

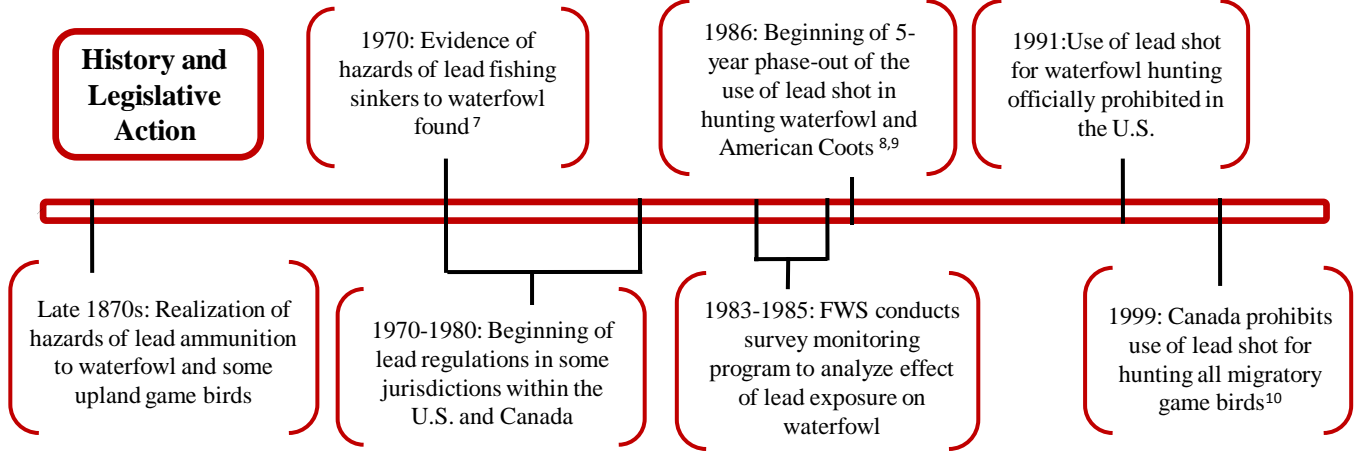


LEAD AND WILDLIFE

Introduction: Lead has been used in ammunition and fishing tackle for centuries; however, recent studies of lead toxicity in wildlife are raising concerns from the conservation community. Although lead is naturally occurring, it has no essential biological function¹ and can cause significant damage to wildlife when exposed. A 1991 ban on the use of lead shot for hunting waterfowl in North America² was successful in reducing lead exposure in waterfowl species; however other key species remain at risk, including upland game (e.g., dove, quail) and scavengers (e.g., vultures, eagles).³ Nonetheless, increased lead levels can still result from wildlife consuming lead directly from shot, bullets, and fragments left in heavily hunted fields, wetlands, and shooting ranges as well as indirectly by feeding on wounded or dead prey containing lead. Additionally, lead can be solubilized, biologically incorporated into food sources, and then ingested.^{4,5,6} Extensive research examining exposure and effects of lead in birds exists, but less information is available for other wildlife. Despite some legislative action to phase out its use, mortality rates linked to lead intoxication in wildlife remain high.



Bald eagle with lead shot in the digestive tract (Jacobson et al. 1977)



Threat: Lead ammunition and fishing tackle pose several direct and indirect threats to wildlife. Expended lead shot shells are not only dangerous in terms of their potential ingestion by wildlife but also can have long-term environmental impacts. Metallic lead can remain relatively stable and intact for decades, even centuries. However, under certain environmental conditions, (e.g., acidic or basic water or soil) lead from shot or tackle can be readily released and taken up by plants or animals, causing a range of biochemical, physiological, and behavioral effects in some species of invertebrates, fish, amphibians, reptiles, birds, and mammals.¹²

“In many settings, minimizing or restricting the use of lead ammunition and fishing tackle would be beneficial to waterbirds, scavenging birds, upland birds, and possibly other species.”

Ingestion by reptiles, birds, and mammals of spent ammunition and lost fishing tackle has also been documented and can cause a range of negative effects in individuals, potentially leading to population-level effects in some species (e.g., waterfowl, eagles, condors, mourning doves, and loons).¹¹ The consumption of hunter-killed animal carcasses containing lead shot can also cause lead poisoning in wildlife.¹³ Ingested lead is absorbed into body tissue, causing lead intoxication.

Effects of Exposure:

- immunosuppression
- hypertension
- neurological impairment
- damage to reproductive system
- tissue and organ damage
- paralysis
- death



California Condor

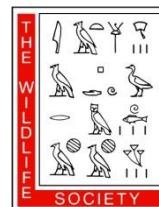
Alternatives: There has been an extensive effort in the development, efficacy testing, and regulation of alternatives to lead-based ammunition for hunting waterfowl and waterbirds in recent years. Several manufacturers have developed nontoxic ammunition that can be used safely in all gauges of modern shotguns, as well as nontoxic rifle bullets for hunting large game. However, the widespread manufacture of this shotgun and rifle ammunition depends on assured markets provided by regulation and enforcement. Dozens of substitutes for lead fishing tackle have entered the marketplace in recent years. A few, but not all, alternative metals in fishing tackle have been deemed safe if ingested by wildlife.



For more information, see TWS' Technical Review titled "[Sources and Implications of Lead Ammunition and Fishing Tackle on Natural Resources](#)"¹⁴ available to members online, as well as TWS' publicly available position statement on [Lead in Ammunition and Fishing Tackle](#).

THE WILDLIFE SOCIETY

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¹Hernberg, S. 2000. Lead poisoning in a historical perspective. *American Journal of Industrial Medicine* 38: 244-254.

²U.S.FWS. 2011. http://www.nwhc.usgs.gov/disease_information/lead_poisoning/

³Rattner, B.A., J.C. Franson, S.R. Sheffield, C.I. Goddard, N.J. Leonard, D. Stand, and P.J. White. 2008. Sources and Implications of Lead-based Ammunition and Fishing Tackle on Natural Resources. Wildlife Society Technical Review. The Wildlife Society, Bethesda, MD, USA.

⁴Ma, W. 1989. Effect of soil pollution with metallic lead pellets on lead bioaccumulation and organ/body weight alterations in small mammals. *Archives of Environmental Contamination and Toxicology* 18:617-622.

⁵Stansley, W., and D.E. Roscoe. 1996. The uptake and effects of lead in small mammals and frogs at a trap and skeet range. *Archives of Environmental Contamination and Toxicology* 30:220-226.

⁶Hui, C.A. 2002. Lead distribution throughout soil, flora and an invertebrate at a wetland skeet range. *Journal of Toxicology and Environmental Health* 65:1093-1107.

⁷Sears, J. 1988. Regional and seasonal variations in lead poisoning in mute swan *Cygnus olor* in relation to the distribution of lead and lead weights in the Thames area, England. *Biological Conservation* 46:115-134.

⁸Griffin, C.R., T.S. Baskett, and R.D. Sparrowe. 1980. Bald eagles and the management program at Swan Lake National Wildlife Refuge. *Transactions of the 45th North American Wildlife and Natural Resources Conference* 45: 252-262.

⁹Pattee, O.H., and S.K. Hennes. 1983. Bald eagles and waterfowl: the lead shot connection. *Transactions of the 48th North American Wildlife and Natural Resources Conference* 48:230-237.

¹⁰ U.S.FWS.2011. http://www.nwhc.usgs.gov/publications/field_manual/chapter_43.pdf.

¹¹Fisher, I.J., D.J. Pain, and V.G. Thomas. 2006. A review of lead poisoning from ammunition sources in terrestrial birds. *Biological Conservation* 131:421-432.

¹²Rattner, B.A., J.C. Franson, S.R. Sheffield, C.I. Goddard, N.J. Leonard, D. Stand, and P.J. White. 2008. Sources and Implications of Lead-based Ammunition and Fishing Tackle on Natural Resources. Wildlife Society Technical Review. The Wildlife Society, Bethesda, MD, USA.

¹³Fisher, I.J., D.J. Pain, and V.G. Thomas. 2006. A review of lead poisoning from ammunition sources in terrestrial birds. *Biological Conservation* 131:421-432.

¹⁴Rattner, B.A., J.C. Franson, S.R. Sheffield, C.I. Goddard, N.J. Leonard, D. Stand, and P.J. White. 2008. Sources and Implications of Lead-based Ammunition and Fishing Tackle on Natural Resources. Wildlife Society Technical Review. The Wildlife Society, Bethesda, MD, USA.