

Without Lead The .410 is dead!

If there is ever a general lead shot ban for game and clay target shooting the .410 shotgun will be relegated to the scrap heap for all practical purposes.

We must learn the lessons from the history of the waterfowl lead ban, or we are doomed to repeat the same mistakes all over again.



Marshall Williams, a lifelong shooting sportsman, retired US government Lawyer and writer of monthly articles and answerer of technical questions in Shotgun Sports Magazine USA.

Here he talks to Tim Woodhouse about the history and effectiveness of steel and other non-toxic shot types after the introduction of the US Lead shot ban for Waterfowling.

TW: Can you tell me about the US situation regarding non-toxic shot?

MW: What I know about the non-toxic shot is the result of having read a lot about it since it was first suggested in the 1960s, and some of that is important. Ed Lowry was one of the ballisticians who worked on the steel shot projects for Olin-Winchester. His various published articles all resulted from what he learned doing that work and tell more scientifically than you can easily find in one place.

He also produced a computer ballistics programme in the 1990's with Keith Garner, which was based on the results of all of their extensive ballistic testing and findings.

It appears that lead poisoning resulting from ducks ingesting lead shot, has been known to exist since as long ago as the 18th. Century. The ducks apparently ingest the shot as they pick up small stones, which are held in their gizzards and are necessary for digestion.

Since the shot goes into the gizzard rather than the stomach and intestines, it does not quickly pass through the system, but stays in the crop until it has been worn away. This makes lead shot a greater danger for ducks and waterfowl as they live and feed in the areas where they are shot.

It was obvious that waterfowl could be saved if there were a non-toxic alternative to lead shot. For this reason, the federal (not States, i.e., Washington, DC, not New York or Virginia*,) wildlife authorities had studies done to determine how serious the problem was and whether there was a reasonable alternative.

* Under the American system, the federal government manages migratory game birds and waterfowl because they travel over many States and are in "Interstate Commerce." This provides uniform management of the resource. Upland game birds, grouse pheasants, turkey, quail, etc. are local birds and are managed by the States as the State see fit.

The mortality studies were based on "worst case scenarios" and these required working with all worst-case assumptions, which determined that some ducks could be saved if there were no lead shot in the water. What is now long forgotten, were the studies relating to how lead shot damage could be minimized.

TW: What were these?

MW: It was found that lead shot sizes larger than US #5s (3mm/UK4's) quickly sink too deeply into the mud for the ducks to pick them up, and that lead shot heavily plated with copper and/or nickel, posed little or no lead poisoning dangers.

TW: That's very interesting, which presumably means that UK number 3 lead shot and larger sizes would fall into this category, but what about the other non-toxic shot types?

MW: Several metals were tested in the early days as alternatives to lead shot, including steel and copper.

It was easily demonstrated that the wounding characteristics of steel shot were inferior to lead for hunting. It has only two-thirds the density of lead.

Therefore, the ballistic coefficient of any size steel shot is only two-thirds of a similar size lead pellet. Steel shot loses its velocity and energy much faster than lead and therefore loses its killing power much faster. That in a nutshell is my and everyone else's (USA) opinion of steel shot.

Importantly it was widely believed that steel shot would result in more birds being wounded and lost due to its inferior wounding characteristics than would die of lead poisoning. Without regard to what may have been the better idea, the political result was that only steel shot was mandated for certain problem areas on certain flyways.

TW: So only steel shot pellets were allowed in these areas, but why not any of the other non-toxic types that were being tested at the time?

MW: There was no provision for any other non-toxics, a point on which the federal authorities made no effort at all. I attribute this to the general opposition to change once a position has been taken, and a law made. This also made it more difficult for alternative non-toxics that were studied and put forward in the US, because of the "red tape" involved in attempting to do it.

TW: What were these steel shot loads like to shoot?

MW: The early results were many, surprising, and sometimes expensive. One had to use much larger steel shot in the hopes of obtaining suitable energy and penetration on target. The then rule of thumb was two sizes/half an mm larger to try to match up striking energy levels. This also resulted in a considerable loss in range.

After a general experience of excessive wounding, it was later found that much larger steel pellet sizes were required to achieve parity of penetration when compared to lead.

This progressed to the introduction of the very large, long forgotten US buckshot sizes like T, carrying 52 pellets to the ounce in steel, with a diameter of 0.200inch/5.1mm (UK AAA equivalent) and F, having 39

pellets to the ounce in steel, with a diameter of 0.220inch/5.6mm (UK SSSSG equivalent), which were reintroduced in steel shot for waterfowl use.

Higher velocities increased energy slightly, so velocities also became higher. However, with far fewer numbers of pellets to the ounce, these much larger shot sizes resulted in much thinner patterns, even for large birds like geese.

This is why in both 10 and 12gauge, the longer 3½ inch magnum shells were introduced, so that more of this very large steel shot could be accommodated.

TW: These days we hear much of potential gun barrel damage attributable to steel shot, but what were the problems?

MW: Shooting steel shot caused "peening" of a shotgun's barrel just behind the choke and a tiny bulge appeared, right where choke starts, similar damage was also seen at the chamber cones.

Shooters who tried to reload steel shot, and it was very hard to find the components, discovered that steel shot scored the inside of their barrels unless it was contained in a much thicker plastic shot protectors than were available. Shooters also discovered that it patterned very poorly in their full choke duck guns.

Gun makers had to redesign their barrels with much thicker metal behind the choke. Ammunition makers had to develop heavy shot insulators (plastic wads), which reduced the amount of shot that could be fitted in the cartridge casing. Shooters then discovered that steel patterned better in more open chokes. I discovered through research that it also patterns better in larger bores. Ten bores out pattern 12s; 12s out pattern 20s.

TW: So in your opinion, would it be fair to say that smaller bore guns such as the English shorter cased 20gauge, the 28 and the .410 bores would be rendered obsolete with the mandatory use of steel shot in particular, because their smaller case volumes would not be able to hold a worthwhile shot charge for any practical sporting use?

MW: Yes, most definitely, the patterns based on experience would most likely be non-too good. There is also the problem of the lack of available wads and very high potential breech pressures. They could theoretically

still be used with very light shot loads of other non-toxic shot at very limited ranges, but they would be prohibitively expensive, and largely ineffective for sporting purposes.

TW: When the steel only rules came in were there any exceptions that allowed the continued use of lead shot in the designated areas?

MW: Yes. When the steel rules were first introduced, the laws permitted the use of lead shot in any gauges for which there were no factory loaded steel shot cartridges available. So as a consequence of this, the 16gauge made a brief comeback. The 10gauge obviously holds a lot more shot than the 12, so these had a big surge in popularity. Both the 16 and 10 gauges had been in steep decline up until this point.

TW: So larger bores and bigger cartridges were needed with steel shot, but its use was enforced only in certain areas, so how did the blanket lead shot ban come to pass?

MW: In general, the steel shot was roundly condemned in print from the beginning and the political process leading to its adoption and the stone-wall of opposition to any reconsideration was also condemned.

Eventually, all of this got sorted out, but not without a lot of shooters retiring their favourite old guns either due to damage or fear of damage. Then one day, the feds decided to extend the ban on lead to all of the flyways.

TW: Why did they do that?

MW: Well, government always wants to expand. Later, they further expanded the ban to any hunting of waterfowl whether in a waterfowl area or not. For example, there is a catch basin about half a mile behind my house, which is home to a lot of Canada geese, and they sometimes fly directly over my house.

If I want to shoot one, I would legally be required to use steel shot, although I can shoot rabbits, squirrels, grouse, turkey, etc. with lead down by the pond.

TW: What about the other types of non-toxic shot?

MW: Eventually some red tape was cut and testing of non-steel non-toxics began. With enough tests, they have been allowed generally co-equal status with steel for waterfowl hunting. Many of these are suitable for old style

barrels and chokes, which is a good thing; unless one doesn't know about the problem and picks up some steel shot!

Many of the new non-toxics are actually denser than lead and common ballistic principles tells us they must be superior to lead. This is all to the good. They kill more effectively at longer ranges. They also seem to give denser patterns than steel shot or even lead shot.

Like steel, these new non-toxics shells are more expensive, but very much more so. Regardless of their inherent ballistic abilities, the vast majority of shooters simply cannot afford to use them.

TW: [Has the US lead shot ban been effective in your opinion?](#)

MW: There were lead shot alternatives that would have minimized the problem of using lead shot and alternatives to steel should have been allowed (in the USA) from the beginning.

I am not omniscient, and one would need to be to determine whether non-toxics were a good idea. I know it has been an expensive idea for the sportsman, and frankly I wonder whether it ever was justified. In the beginning, someone took a worst-case scenario which was based on worst-case assumptions, and said this is the worst number I can imagine. This is doubly bad, particularly as so many of these assumptions are just that, assumptions. Then policy makers went to work based on that.

TW: [Marshall, thank you very much.](#)

