Lead Pollution at Outdoor Firing Ranges

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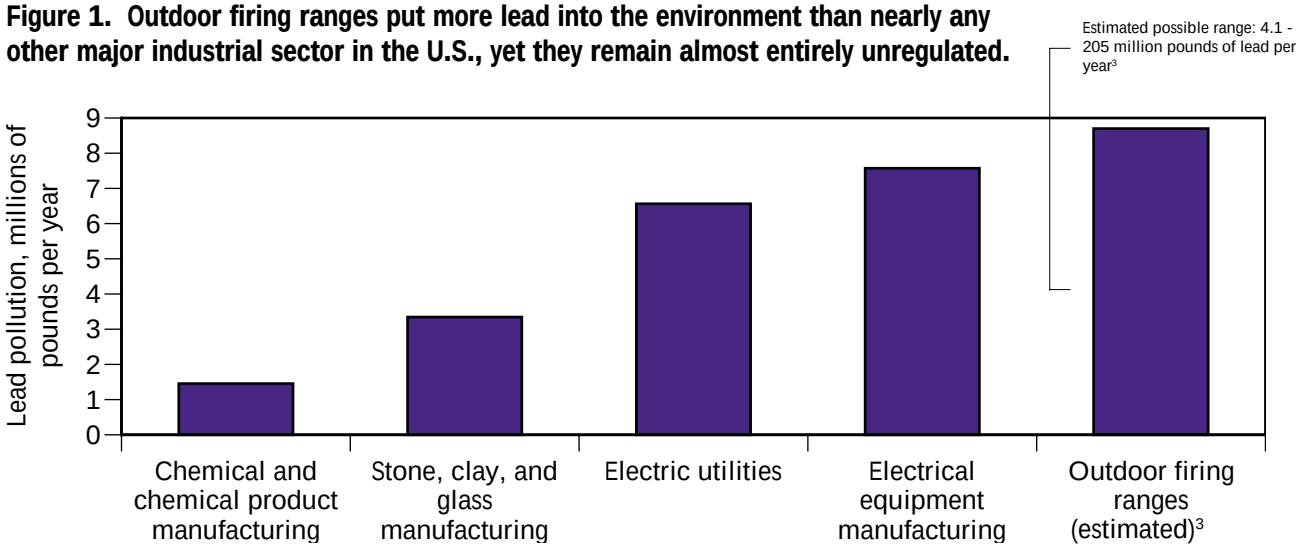
Outdoor firing ranges can be highly contaminated with lead

Lead is the most prevalent contaminant at Superfund sites across the country (EPA 2001a). The highly toxic metal triggers more Superfund cleanups than any other industrial chemical or waste product in the environment. Lead is considered the number one environmental threat to children's health by the federal government, and at very low levels is linked to subtle developmental delays and reduced I.Q. in children (EPA 2001b, 2001c).

Recognition of the toxicity of lead is broad and nonpartisan. On April 17, 2001, the Bush Administration took its first action against lead polluters, in an announcement that the Bush Environmental Protection Agency (EPA) would uphold a Clinton Administration rule requiring all businesses releasing 100 pounds of lead a year (or greater) to report this pollution to the government. The announcement came despite objections raised by affected industries.

Lead contamination has now emerged in another context: firing ranges. The military has been involved in massive lead cleanup efforts for years, at an estimated 700 military firing ranges across the country. In this report, we present the first estimates of lead pollution at commercial and private firing ranges. Our analysis shows that shooting ranges are likely to be one the biggest sources of lead pollution in the country (Figure 1). Assuming a very modest level of activity at the nation's 1,813 firing ranges - just 15 customers shooting 50 rounds a day - firing ranges would put nearly nine million pounds of lead into the environment per year. This is more lead pollution than is produced by any other industry except metals mining and manufacturing, and waste recovery operations. While most of this lead will likely remain on the site, the nation's firing ranges represent a major potential source of lead in water and wildlife, and a potential liability to nearby property owners who may find themselves living next to a hazardous waste site or who might be victims of lead drifting onto their property.

Figure 1. Outdoor firing ranges put more lead into the environment than nearly any other major industrial sector in the U.S., yet they remain almost entirely unregulated.



Notes:
1) This figure represents the top five lead polluting industries in the country after metals mining and manufacturing, and waste recovery operations. 2) Industrial emissions are Toxics Release Inventory reportable emissions for 1999 of lead and lead compounds. 3) Assumes 15 people firing 50 rounds per day at 1,813 ranges nationwide. Estimated possible range of lead pollution produced at 1,813 ranges: minimum value shown represents 10 people firing 20 rounds per day for each range; maximum value shown represents 100 people firing 50 rounds per day for each range.

Source: U.S. Environmental Protection Agency.

Firing ranges are exempt from pollution control laws

In spite of widespread scientific and political agreement on lead toxicity and the need to reduce it, commercial firing ranges are exempt from the EPA's new lead reporting requirements, and virtually every major pollution control law in the United States.

A number of loopholes allow unlimited lead contamination at outdoor firing ranges. In spite of legal precedents to the contrary (VPC 2001), EPA continues its policy allowing firing ranges near water bodies to operate without the pollution discharge permits that are required under the Clean Water Act for all other lead-polluting industries. These ranges present a significant water pollution threat, according to industry sources (NASR 2000). Under the Resource Conservation and Recovery Act, most industries are under strict requirements to dispose of lead waste safely, typically in hazardous waste landfills; shooting ranges are exempt because the act of firing bullets into the soil has not been interpreted by EPA as "discarding" lead.

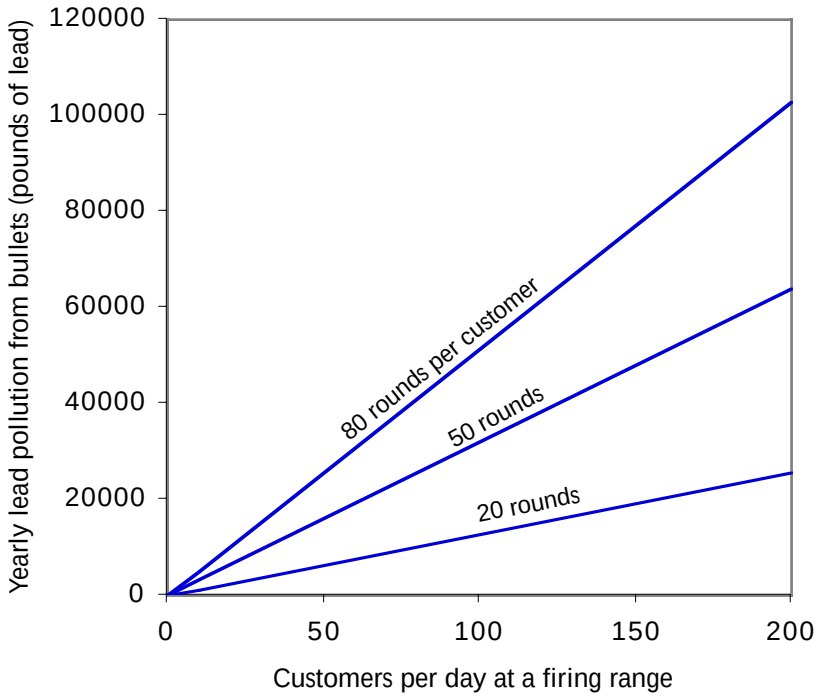
The military's response to contamination at its ranges illustrates the potential magnitude of the problem. The armed forces are involved in massive lead cleanup efforts at an estimated 700 military firing ranges across the country. Private firing ranges enjoy immunity from the environmental laws that drive these cleanups, despite the fact that their operation can result in contamination levels many times what triggers major remediation efforts at industrial and military sites. At very modest levels of activity it is quite possible that every firing range in the U.S. is contaminated with lead at levels that would trigger Superfund cleanups (Figure 2). The threat lead poses to the surrounding environment and communities is not known, but could be substantial. If totally dissolved into the environment:

- A single shot from a 30-30 Winchester containing 8.1 grams of lead could contaminate about 370 cubic feet of soil to Superfund site contamination levels (the equivalent of about 56 bathtubs filled with Superfund site dirt).

- The lead in just one bullet from a 22-caliber rifle (2.6 grams) could contaminate one day's worth of drinking water for the entire population of Salt Lake City with a level of lead deemed unsafe by the EPA. (One bullet weighing 2.6 grams fully dissolved in 51,000 gallons of water results in a lead concentration of 15 parts per billion, the legal limit for drinking water.)

- The amount of lead used in bullet production over a period of four years would be enough to contaminate the entire State of Rhode Island at Superfund levels, to a depth of one foot.

Figure 2. Even at modest levels of activity, a single firing range can become contaminated with tens of thousands of pounds of lead.



Source: Environmental Working Group.

What is a safe level of lead exposure?

There is no amount of lead exposure known to be completely safe for a child. Federal safety standards are based on exposures that present a risk for a child's brain to be measurably harmed. Currently, the Centers for Disease Control and Prevention uses a benchmark safety level of 100 micrograms of lead per liter of a child's blood as an indicator for children at risk for the harmful effects of lead.

The federal government considers that a child playing outdoors is at risk for lead poisoning if concentrations of lead in the soil where the child is playing are higher than 400 parts per million (400 ppm). Through incidental contact with soil from outdoor play, children ingest tiny amounts of soil through what the EPA calls children's normal "hand-to-mouth" activity. In other words, children play in the dirt, get dirt on their hands, and then put their hands and fingers in their mouths, or eat food without washing their hands.

When industrial pollution impacts residential areas - for instance, when soil is contaminated with levels of lead that could put children at risk for lead poisoning - various environmental laws in this country, including the Superfund law, require cleanup actions to make the area safe for children. In contrast, most firing ranges fall outside the purview of environmental statutes. Lead levels can build up to any amount at most privately owned outdoor firing ranges and neighboring properties, with absolutely no requirements for soil testing or remediation until that property is sold. Generally it is only after rivers, streams, or public water supplies have become contaminated that citizen lawsuits can force cleanup actions.

Figure 3. In just 2 years a typical firing range can have lead contamination equivalent to a 5-acre Superfund site.

Source: Environmental Working Group.

Table 1. If totally dissolved in the water supply, the lead contained in a single bullet could contaminate the amount of water consumed daily by hundreds of thousands of people.

	Lead contained in a single shell or bullet (grams)	One bullet can contaminate the amount of water consumed daily by this many people…	Equivalent to the amount of water consumed daily in…
12-gauge shotgun shell	28.0	1,866,667	Houston
45 automatic pistol match ammunition	12.0	799,200	San Francisco
308 Winchester round	9.7	648,000	Baltimore
30-30 Winchester round	8.1	540,000	Seattle
9 mm Luger handgun bullet	7.5	496,800	Denver
22 caliber rifle bullet	2.6	172,800	Salt Lake City

Source: Environmental Working Group. Contamination level was taken as 15 ppb, the action level under the Federal Safe Drinking Water Act.

Outdoor firing ranges can be contaminated with tremendous amounts of lead that can contaminate water supplies and put children at risk

Consider a firing range that has just 15 visitors each day, each of whom fires about 50 rounds or bullets. Assuming an average lead content representative of the common types of ammunition used, in just two years the entire top foot of soil over an area of five acres could be contaminated to Superfund levels. This firing range operating over a period of 20 years would contain about 9.6 times the amount of lead that could trigger a Superfund cleanup (Figure 3). Ranges operating at a higher volume of activity on the same space could easily contaminate the ground to a level where remediation would require the soil to be treated as hazardous waste before it was placed in a double-lined hazardous waste landfill.

The lead found in soil at firing ranges will be in the form of various amounts of dust, small fragments, and nearly intact bullets and pellets. The bullets and pellets will dissolve with time as rain leaches through the soil. Depending on soil type and pH, varying amounts of lead can move off the site, potentially contaminating water supplies. At any given time, the contamination profile at a firing range can include highly contaminated soil in the backstop or berm, more diffuse contamination across the entire extent of soil leading to the backstop, and then some area under the ground in which rainwater has leached lead into the groundwater to form a plume of contamination. Lead will migrate more quickly in sandy soil, with a higher potential to contaminate water supplies. The lead contained in even a single bullet can contaminate the amount of water consumed daily by hundreds of thousands of people (Table 1).

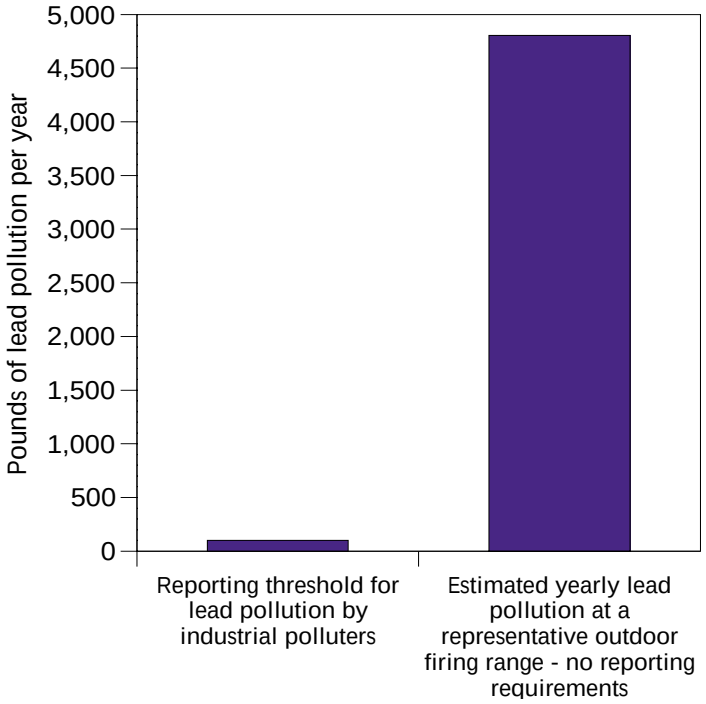
Children living near firing ranges can be exposed to lead through dust that blows off the range to contaminate the air and soil nearby. Families living near firing ranges could be drinking water from their private well that is contaminated with lead that has leached from the range soil. Public water supplies can be contaminated. In the long-term, each firing range in the U.S. almost certainly represents a piece of land so highly contaminated that it would require a massive cleanup effort to be safe for wildlife or any industrial or residential use.

Outdoor firing ranges are exempt from new lead pollution reporting rules

New rules finalized by EPA in January 2001, and supported by the Bush Administration, require industries across the country to report even small amounts of lead pollution to a public database maintained by the government called the toxics release inventory (TRI). Facilities that discharge just 100 pounds of lead each year to the environment are subject to these new, strict reporting requirements.

Private firing ranges are exempt from the new reporting requirements, regardless of how much lead they put in the environment. And the amounts appear to be substantial. A small firing range can emit 100 pounds of lead to the environment (the minimum to trigger reporting for the regulated

Figure 4. A representative outdoor firing range pollutes at 48 times the level that triggers strict reporting requirements for industrial polluters.



Source: Environmental Working Group.

industries) in a matter of days. For example, a range that has 15 customers each day, each of whom shoots 50 rounds or bullets, would create 100 pounds of lead pollution in 7.5 days, or 4,800 pounds of lead contamination in a year (Figure 4).

Despite their significant lead pollution, outdoor firing ranges are exempt from the reporting requirements of EPA's new rules. These ranges are not required to report their pollution, they are not required to get a permit to pollute, and they are not required to clean up the pollution that they cause (unless injured parties bring legal action). This broad exemption from environmental statutes is producing thousands of highly contaminated toxic waste sites at firing ranges across the country.

Recommendations

Private firing ranges are a potentially huge and completely unregulated source of lead pollution in the environment. In order to more fully understand the exact nature of this problem and devise solutions to address it, we recommend that the U.S. EPA, in coordination with state environmental agencies, immediately begin a study of the problem of lead contamination at commercial and private shooting ranges. As a part of that study the U.S. EPA should commission a study of lead levels in the blood of range employees and their children, frequent users of the facilities and their children, as well as children living near these facilities.

Methodology

Estimates of lead pollution presented in this report are based on the following assumptions:

- Soil at firing ranges: Representative unit weight of soil into which bullets are fired — 110 pounds per cubic foot

- Weight of ammunition: taken as representative weight from the range of weights of commonly-used ammunition (Ramage 2000):

  12-gauge shotgun shell – 28 grams
  22 caliber rifle bullet – 40 grains (2.6 grams)
  9 mm Luger handgun bullet – 115 grains (7.5 grams)
  45 automatic pistol match ammunition – 185 grains (12.0 grams)
  30-30 Winchester round – 125 grains (8.1 grams)
  308 Winchester round – 150 grains (9.7 grams).

  For purposes of calculations of total pollution, an average bullet weight, 123 grains (8.0 grams) was assumed. This represents the mean of the 5 lightest types of ammunition shown above (shotgun shells were not included).

- Calculations of contamination relative to Superfund levels: For purposes of discussing the possible extent of contamination at firing ranges relative to that at Superfund sites, lead concentrations were calculated assuming the lead to be concentrated in the upper foot of soil at a range.

- Total number of commercial firing ranges: Calculations of national pollution amounts from firing ranges assume 1,813 operating firing ranges. This is the number of outdoor ranges registered on the National Shooting Sports Foundation web site, but this list is not comprehensive. Catogories of ranges included in the estimated total, as listed on www.nssf.org, are: handgun outdoors, rifle outdoors, skeet shooting, sporting clays, trap shooting, and cowboy action shooting.

- Average amount of water consumed by an individual: Taken as the average population wide consumption in the U.S., one liter (0.29 gallons) per day, from water consumption data presented in EPA 1999.

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