

## Pollution Prevention (P2) for Outdoor Firing Ranges

Outdoor shooting ranges can contribute to lead pollution in soil and water due to the use of lead bullets in the sport of shooting. The excess amounts of lead build up at firing ranges can have detrimental impacts on the environment and health of individuals that work at or use the outdoor shooting range. Introducing pollution abatement techniques will help to improve the environmental quality of outdoor shooting ranges and save the facilities money in operation costs.



### Lead-Free Ammunition

Substituting lead-free bullets for lead ammunition has the dual benefits of reducing lead exposure for firing range employees and users as well as preventing lead pollution in the environment. Although lead exposure is more of a risk at indoor ranges, lead contamination at outdoor ranges has been measured on firearms, nearby eating areas and employee's hands.<sup>1</sup>

Lead exposure is also a risk through soil contaminated by spent lead, or by exposure to dissolved lead in nearby surface water or groundwater.<sup>2</sup> Typically these risks are mitigated through lead containment and removal. By encouraging the use of lead-free ammunition, ranges can reduce the amount of lead entering the site and prevent lead pollution from taking place.

The Arizona Game and Fish Department (AZGFD) encourages the use of lead-free ammunition while hunting to reduce lead poisoning in wildlife as part of its California Condor Recovery Program.<sup>3</sup> Their outreach has found that 93 percent of hunters believed non-lead ammunition performed as well or better than lead bullets. Visit [AZGFD.gov](http://AZGFD.gov) to learn more about the performance and benefits of lead-free ammunition, as well as a list of available lead-free ammunition brands.

### Lead Containment

When lead ammunition is fired, it should be contained on site. This is primarily for safety reasons, but containing and concentrating lead in a smaller area also makes it simpler to manage and eventually remove, preventing pollution from migrating offsite. Some recommended methods of containment include:<sup>4</sup>

**Bullet Traps** — Containers can be placed directly behind targets to collect expended bullets and particles. They can prevent lead from entering the environment and make lead collection as simple as emptying a tray behind each target, but may also increase bullet fragmentation and lead dust. Care should be taken to protect employee's safety while emptying traps.

**Earthen Berms** — Embankments should be located behind targets as a backstop, and can also be located in the interior and exterior of the site to separate ranges from each other and the surrounding area. They should be covered with vegetation to reduce erosion and controlled for pH to reduce lead migration.

### Lead Removal

Any lead that does enter the environment should be removed and recovered on a regular basis. The layout and conditions at each range should be considered when

selecting the most effective method for lead removal. Removal frequency may depend on the amount of lead that builds up onsite and other conditions like soil type and precipitation, but is generally recommended every one to five years.<sup>2</sup> Hand raking followed by sifting to separate lead and soil, carried out by range employees or volunteers, may be practical for smaller ranges with lower amounts of lead build-up. Larger ranges with higher lead concentration should consider larger lead reclamation equipment or professional reclamation services.

Any lead that is recovered can be considered scrap metal, and is exempt from hazardous waste regulations so long as best management practices are followed in terms of storage and it is legitimately recycled (40 CFR 261.6(a)(3)(ii)). For more information or assistance complying with RCRA regulation, contact ADEQ's Hazardous Waste Unit.

### Preventing Lead Migration

If lead is not prevented from entering the soil by use of lead-free ammunition or bullet traps, its spread can be minimized by taking steps to prevent it from migrating into nearby surface water or groundwater. Some recommended practices include:<sup>2</sup>

**Soil Amendments** — Lead mobility increases in acidic soil, so regular monitoring of soil pH is suggested. Lime can be added to acidic soils to adjust pH to the recommended range of 6.5 to 8.5. Other amendments include phosphate and organic matter like compost, which prevent migration by binding to lead to immobilize it.<sup>5</sup>

**Runoff Control** — Lead migration can also be reduced by limiting runoff and erosion that might transport lead off site. This can be achieved by planting vegetation on the range, applying mulch or compost to the soil or altering topography to slow runoff. Vegetation around the range may also have the added benefit of absorbing sound that would otherwise travel offsite.<sup>4</sup>

## Controlling Lead Exposure

Employees and visitors at firing ranges can be exposed to lead through various routes, including inhalation of lead dust in the air and contact with lead fragments or contaminated soil. It can even build-up on clothes or skin and be transferred off site, including to the cars or homes of range users and employees. For assistance developing a health and safety plan to mitigate these risks, consult the Occupational Safety and Health Administration (OSHA) General Industry Lead Advisor software or contact the Arizona Division of Occupational Safety and Health (ADOSH) for free consultation services.<sup>6,7</sup>



## References

- <sup>1</sup> [National Institute for Occupational Safety and Health. \*Workplace Solutions. Reducing Exposure to Lead and Noise at Outdoor Firing Ranges.\*](#)
- <sup>2</sup> [EPA. \*Best Management Practices for Lead at Outdoor Shooting Ranges.\*](#)
- <sup>3</sup> [AZGFD. \*California Condor Recovery.\*](#)
- <sup>4</sup> [ITRC. \*Environmental Management at Operating Outdoor Small Arms Firing Ranges.\*](#)
- <sup>5</sup> [Blaustein, Richard. American Institute of Biological Sciences. Oxford University Press. \*Phytoremediation of Lead: What Works, What Doesn't.\*](#)
- <sup>6</sup> [OSHA. \*General Industry Lead Advisor 1.0.\*](#)
- <sup>7</sup> [ADOSH. \*Consultation and Training.\*](#)

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