic Shot for the Taking of Waterfowl, Coots, and Certain Other Species Beginning in the 1991-92 Hunting Season). The FWS cited the MBTA and ESA as their authority to implement the ban. *Id.*

¹⁹³ *Id.* at 22,100. As discussed below, *infra* Section IV.C, the restriction on the use of lead-shot for hunting waterfowl have led to the availability of a variety of nontoxic alternatives, such that issuing a regulation that requires the immediate use of nontoxic ammunition would not burden agency management or hunting activities in these areas. However, Petitioners recognize that the DOI may prefer to implement such a requirement pursuant to a phase-in program, similar to the way in which the FWS implemented its waterfowl restrictions.

¹⁹⁴ *Id.* (emphasis added).

¹⁹⁵ *Id.* at 22,101–102.

¹⁹⁶ 50 C.F.R. § 20.108.

¹⁹⁷ *Id.*

¹⁹⁸ 50 C.F.R. § 20.21(j)(1); *see also infra* notes 245–249 and accompanying text (describing the certification process and types of approved nontoxic shot).

¹⁹⁹ *See e.g.*, 78 Fed. Reg. 65,573 (Nov. 1, 2013) (approving the use of a new shot type).

²⁰⁰ Thomas, *supra* note 14, at 354; *see also* R.O. Kimmel & M.A. Tranel, *Evidence of Lead Shot Problems for Wildlife, the Environment, and Human Health – Implications for Minnesota, in*

transition, [and] is conducive to a broader use of lead substitutes” and that requiring nontoxic ammunition in waterfowl hunting “*has been the most cost-effective conservation tool to date in conserving waterfowl populations*” and argues that similar savings could be expected upon enactment of a prohibition on the use of lead ammunition for hunting other species.²⁰¹ Another study estimated that the FWS rule reduced lead poisoning deaths for Mississippi Flyway mallards by 64 percent, while overall ingestion of toxic pellets declined by 78 percent over previous levels, and spared approximately 1.4 million ducks from lead poisoning every year.²⁰² Another study reported that lead concentrations in certain species of ducks decreased following implementation of the rule, while lead levels in the American woodcock, a species not covered by the rule, remained the same.²⁰³

Such statistics led a FWS-funded study to declare that “the ban on lead shot has been a resounding success for the health of waterfowl populations, and has almost certainly contributed to the record numbers of waterfowl...in recent years.”²⁰⁴ Additionally, the study concluded that “the ban on lead shot has probably benefitted more than 27 other birds species in which lead poisoning has been documented.”²⁰⁵ Similarly, following Canada’s first restrictions on the use of lead ammunition in the early 1990s (which limited lead ammunition in wetland habitats), studies revealed that the concentration of lead in the bones of dabbling ducks, who live in wetlands, decreased significantly between 1990 and 2000, while the lead in the bones of American woodcock, which as an upland game bird could still be legally hunted with lead ammunition, did not.²⁰⁶ These studies indicate that wildlife in areas where lead ammunition is allowed will continue to accumulate lead in their systems and be negatively impacted by lead, and that a requirement to use nontoxic ammunition when taking waterfowl is effective at reducing lead exposure in these species. A requirement to use nontoxic ammunition on NPS and FWS lands would no doubt lead to similar, cost-effective successes for the health and welfare of many other species of wildlife.

SUMMARIES OF WILDLIFE RESEARCH FINDINGS 2007: MINNESOTA DEPARTMENT OF NATURAL RESOURCES: WILDLIFE POPULATIONS AND RESEARCH UNIT, 7 (M.W. DonCarlos *et al.*, eds. 2007) (noting that the “[FWS] ban on the use of lead shot for hunting waterfowl. . . has been demonstrated to have a positive impact on wildlife.”).

²⁰¹ Thomas, *supra* note 14, at 351, 354 (emphasis added).

²⁰² FWS, *Service Continues to Expand Non-Toxic Shot Options as Study Shows Ban on Lead Shot Saves Millions of Waterfowl*, (Oct. 25, 2000); W.L. Anderson, *et al.*, *Ingestion of Lead and Nontoxic Shotgun Pellets by Ducks in the Mississippi Flyway*, 64 J. WILDL. MANAGE. 848–857 (2000).

²⁰³ Stevenson, *et al.*, *supra* note 67, at 409; Tranel & Kimmel, *supra* note 14, at 328.

²⁰⁴ FWS, *supra* note 202; Anderson, *et al.*, *supra* note 202.

²⁰⁵ *Id.*

²⁰⁶ Stevenson, *et al.*, *supra* note 67, at 405, 409.

2. The NPS Policy Requiring Nontoxic Ammunition

In 2006, the NPS initiated a policy mandating that only nontoxic ammunition be used for firearms practice, training, and qualification.²⁰⁷ Among the reasons the NPS found that “it is beneficial to make the switch to green ammunition,” included “the highly toxic nature of lead and the fact that it is classified by EPA as a persistent, bioaccumulative and toxic (PBT) chemical that has the potential to cause adverse effects on human health and the environment.”²⁰⁸

In 2009, the NPS issued a press release entitled “National Park Service Gets the Lead Out!” The release stated that the NPS “want[s] to take a leadership role in removing lead from the environment” and as such, the agency hoped “to eliminate the use of lead ammunition and lead fishing tackle in parks by the end of 2010.”²⁰⁹ The press release also noted the prohibitions on the use of lead in various products due to its negative effects on human health, and that the removal of lead as a source of contamination in natural resource activities in national parks will benefit humans, wildlife, and ecosystems both within and outside of national park boundaries.²¹⁰ Despite these admissions, the NPS has yet to enact an outright requirement on the use of nontoxic ammunition in national parks; its lead ammunition phase-out plan currently only applies to NPS management and employees, to wildlife culling operations, and dispatching sick or wounded animals.²¹¹

3. The U.S. Army’s Green Bullet Program

The U.S. Army also has taken steps to guard against the toxic effects of lead ammunition. Such efforts originated after a series of investigations revealed extensive lead contamination on Army land. First, inspections of National Guard indoor ranges in the late 1980s led to the closure of 812 ranges “due to high levels of lead contamination, both surface and airborne.”²¹² The inspections and closures followed studies conducted by the U.S. Army Center for Health Promotion and Preventative Medicine that showed that lead-based cores and compounds used in primers create dust and fumes when fired, “exposing shooters and range operators

²⁰⁷ Memorandum from Associate Director, Visitor and Resource Protection of the NPS to the Regional Directors of the NPS (Jul. 19, 2006).

²⁰⁸ *Id.*

²⁰⁹ Press Release, NPS, National Park Service Gets the Lead Out! (Mar. 10, 2009).

²¹⁰ *Id.*

²¹¹ *Id.*

²¹² U.S. Army Environmental Center, Pollution Prevention & Environmental Technology Division, FY – Annual Report 2000, No. SFIM-AEC-ET-TR-200116 at 67 (2000).

to dangerously high levels of airborne lead.”²¹³ Then in 1997, the EPA ordered the Army’s Massachusetts Military Reservation to cease all live-fire training exercises following a study revealing that lead from the base was leaching into Cape Cod’s underground water supply.²¹⁴ A series of other investigations throughout Army, Navy, Marine Corps, and Air Force small-arms ranges revealed elevated levels of lead in the soil, sediment, surface water and groundwater at each location; lead uptake levels in vegetation at a Marine Corps range in Quantico, Virginia were found as high as 23,200 parts per million.²¹⁵

In recognition of the various threats to both the environment and human health caused by the use of lead ammunition, the Army established the Joint Service Non-Toxic Ammunition Working Group (“JSNTAG”) in 1995 to investigate alternative, environmentally-friendly ammunition, with the goal of eventually ending the use of environmentally hazardous substances in small-arms munitions for all services.²¹⁶ To that end, in 2000, in part due to the work of the JSNTAG, the Army launched a “Green Bullet Program.”²¹⁷ The bullets, referred to as the “green bullet” because its core is made from copper rather than a lead, were first used in various training exercises, before being sent to troops in the field.²¹⁸ From June, 2010 through May 2011, the Army sent over thirty million “environmentally-friendly rounds” to troops in Afghanistan, and has received consistently positive reviews from troops regarding its performance in the field.²¹⁹

4. State Restrictions on the Use of Lead Ammunition

In addition to these federal restrictions, over 25 states currently mandate the use of nontoxic ammunition beyond the FWS’s waterfowl regulations. For example, in 2007, recognizing that lead ammunition poses a significant threat to the California condor as well as other species of wildlife, the California Legislature implemented a law to “protect vulnerable wildlife species, including the California condor...from the ongoing threat of lead poisoning.”²²⁰ Specifically, the Legislature passed the Ridley-Tree Condor Preservation Act, which requires the use of non-lead

²¹³ *Id.* at 67–68.

²¹⁴ Pauline Jelinek, *U.S. Army to Use ‘Green Ammo’*, ABC News, May 3, 2000, available at <http://abcnews.go.com/Technology/story?id=98594&page=1>.

²¹⁵ U.S. Army Environmental Center, *supra* note 212, at 67.

²¹⁶ *Id.* at 68.

²¹⁷ *Id.*

²¹⁸ Press Release, U.S. Army, “Green Bullet” As Effective as M855 Round – Consistently (May 6, 2011).

²¹⁹ *Id.*

²²⁰ 2007 Cal. Stat. c. 570 (A.B.821), sec. 1.

rifle and pistol ammunition when hunting big game²²¹ in areas known to be used by the California condor.²²² The California Fish and Game Commission subsequently expanded the reach of the prohibition by adopting regulations that prohibit the use of lead ammunition for hunting nongame birds and mammals in the range of the California condor.²²³ The Commission also established a specific process with which ammunition manufacturers must comply in order to have their ammunition certified for use for hunting big game or nongame birds and mammals in condor habitat.²²⁴ Then in 2013, in recognition of the on-going threats to wildlife and public health within the state because the requirement to use non-lead ammunition only applied in certain areas and to the hunting of particular species, the California legislature amended the Ridley-Tree Condor Preservation Act to require the use of non-lead ammunition when taking all wildlife throughout the state.²²⁵

In addition, Missouri prohibits hunting with lead shot in 21 separate state conservation areas,²²⁶ and New Mexico requires the use of nontoxic shot to hunt on any land owned by the state game commission.²²⁷ Several states also have enacted volunteer programs and initiatives to encourage hunters to use nontoxic shot of their own volition. For example, after determining that spent lead ammunition posed a significant threat to California condors, the Arizona Game and Fish Department (“AGFD”) initiated a campaign asking hunters to use non-lead ammunition when hunting in areas within the condor range in Arizona.²²⁸ In 2005, the AGFD began offering non-lead rifle ammunition to hunters in areas frequented most by condors.²²⁹ Since 2007, 80–90 percent of hunters have participated in the program.²³⁰

221 The California Fish and Wildlife Commission defines “big game” as “deer (genus *Odocoileus*), elk (genus *Cervus*), pronghorn antelope (genus *Antilocarpa*), wild pig (feral pigs, European wild pigs and their hybrids (genus *Sus*)), black bear (genus *Ursus*) and Nelson bighorn sheep (subspecies *Ovis canadensis nelsoni*).” Cal. Code Regs. Tit. 14 § 350.

222 CAL. FISH & GAME CODE § 3004.5(a).

223 CAL. CODE REGS. Tit. 14 §§ 353 (prohibiting lead ammunition when hunting big game in condor habitat), 475(f) (prohibiting the use and possession of lead ammunition when hunting nongame birds and nongame mammals in condor habitat).

224 CAL. CODE REGS. Tit. 14 § 355(a)–(e).

225 Cal. Assembly Bill No. 711 (2013), amending Section 3004.5 of the Fish and Game Code.

226 MO. CODE REGS. Tit. 3 § 10-11.180(8).

227 N.M. ADMIN. CODE § 19.31.5.9(H)(3).

228 Az. Game & Fish Dept., *Condors and Lead*, http://www.azgfd.gov/w_c/california_condor_lead.shtml (last accessed Apr. 24, 2014).

229 *Id.*

230 *Id.*

In 2006, the Minnesota Department of Natural Resources formed a Nontoxic Shot Advisory Committee (“NSAC”) and commissioned a study on the use of lead shot.²³¹ After surveying 56 states and provinces, the NSAC found that 46 percent of respondents already had some form of a nontoxic shot regulation beyond those required for waterfowl by the FWS.²³² Most of these regulations mandate the use of nontoxic shot for the hunting of doves, pheasant, and small game animals.²³³ However, the NSAC – which was comprised of individuals representing lead ammunition manufacturing and retail industries, hunting interests, environmentalists, and technical experts – *unanimously agreed* that, because lead is toxic to both humans and wildlife, restrictions on the use of lead ammunition are needed beyond current state and federal regulations for waterfowl.²³⁴

5. International Restrictions on the Use of Lead Ammunition

The enactment of prohibitions on the use of lead ammunition is also a growing international trend. For example, the African-Eurasian Migratory Waterbirds Agreement (“AEWA”), developed under the Convention on the Conservation of Migratory Species of Wild Animals (“the Bonn Convention”), which covers 118 countries, calls upon the Parties to engage in a wide range of conservation actions as described in a comprehensive Agreement and Action Plan.²³⁵ Paragraph 4.1.4 states that the “Parties shall endeavour to phase out the use of lead shot for hunting in wetlands as soon as possible.”²³⁶

Currently, at least 29 countries have regulations regarding the use of lead ammunition.²³⁷ These regulations range from voluntary restrictions on using lead shot to a complete, legislative prohibition on the import and use of lead ammunition.²³⁸ The use of lead shot in wetlands or for the hunting of waterfowl is banned in 14 countries and Australian territories, including Belgium, Canada, Hungary, Finland, France, Spain, Switzerland, England, and Scotland.²³⁹ In

²³¹ NSAC, *Report of the NSAC*, Submitted to Minn. Dept. of Nat. Resources (Dec. 12, 2006).

²³² *Id.* at 34.

²³³ *Id.* at 30-31; *see also, e.g.* MINN. RULES 6230.0200(13) (prohibiting the use of lead shot while hunting doves in state wildlife management areas).

²³⁴ NSAC, *supra* note 231, at 7.

²³⁵ UNEP, *About AEWA*, <http://www.unep-aewa.org/en/about/introduction> (last updated Feb. 24, 2014).

²³⁶ AWEA, Agreement Text and Action Plan, ¶ 4.1.4, adopted by the Fifth Session of the Meeting of the Parties (MOP5), May 14-18, 2012.

²³⁷ D. Avery & R. T. Watson, *Regulation of Lead-Based Ammunition Around the World*, in *INGESTION OF LEAD FROM SPENT AMMUNITION: IMPLICATIONS FOR WILDLIFE AND HUMANS* 161-168 (R. T. Watson, *et. al.*, eds., 2009).

²³⁸ *Id.*

²³⁹ *Id.* at Table 1.

addition, Canada banned the use of lead shot for hunting game birds in 1999, and Denmark instituted an outright prohibition on using lead ammunition for all hunting in 1996, and banned the import of lead ammunition in 2000.²⁴⁰ The Netherlands enacted a ban on lead ammunition for all hunting in 1993 and for clay pigeon shooting in 2004.²⁴¹ Norway enacted a ban on lead shot for all hunting in 2005 and Sweden enacted a ban on the use of all forms of lead ammunition in 2008.²⁴²

While these federal, state, and international regulations and programs are important steps forward and demonstrate that requiring the use of non-lead ammunition is possible, they only apply to particular species or in particular areas and thus do not go far enough. Lead ammunition remains a significant threat as a result.

C. Availability and Performance of Nontoxic Ammunition

As the dangerous effects of lead ammunition became more apparent, more and more ammunition manufacturers began turning to other metals to produce shot pellets and bullets. In fact, the industry has been aware of the negative impacts of lead ammunition since at least the early 1950s, during which time it has been developing alternatives.²⁴³ However, it was not until the FWS enacted the federal ban on the use of lead ammunition for waterfowl hunting in 1991 that nontoxic shot became more readily available in the United States.²⁴⁴ Today, a wide variety of nontoxic ammunition is easily accessible.

According to the FWS, “nontoxic shot is defined as any shot type that does not cause sickness and death when ingested.”²⁴⁵ The FWS routinely screens and approves the use of nontoxic shot in accordance with its ban on lead shot for waterfowl hunting. Before approving a nontoxic shot, the FWS considers various features of the shot type, including the chemical composition and erosion characteristics.²⁴⁶ The FWS has stated that the “overall goal [of the candidate nontoxic shot screening procedures] is to preclude the use of toxic substances in shot used by hunters...[and] to eliminate acute toxicity as a source of mortality in

²⁴⁰ *Id.*

²⁴¹ *Id.*

²⁴² *Id.*

²⁴³ Longcore, *et al.*, *supra* note 51.

²⁴⁴ Tranel & Kimmel, *supra* note 14, at 326.

²⁴⁵ See FWS, *Nontoxic Shot Regulations for Hunting Waterfowl and Coots in the U.S.*, <http://www.fws.gov/migratorybirds/currentbirdissues/nontoxic.htm> (last updated Nov. 5, 2013).

²⁴⁶ See 50 C.F.R. § 20.134 (describing the approval process).

migratory birds...to ensure healthy, viable waterfowl and other migratory bird populations in perpetuity.”²⁴⁷ Currently, the FWS has approved thirteen different shot types as nontoxic and safe for hunting waterfowl including, iron (steel), iron-tungsten, tungsten-bronze, iron-tungsten-nickel, bismuth-tin, and copper-clad iron.²⁴⁸ The FWS also permits coatings of copper, nickel, tin, zinc, zinc chloride, zinc chrome, and fluoropolymer on approved nontoxic shot types.²⁴⁹

These alternatives to lead shot are often inexpensive and readily available to hunters.²⁵⁰ The FWS has also recognized that nontoxic shot performs ballistically as well as its lead-based counterpart and thus that it will not place hunters at a performance disadvantage. Specifically, the FWS reported that “[i]t appears...there is little difference in the performance of the lead and steel loads...from either a theoretical or a practical standpoint.”²⁵¹ Moreover, shot experts themselves recognize the benefits and capabilities of alternative ammunition²⁵² and some hunters have already voluntarily switched to using nontoxic ammunition.²⁵³ A post-hunt survey in Arizona revealed that 93 percent of hunters who used non-lead ammunition felt that it “performed as well as or better than lead bullets.”²⁵⁴

Today, new ballistic materials are available for hunting upland species and in all gauges of modern and vintage guns, as well as nontoxic ammunition for use in rifle cartridges of multiple calibers.²⁵⁵ However, at least one study has found that these nontoxic alternatives are readily available only because of the federal ban on lead-based ammunition for hunting waterfowl, demonstrating that the ammunition manufacturing industry requires enforceable regulations to guarantee a market demand for their product.²⁵⁶ A DOI-instituted requirement to use nontoxic

²⁴⁷ FWS, Office of Migratory Bird Management, Nontoxic Shot Approval, 723 FW 4 (June 30, 1995). Although the FWS permits less than one percent of residual lead in approved nontoxic shot, the lead is present only as a result of the manufacturing processes and the trace amount of lead carries a greatly reduced risk to wildlife and humans. 50 C.F.R. § 20.21(j)(2).

²⁴⁸ 50 C.F.R. § 20.21(j)(1); 78 Fed. Reg. 65,573 (Nov. 1, 2013).

²⁴⁹ *Id.*

²⁵⁰ For example, nontoxic ammunition is readily available on the websites of Ballistic Products, Inc. (<http://www.ballisticproducts.com/Shot-Slugs/departments/63/>); Cabela’s (http://www.cabelas.com/catalog/browse/_/N-1100188?WTz_1=SBC%3BMMcat104792580); Ecotungsten (<http://www.ecotungsten.com/shots.html?gclid=CMPh986Hz6gCFctw5Qod7ETvfw>).

²⁵¹ FWS, *supra* note 34 at 48.

²⁵² See L. Simpson, *Making Sense of Nontoxic Shot* (Nov. 6, 2008) (evaluating various types of nontoxic shot).

²⁵³ Tranel & Kimmel, *supra* note 14 at 328.

²⁵⁴ P.T. Seng, *Non-Lead Ammunition Program Hunter Survey*, FINAL REPORT TO THE ARIZONA GAME AND FISH DEPARTMENT at 8 (Feb. 2006).

²⁵⁵ Tranel & Kimmel, *supra* note 14, at 326.

²⁵⁶ Thomas, *supra* note 14, at 359.

ammunition on NPS and FWS lands would provide even greater demand, thereby further incentivizing the expansion of the availability and affordability of effective, nontoxic ammunition. In addition, it would further protect wildlife, human health, and the environment from the detrimental and deadly effects of lead, and help ensure the conservation of the lands that the DOI is charged with protecting.

V. AUTHORITY FOR PETITIONED ACTION

As the nation's principle conservation agency, the DOI has ample authority under the U.S. Constitution and numerous federal laws to require the use of nontoxic ammunition on NPS and FWS lands. This authority vests the DOI with the ability to implement such a requirement across all NPS and FWS lands in one, comprehensive action to ensure that these lands, the wildlife therein, and public health and welfare receive immediate protection from lead – a highly toxic substance. However, Petitioners recognize that that the DOI may prefer to implement such a requirement pursuant to a phase-in program, similar to the way in which the FWS implemented its restrictions on the use of lead shot in waterfowl hunting. Importantly, such a requirement, whether implemented immediately across all NPS and FWS lands or as a phase-in, would also be a way the DOI can comply with its primary goal in its Strategic Plan for 2011-2016 to “ensure that America’s natural endowment – America’s Great Outdoors – is protected for the benefit and enjoyment of current and future generations.”²⁵⁷

A. The U.S. Constitution

The Property Clause of the U.S. Constitution states that “Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States.”²⁵⁸ Under this clause, “[t]he power over the public land thus entrusted to Congress is without limitations”²⁵⁹ and includes the power to delegate the management of federal lands to the Executive Branch.²⁶⁰ Congress has exercised this authority and delegated management of public lands to the DOI.²⁶¹ Accordingly, the “Department [of Interior] has been granted plenary authority over the administration of public

²⁵⁷ DOI, *Strategic Plan for Fiscal Years 2011-2016*, Goal #1.

²⁵⁸ U.S. CONST. ART. IV § 3, cl. 2.

²⁵⁹ *U.S. v. City and County of San Francisco*, 310 U.S. 16, 29 (1940); see also *Kleppe v. New Mexico*, 426 U.S. 529, 540 (1976) (“Congress exercises the powers both of a proprietor and of a legislature over the public domain”).

²⁶⁰ See e.g., *Mountain States Tel. & Tel. Co. v. U.S.*, 499 F.2d 611, 614 (Ct. Cl. 1974) (“Congress may delegate the power to manage federal lands to the Executive”).

²⁶¹ Act of March 3, 1849, Ch. 108, 9 Stat. 395–397; 43 U.S.C. §§ 2, 1201.

lands...and it has been given broad authority to issue regulations concerning them.”²⁶² In other words, as the proprietor of various public lands, the DOI has the authority to enact regulations respecting the use of that property, particularly when that use threatens the health of the land, its inhabitants, and its visitors. Such authority certainly includes instituting a requirement to use nontoxic ammunition on NPS and FWS lands that would serve to protect these lands and the wildlife and visitors therein by eliminating a significant source of toxic contamination.

B. The DOI is Charged with Protecting and Conserving Natural Resources and Maintains the Authority to Promulgate Regulations for Conservation Purposes

The DOI is responsible for the conservation of an expansive area of federal land. Created by an act of Congress in 1849, the DOI’s role has evolved from “that of general housekeeper for the Federal Government to that of custodian of the Nation’s natural resources.”²⁶³ Congress also specifically charged the DOI with protecting wild birds and game birds²⁶⁴ and authorized the DOI “to adopt such measures as may be necessary to carry out the purposes” of preservation of wild and game birds.²⁶⁵ The DOI’s self-proclaimed goals include “protect[ing] and preserv[ing] our nation’s natural. . .resources” and “manag[ing] natural resources for a healthy environment.”²⁶⁶ Indeed, the DOI itself recognizes that “wildlife must be maintained for their ecological, cultural, educational, historical, aesthetic, scientific, recreational, economic, and social values” and that the DOI, along with other federal and state government agencies, holds wildlife “in public trust. . .for the benefit of present and future generations of Americans.”²⁶⁷

In addition, the enabling legislation of the NPS and FWS – bureaus within the DOI – mandate that they manage federal land in a manner that will protect its habitats, inhabitants, and resources. A number of independent, federal statutes also provide the authority for the DOI to take action to protect wildlife, the ecosystems on which they depend, and public health from the detrimental effects of lead ammunition. A regulation requiring the use of nontoxic ammunition on NPS and

²⁶² *Best v. Humboldt Placer Min. Co.*, 371 U.S. 334, 336 (1963).

²⁶³ DOI, *Department Manual: Creation, Mission and Goals*, 105 DM 1, at 1.2 (Apr. 4, 2000); *see also* 30 Cong. Ch. 108, 9 Stat. 395–397 (1849) (creating the DOI).

²⁶⁴ *See* 16 U.S.C. § 701 (“duties and powers of the Department of the Interior include the preservation, distribution, introduction, and restoration of game birds and other wild birds”).

²⁶⁵ *Id.*

²⁶⁶ DOI, *supra* note 263, at 1.4.

²⁶⁷ 43 C.F.R. § 24.1(b).

FWS lands would help satisfy the DOI's statutory obligations, its self-proclaimed objectives, and the specific mandates of the NPS and FWS.

1. The Organic Act and the National Park Service

Congress established the NPS to “promote and regulate the use of the Federal areas known as national parks, monuments and reservations. . .by such means and measures as to conform to [their] fundamental purpose” and specified that such purpose “is *to conserve* the scenery and the natural and historic objects and the *wild life* therein and to and to provide for the enjoyment of the same in such manner and by such means as will leave [federal parks] *unimpaired for the enjoyment of future generations*.”²⁶⁸ As recognized by both federal courts and the NPS itself, the Organic Act imposes a “conservation mandate” on the NPS.²⁶⁹ “This mandate is independent of the separate prohibition on impairment and applies all the time with respect to all park resources and values.”²⁷⁰ To fulfill this statutory mandate, Congress vested the Secretary of the Interior with broad power to “make and publish such rules and regulations as he may deem necessary or proper for the use and management of the parks.”²⁷¹ As Congress “reaffirm[ed], declare[d], and direct[ed]” in 1978:

the promotion and regulation of the various areas of the National Park System . . . shall be consistent with and founded in the purpose established by [the Organic Act], to the common benefit of all the people of the United States. The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress.²⁷²

As the NPS has previously admitted, whatever discretion it has in managing the National Parks is limited by its conservation mandate. According to the agency, “[i]n its role as steward of park resources, the NPS must ensure that acceptable park uses would not cause impairment of, or unacceptable impacts on, park resources and values. When proposed park uses and the protection of park resources and values come into conflict, *the protection of resources and values must*

²⁶⁸ 16 U.S.C. § 1 (emphasis added).

²⁶⁹ *Greater Yellowstone Coalition v. Kempthorne*, 577 F.Supp.2d 183, 191 (D.D.C. 2008); NPS, *2006 Management Policies* at § 1.4.3 (2006).

²⁷⁰ NPS, *supra* note 269 § 1.4.3.

²⁷¹ 16 U.S.C. § 3.

²⁷² *Id.* § 1a-1.

be predominant.”²⁷³ In other words, the “fundamental purpose of the national park system is to conserve park resources and values.”²⁷⁴

As explained in detail above, the use of lead ammunition has a deleterious impact on wildlife and impairs federal land and the natural resources therein, thereby preventing future generations from fully enjoying federal land in general, and national parks in particular.²⁷⁵ Indeed, when establishing the prohibition on the use of lead ammunition by its employees, the NPS recognized that “lead is an environmental contaminant in many parts of the world . . . including our national parks.”²⁷⁶ Daniel Wenk, while serving as Acting Director of the NPS, stated that the “[r]emoval of lead as a source of contamination in natural resources related activities in natural parks will benefit humans, wildlife and ecosystems within and outside of national park boundaries.”²⁷⁷ While the NPS has taken proactive steps to comply with its mission by banning the use of lead ammunition by its employees, the use of lead ammunition by members of the public is still permitted in areas administered by the NPS. A regulation requiring the use of nontoxic ammunition on all NPS land would foster the NPS’s compliance with its duty to prioritize conservation and help ensure our national parks are preserved for future generations by preventing further accumulation of this toxic substance.

2. National Wildlife Refuges and the Fish and Wildlife Service

The National Wildlife Refuge System Administration Act of 1966²⁷⁸ and the National Wildlife Refuge System Improvement Act of 1997²⁷⁹ (collectively, the “Refuge Act”) provide for the administration of the National Wildlife Refuge System by the FWS. “The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”²⁸⁰ In enacting the 1997 Amendments, Congress specifically recognized that “[t]he System serves a pivotal role in the conservation of migratory birds..., marine mammals,

²⁷³ NPS, *Winter Use Plans Record of Decision Amendment – Sylvan Pass Management* at 12 (July 16, 2008) (emphasis added).

²⁷⁴ *Greater Yellowstone Coalition*, 577 F.Supp.2d at 192.

²⁷⁵ See *supra*, notes 12-191 and accompanying text.

²⁷⁶ Memo from Daniel Wenk, Acting Director, NPS to Regional Directors (Sept. 26, 2003).

²⁷⁷ *Id.*

²⁷⁸ Pub. Law 89-669 § 4, 80 Stat. 927 (1966); *codified at* 16 U.S.C. § 668dd.

²⁷⁹ Pub. Law 105-57 §§3(b) to 8, 111 Stat. 1252 (1997); *codified at* 16 U.S.C. § 668dd.

²⁸⁰ 16 U.S.C. § 668dd(a)(2).

endangered and threatened species, and the habitats on which these species depend.”²⁸¹

In pursuit of its conservation goal, the Refuge Act mandates that the FWS administer the System to, *inter alia*, “provide for the conservation of. . . wildlife. . . and their habitats within the System.”²⁸² The Refuge Act defines “conservation” as “to sustain and, where appropriate, restore and enhance, healthy populations of. . . wildlife. . .utilizing. . .methods and procedures associated with modern scientific resource programs” which include “protection” and “habitat management.”²⁸³ Additionally, the Refuge Act requires the FWS to “ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans”²⁸⁴ and vests the agency with the power to “issue regulations to carry out the Act.”²⁸⁵

Consistent with its statutory mandates under the Refuge Act, the FWS’s refuge policy states that national wildlife refuges are to be managed to not only maintain existing levels of biological integrity, diversity, and environmental health, but to restore conditions where degraded.²⁸⁶ Refuge policy explicitly states that the FWS is “especially concerned” with chemical contamination:

We are especially concerned with environmental features as they affect all living organisms. For example, at the genetic level, we manage for environmental health by preventing chemical contamination of air, water, and soils that may interfere with reproductive physiology or stimulate high rates of mutation. Such contamination includes carcinogens and other toxic substances that are released within or outside of refuges.²⁸⁷

Currently, over 560 federally protected refuges exist in the United States.²⁸⁸ While the FWS prohibits the use of lead shot for waterfowl hunting, hunting with lead ammunition is still permitted when targeting other species in these refuges. Given the significant threat lead ammunition poses to other species of birds and wildlife and the habitats upon which they depend, continued inaction on the use of lead ammunition within the Refuge System is no longer defensible. Further action

²⁸¹ Pub. Law 105-57 § 2(3).

²⁸² 16 U.S.C. § 668dd(a)(4)(A).

²⁸³ *Id.* § 668ee(4).

²⁸⁴ *Id.* § 668dd(a)(4)(B).

²⁸⁵ *Id.* § 668dd(b)(5).

²⁸⁶ FWS, *Refuge Management*, 601 FW 3 (Apr. 16, 2001).

²⁸⁷ *Id.* § 3.10(C)(2).

²⁸⁸ FWS, *National Wildlife Refuge Locator*, <http://www.fws.gov/refuges/refugelocatomaps/> (Jan. 2013).

is needed in order for the FWS to comply with its duties under the Refuge Act to “ensure” the maintenance of the biological integrity, diversity and health of wildlife located within units of the Refuge System. As indicated above, the use of lead ammunition has caused the deaths and serious injuries of a wide variety of species of wildlife both in and out of the Refuge System, and harms the habitats on which they depend.²⁸⁹ As such, the risks associated with the use of lead ammunition, both with respect to fatal and debilitating lead poisoning of wildlife and environmental contamination, constitute a situation in which it is “appropriate” for the FWS to utilize its authority under the Refuge Act to not only “sustain” wildlife and their habitats, but to take action “to restore and enhance” wildlife populations throughout the Refuge System by requiring the use of nontoxic ammunition on its lands.

3. The Wilderness Act

In addition to the lands managed pursuant to their specific enabling legislation, the NPS and FWS both manage certain areas of federal land under the Wilderness Act of 1964 (“The Wilderness Act” or “the Act”).²⁹⁰ The Wilderness Act establishes “the National Wilderness Preservation System to be composed of federally owned areas designated by Congress as ‘wilderness areas.’”²⁹¹ The Act defines a wilderness area as “an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain” and an “area of undeveloped Federal land retaining its primeval character and influence.”²⁹² In passing the Act, Congress sought to preserve and protect lands in their natural condition for two interconnected reasons – first, to protect wild land from “expanding settlement and growing mechanization” and second, to preserve these areas for present and future generations for recreational, aesthetic, scientific, and educational use.²⁹³ Accordingly, the Act’s fundamental mandate with respect to the management of wilderness areas is that federal agencies preserve the wilderness character of these lands so that they are left “unimpaired for future use and enjoyment as wilderness.”²⁹⁴ This directive, coupled with the definition of

²⁸⁹ See *supra*, notes 12-191 and accompanying text.

²⁹⁰ 16 U.S.C. §§ 1131–1136.

²⁹¹ *Id.* § 1131(a).

²⁹² *Id.* § 1131(c).

²⁹³ *Id.* §§ 1131(a); 1133(b).

²⁹⁴ *Id.* § 1131(a); see also 16 U.S.C. § 1133(a) (the Act declares that the purposes of the Wilderness Act are “within and supplemental to the purposes for which. . . units of the national parks and national wildlife refuge systems are established and administered.”).

wilderness area, requires federal agencies to manage these areas in such a way that preserves both their natural appearance and ecological integrity.²⁹⁵

When Congress designates an area to be included in the National Wilderness Preservation System, the agency charged with managing the area immediately prior to such designation maintains management responsibility over such lands.²⁹⁶ Wilderness areas currently make up a large part of the lands managed by the NPS and FWS – more than half the lands managed by the NPS are designated wilderness areas,²⁹⁷ and the FWS manages 75 wilderness areas, comprising more than 20 million acres in 63 units of the National Wildlife Refuge System in 26 states.²⁹⁸

The DOI has promulgated regulations implementing the Wilderness Act. Pursuant to these regulations, any specific rule regarding the management of wilderness areas “shall be developed with a view to protecting such areas and preserving their wilderness character for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, with inconsistent uses held to a minimum.”²⁹⁹ The FWS has promulgated additional regulations implementing the Wilderness Act. The FWS’s regulations largely mirror the language of the Wilderness Act and require the FWS to manage its wilderness areas in accordance with the National Wildlife Refuge System and in a way that “preserve[s their] wilderness character.”³⁰⁰

Requiring the use of nontoxic ammunition on NPS and FWS lands would be a proactive means by which the NPS and FWS could comply with their duties under the Wilderness Act. Such action would help preserve the wilderness characteristics of designated wilderness areas by eliminating a source of toxic contamination, thereby promoting and restoring the ecological health of these lands, limiting an inconsistent use, and helping to guarantee such areas remain unimpaired for future generations.

²⁹⁵ 16 U.S.C. § 1133(b) (federal agencies must manage areas designated as wilderness areas to preserve their “wilderness character”).

²⁹⁶ *Id.* § 1131(b).

²⁹⁷ NPS, *Wilderness*, <http://wilderness.nps.gov/wilderness.cfm> (last accessed Apr. 24, 2014).

²⁹⁸ FWS, *Special Management Areas*, <http://www.fws.gov/refuges/whm/wilderness.html> (last updated Mar. 7, 2014).

²⁹⁹ 43 C.F.R. § 19.6.

³⁰⁰ 50 C.F.R. § 35.2(a).

C. The DOI Must Require the Use of Nontoxic Ammunition on NPS and FWS Lands Because the Use of Lead Ammunition Presents an Unnecessary Threat to Wildlife and the Environment

In addition to the enabling legislation of the DOI and its agencies, a number of independent federal statutes require federal agencies to utilize their authorities to protect wildlife and the habitats upon which they depend. These laws demonstrate an overwhelming consensus towards eliminating or preventing the addition of harmful substances to the environment. As detailed above, extensive scientific research and field observations have clearly shown that exposure to lead ammunition has debilitating and deadly effects on a wide variety of wildlife species.³⁰¹ Moreover, lead not only impacts animals specifically targeted by the lead ammunition of hunters, but also impacts species that may subsequently encounter spent lead ammunition or consume an animal carcass contaminated by lead. By continuing to allow the use of lead ammunition on NPS and FWS lands, the DOI is failing to adequately protect wildlife and the land on which they depend, in clear contravention of the conservation policies embodied within these federal statutes.

1. The Endangered Species Act

Enacted in 1973, the Endangered Species Act (“ESA”) is a broad statutory scheme designed to protect endangered and threatened species and conserve the habitats upon which they depend.³⁰² Considered “the most comprehensive legislation for the preservation of endangered species ever enacted by any nation,” the ESA embodies the “plain intent” of Congress to “halt and reverse the trend toward species extinction, whatever the cost.”³⁰³

To that end, Section 2(c) of the ESA establishes that it is the “policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes [of the ESA].”³⁰⁴ Similarly, Section 7(a)(1) states that all federal agencies “shall”, in consultation with the FWS or National Marine Fisheries Service, “utilize their authorities in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered species and threatened species.”³⁰⁵ The ESA defines “conserve” as “the use of all methods and procedures

³⁰¹ *Supra*, notes 12-191 and accompanying text.

³⁰² 16 U.S.C. § 1531(b).

³⁰³ *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 180, 184 (1978).

³⁰⁴ 16 U.S.C. § 1531(c)(1).

³⁰⁵ *Id.* § 1536(a)(1).

which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary.”³⁰⁶ Section 7 “substantially amplifie[s] the obligation of [federal agencies] to take steps within their power to carry out the purposes of” the ESA.³⁰⁷ Indeed, some courts have held that Section 7(a)(1) imposes a specific obligation upon all federal agencies to develop and carry out programs to conserve each endangered and threatened species.³⁰⁸ In any case, “[t]otal inaction is not allowed.”³⁰⁹

As discussed above, the use of lead ammunition has had clearly demonstrated negative impacts on ESA-listed species.³¹⁰ Indeed, when the FWS enacted the requirement to use nontoxic shot for waterfowl hunting, it noted that based on the mandates of the ESA, “the Secretary [of Interior] must consider where it is necessary to require nontoxic shot in order to reduce exposure of [ESA-listed species] to lead in their waterfowl prey.”³¹¹ Lead ammunition also has direct effects on listed species – lead poisoning was one of the major factors leading to decline of California condors in the 1980s.³¹² Recent research conducted as part of the recovery program for the species confirms this, with at least five deaths and ten emergency chelation treatments to resuscitate acutely poisoned birds reported for birds released to reestablish the species in California and Arizona.³¹³ As summarized by the authoritative account of the species’ ecology: “lead poisoning looms as likely the most important cause of the recent decline of the species, and may well account for much of the historic decline. It evidently represents the major problem to be solved in reestablishing viable wild populations.”³¹⁴ In addition, the endangered Aplomado falcon (*Falco femoralis*) is considered to be “seriously threatened” by lead poisoning because the species feeds primarily on mourning

³⁰⁶ *Id.* § 1532(3).

³⁰⁷ *T.V.A.*, 437 U.S. at 183-84 (citing 119 Cong. Rec. 42913 (1973)).

³⁰⁸ *Sierra Club v. Glickman*, 156 F.3d 606, 616 (5th Cir.1998).

³⁰⁹ *Florida Key Deer v. Paulison*, 522 F.3d 1133, 1146 (11th Cir. 2008); *see also Nat'l Wildlife Fed'n v. Norton*, 332 F.Supp.2d 170, 187 (D.D.C. 2004) (Section 7(a)(1) confers discretion, but that “discretion is not so broad as to excuse total inaction”); *Glickman*, 156 F.3d at 617 (same); *Defenders of Wildlife v. DOI*, 354 F.Supp.2d 1156, 1174 (D.Or 2005) (“compliance [with Section 7(a)(1)] is not committed to agency discretion by law”).

³¹⁰ *See supra*, notes 95-111 and accompanying text.

³¹¹ FWS, *supra* note 34.

³¹² Meretsky, *et al.*, *supra* note 105; D.L. Janssen, *et al.*, *Lead poisoning in free-ranging California Condors*, 189 J. AM. VET. MED. ASSOC. 1115–1117 (1986); J.R. Walters, *et al.*, *Status of the California Condor and Efforts to Achieve its Recovery*, The American Ornithologists' Union and Audubon California (Aug. 2008).

³¹³ V.J. Meretsky, *et al.*, *Quantity Versus Quality in California Condor Reintroduction: Reply to Berese and Starfield*, 15 CONS. BIO. 1449, 1450 (2001).

³¹⁴ N.F.R. Snyder & N.J. Schmitt, *California Condor (Gymnogyps californianus)*, in *THE BIRDS OF NORTH AMERICA*, NO. 610, (A. Poole and F. Gill, eds., 2002).

doves and northern bobwhite, both of which suffer from the toxic effects of lead in ammunition.³¹⁵

As the federal agency charged with protecting and managing federal land and the wildlife therein, the ESA's broad mandate that all federal agencies use their authority to protect and conserve endangered and threatened species clearly applies to the DOI.³¹⁶ In fact, Congress specifically charged the Secretary of the Interior with administering the ESA for terrestrial and fresh water species.³¹⁷ The use of lead ammunition poses a significant, but preventable, threat to wildlife, including threatened and endangered species. Requiring the use of nontoxic ammunition on NPS and FWS lands is not only well within the DOI's power, but would be a means by which the DOI could comply with its mandate under the ESA to support the conservation and recovery of listed birds and other species who suffer from the debilitating and often lethal effects of lead poisoning.

2. The Migratory Bird Treaty Act

In 1916, recognizing that migratory birds were of "great value" but "in danger of extermination through lack of adequate protection", the United States and Great Britain entered into the Convention for the Protection of Migratory Birds traveling between the United States and Canada.³¹⁸ Subsequently, the United States entered into similar agreements with Mexico,³¹⁹ Japan,³²⁰ and the former Soviet Union.³²¹ Together, these agreements establish an international framework for the protection and conservation of migratory birds. The Migratory Bird Treaty Act ("MBTA"), originally enacted in 1918, implements these treaties in the United States and

³¹⁵ Keddy-Hector, *supra* note 124.

³¹⁶ As explained in the preceding paragraph, the DOI's duties under the ESA to utilize its authority to conserve listed species pursuant to Section 7(a)(1) exist separate and apart from the FWS' duty to implement and enforce the ESA, pursuant to Section 4, Section 7(a)(2), Section 9 and other provisions of the Act.

³¹⁷ 16 U.S.C. §§ 1532(15); 1533; 1536; 1537a; 1539.

³¹⁸ 39 Stat. 1702 (1916); Convention for the Protection of Migratory Birds, Aug. 16, 1916, United States-Great Britain (on behalf of Canada), 42 U.S.T. 628.

³¹⁹ Congress amended the MBTA on June 20, 1936 to extend its provisions to the treaty with Mexico. 49 Stat. 1555 (1936); Convention Between the United States of America and the United Mexican States for the Protection of Migratory Birds and Game Mammals, February 7 1936, 46 U.S.T. 912.

³²⁰ Congress amended the MBTA on June 1974 to cover the treaty with Japan; 88 Stat. 190 (1974). Convention Between the Government of the United States of America and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction, and their Environment, March 4, 1972, 25 U.S.T. 3329.

³²¹ Congress amended the MBTA on December 13, 1989, to cover the treaty with the former Soviet Union. 103 Stat. 1977 § 15 (1989); Convention Between the United States of America and the Union of Soviet Socialist Republics Concerning the Conservation of Migratory Birds and Their Environment, November 19, 1976, 29 U.S.T. 4647.

makes it unlawful “to pursue, hunt. . .[or] kill” any protected migratory bird “by any means or in any manner” unless and except as permitted by regulation.³²²

The MBTA vests the Secretary of the Interior with broad rulemaking authority, including the power to issue “such regulations as may be necessary to implement the provisions” of the migratory bird treaties.³²³ In addition, the MBTA authorizes the Secretary to determine, consistent with the terms of the conventions, the method as to “when, to what extent, if at all, *and by what means*” a migratory bird may be taken “and to adopt suitable regulations permitting and governing [taking, hunting, and killing], in accordance with such determinations.”³²⁴ As the MBTA grants the DOI the authority to issue regulations regarding the methods of hunting migratory birds, it is certainly well within the DOI’s authority to issue a regulation requiring the use of nontoxic ammunition to kill such birds and to require the use of nontoxic ammunition on NPS and FWS lands given that its use also kills such birds via primary and secondary lead poisoning. Lead ammunition presents an unquestionable danger to the conservation of migratory birds. A regulation requiring the use of nontoxic ammunition on federal land would provide protection to migratory birds in accordance with the MBTA by mitigating harm to the protected birds caused by the release of lead-based ammunition into the environment.

3. The Bald and Golden Eagle Protection Act

As its name suggests, the Bald and Golden Eagle Protection Act (“BGEPA”) seeks to protect eagle populations from hunters and other societal threats.³²⁵ The BGEPA, in pertinent part, prohibits the taking – defined as the pursuing, shooting, shooting at, poisoning, wounding, killing, trapping, capturing, collecting, molesting or disturbing – as well as the possession, purchase, barter, sale, or the offer to perform such acts, of any bald eagle or any golden eagle.³²⁶ The Secretary of the Interior may issue permits for the taking of bald and golden eagles provided it is first determined that such taking is “compatible with the preservation of” the bald or golden eagle, and that the specimen is to be used for scientific or exhibition

³²² 16 U.S.C. § 703(a).

³²³ *Id.* § 712(2).

³²⁴ *Id.* § 704(a) (emphasis added).

³²⁵ 16 U.S.C. §§ 668–668d. Congress originally enacted the BGEPA in 1940 as the Eagle Act, but amended it in 1962 to include protection for golden eagles as well. Act of June 8, 1940, ch. 278, §1, 54 Stat. 250–51; Act of Oct. 24, 1962, Pub. L. 87–884, 76 Stat. 1246; *see also U.S. v. Hardman*, 297 F.3d 1116, 1122 (10th Cir. 2002) (describing the amendment to and purposes of the act).

³²⁶ 16 U.S.C. § 668(a); *see also id.* § 668c (defining “take”).

purposes, for the religious purposes of Indian tribes, or for the protection of wildlife or agriculture.³²⁷

Harsh penalties are imposed upon anyone found to be in violation of the Act; first time violators face a fine of up to \$5,000 and one year imprisonment, subsequent violations carry a \$10,000 fine and up to two years in prison.³²⁸ Moreover, the BGEPA authorizes the cancellation of any grazing agreement on federal lands upon conviction of a violation of the BGEPA's prohibitions.³²⁹ The severe penalties prescribed by the BGEPA demonstrate the seriousness and importance that Congress places on the protection of bald and golden eagles. As aforementioned, lead ammunition poisoning has caused the premature and preventable death of bald and golden eagles throughout the United States and remains a significant threat to both species.³³⁰ The implementation of a requirement to use nontoxic ammunition on NPS and FWS lands would further the purpose of the BGEPA to protect and conserve eagle populations.³³¹

4. The Fish and Wildlife Conservation Act and the Fish and Wildlife Coordination Act

The Fish and Wildlife Conservation Act (“the Act”) recognizes that all species of wildlife provide ecological, esthetic, and cultural values to the nation and that improved conservation and management of wildlife will help assure “a productive and more esthetically pleasing environment for all citizens,” but that nongame wildlife, in contrast to “more recreationally and commercially important species,” have not traditionally been the beneficiaries of conservation programs.³³² Accordingly, the Act provides for technical and financial assistance to the states for the development and implementation of programs to conserve nongame wildlife,³³³ which it defines as animals “not ordinarily taken for sport, fur, or food;” not listed under the ESA; and “not marine mammals.”³³⁴ The Act “encourage[s] all Federal departments and agencies to utilize their statutory and administrative authority, to the maximum extent practicable and consistent with each agency’s statutory

³²⁷ *Id.* § 668a.

³²⁸ *Id.* § 668(a).

³²⁹ *Id.* § 668(c).

³³⁰ FWS, *Bald Eagle Fact Sheet*, <http://www.fws.gov/midwest/eagle/recovery/biologue.html> (last updated Mar. 18, 2013); Cruz-Martinez *et al.*, *supra* note 130; Stauber *et al.* *supra* note 130; Pagel *et al.*, *supra* note 130.

³³¹ K.S. Smallwood & C. Thelander C., *Bird mortality in the Altamont Pass Wind Resource Area, California*, 72 J. WILDL. MANAGE. 215–223 (2008).

³³² 16 U.S.C. § 2901(a)(2), (4).

³³³ *Id.* § 2901(b)(1).

³³⁴ *Id.* § 2902(6).

responsibilities, to conserve and to promote conservation of nongame...wildlife and their habitats.”³³⁵

Similarly, the Fish and Wildlife Coordination Act (“FWCA”)³³⁶ authorizes the DOI to provide technical and financial assistance to state and other federal agencies with the goal of further conserving wildlife. Under the FWCA, the Secretary of the Interior is directed to “provide assistance to, and cooperate with, Federal, State and public or private agencies and organizations in the . . . protection. . . of all species of wildlife, resources,...their habitat, and in controlling losses of the same from disease or other causes...”³³⁷ Moreover, the FWCA directs the DOI to issue regulations to carry out the purpose of the statute,³³⁸ and further recognizes “the vital contribution of our wildlife resources to the Nation [and] the increasing public interest and significance thereof due to expansion of our national economy and other factors.”³³⁹

Both Acts emphasize the importance of protecting and conserving wildlife and provide authority for the DOI to take proactive measures to reach these goals. Requiring the use of nontoxic ammunition on NPS and FWS lands would be a means by which the DOI could comply with the directives of both Acts that federal agencies initiate specific measures to conserve and protect wildlife.

D. Executive Orders Demonstrating the Need for the DOI to Issue a Regulation Prohibiting the Use of Lead Ammunition

Over the past few decades, a series of Presidential Executive Orders have required federal agencies to implement more environmentally sound policies and procedures to eliminate threats to the environment, thereby protecting wildlife and the habitats on which they depend, as well as public health and welfare. These Executive Orders, authorized by the United States Constitution, help direct officers of the executive branch to carry out their delegated duties³⁴⁰ and serve as further authority for the DOI to require the use of nontoxic ammunition on NPS and FWS lands. This authority includes the ability to implement such a requirement across all NPS and FWS lands in one, comprehensive action, or pursuant to a phase-in program similar to the FWS’s approach in establishing the requirement to use nontoxic shot when hunting waterfowl.

³³⁵ *Id.* § 2901(b)(2).

³³⁶ *Id.* §§ 661-667.

³³⁷ 16 U.S.C. § 661.

³³⁸ *Id.* § 664.

³³⁹ *Id.* § 661.

³⁴⁰ *See* U.S. CONST. Art. II, § 1, cl. 1; Art. II, § 3.

First, Executive Order 13514, “Federal Leadership in Environmental, Energy and Economic Performance” (“E.O. 13514”), issued by President Obama on October 5, 2009, is a broad executive mandate aimed at encouraging all federal agencies to establish environmentally sound policies. Specifically, E.O. 13514 instructs federal agencies to implement policies that “focus[] on making improvements in their environmental, energy, and economic performance[s],”³⁴¹ and directs that “Federal agencies shall. . .eliminate waste, recycle, and *prevent pollution*” and mandates that federal agencies “promote pollution prevention and eliminate waste by minimizing the generation of waste and pollutants *through source reduction*.”³⁴²

Next, Executive Order 12996, “Management and General Public Use of the National Wildlife Refuge System” (“E.O. 12996”), reiterates that the purpose of the System “is to preserve a national network of lands and waters for the conservation and management of fish, wildlife, and plant resources of the United States for the benefit of present and future generations.”³⁴³ E.O. 12996 affirms four guiding principles for the management and general public use of the System, including that because wildlife “will not prosper without high-quality habitat, and without fish and wildlife, traditional uses of refuges cannot be sustained. The Refuge System will continue to conserve and enhance the quality and diversity of fish and wildlife habitat within refuges.”³⁴⁴ Accordingly, E.O. 12996 directs the Secretary of the Interior to, *inter alia*, provide increased opportunities for families to experience wildlife-dependent recreation, especially those that enable them to engage safely in traditional outdoor activities like hunting; “ensure that the biological integrity and environmental health of the Refuge System is maintained for the benefit of present and future generations of Americans”; and manage the Refuge System by means best suited to accomplish its mission, to help conserve the ecosystems of the United States.³⁴⁵

Finally, pursuant to Executive Order 13423 “Strengthening Federal Environmental, Energy and Transportation Management” (“E.O. 13423”), federal agencies are reminded that “[i]t is the policy of the United States that Federal

³⁴¹ Press Release, The White House, Office of the Press Secretary, President Obama Signs an Executive Order Focused on Federal Leadership in Environmental, Energy, and Economic Performance (Oct. 5, 2009), at http://www.whitehouse.gov/the_press_office/President-Obama-signs-an-Executive-Order-Focused-on-Federal-Leadership-in-Environmental-Energy-and-Economic-Performance.

³⁴² Exec. Order No. 13514, 74 Fed. Reg. 52,117–52,118 (Oct. 5, 2009) (emphasis added).

³⁴³ Exec. Order No. 12996, 61 Fed. Reg. 13,647 (Mar. 25, 1996).

³⁴⁴ *Id.*

³⁴⁵ *Id.* at 13,648.

agencies conduct their environmental. . . activities under the law in support of their respective missions in an environmentally, . . . integrated, continuously improving, efficient, and sustainable manner.”³⁴⁶ Additionally, E.O. 13423 directs Federal agencies to “reduce [] the quantity of toxic and hazardous chemicals and materials acquired, used or disposed of by the agency.”³⁴⁷

A regulation requiring the use of nontoxic ammunition on NPS and FWS lands would comply with the directive given to federal agencies by these Executive Orders to remove toxic contaminants from the environment, enact environmentally sound management policies and operations, and help protect wildlife and the habitats upon which they depend for the benefit of present and future generations.

VI. CONCLUSION

In contrast to nontoxic ammunition, lead ammunition continues to kill long after it leaves the gun barrel by creating a pathway through which wildlife and humans become exposed to lead – an extremely hazardous and toxic substance. In light of the overwhelming scientific evidence documenting the debilitating and often lethal effects of lead ammunition, and the widespread availability of nontoxic alternatives, Petitioners respectfully urge the DOI to promulgate a regulation requiring the use of nontoxic ammunition on NPS and FWS lands.

As explained in this Petition, the DOI has more than ample authority under the United States Constitution and various federal statutes to enact a regulation requiring the use of nontoxic ammunition on NPS and FWS lands. Indeed, as the nation’s principle conservation agency, the DOI can no longer ignore the reality that hunting with lead ammunition causes the unnecessary death and suffering of numerous species of wildlife (including endangered species), threatens the ecological integrity of the federal lands it is charged with protecting, and presents a danger to public health and welfare. Requiring the use of nontoxic ammunition on NPS and FWS lands would help ensure our nation’s wildlife and public lands receive adequate protections and are preserved for the benefit of present and future generations as required by law, while allowing recreational activities on these lands to continue in a safer environment.

³⁴⁶ Exec. Order No. 13423, 72 Fed. Reg. 3,919 (Jan. 24, 2007).

³⁴⁷ *Id.*

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