

Choosing the Unleaded Option

Hunters are switching to copper and other less toxic bullets after learning how lead projectiles endanger eagles and other scavenging wildlife.

By Tom Dickson



In a grassy field on the MPG Ranch, located south of Missoula in the Bitterroot Valley, Mike McTee arranges an unusual target. He lines up six one-gallon water jugs inside a rain barrel set on its side atop a folding table. Then he paces off 70 steps, sets his Tikka T3 .270 Win. rifle on a rest, and fires a single 150-grain Remington Core-Lokt cartridge that pierces four jugs before stopping. McTee tips the barrel and pours the water and bullet residue trapped inside through a paper coffee filter.

What remains are the lead bullet, about 70 percent intact, along with more than 100 particles it shed while passing through the water jugs. “I show these fragments to other hunters, and they tell me, ‘I had no idea I was leaving all that in my deer or elk,’” says McTee, a big game hunter and a conservation scientist for the ranch who has given presentations on lead bullet fragmentation to rod and gun clubs across Montana. “When hunters field dress their animal and find the bullet, it seems mostly intact. They don’t see what remains in the meat and the gut pile.”

McTee repeats the experiment, this time firing an all-copper 130-grain Barnes TTSX cartridge. He drains the water into a filter and only the copper bullet, completely intact, comes out. Not a single fragment.

The jugs simulate a deer or elk (which, like all mammals, are mostly water). When a lead bullet strikes a big game animal, it expands, or mush-

JESSE LEE VARRIADO

GROUNDLED A golden eagle found in the Bitterroot Valley near Corvallis awaits treatment for lead poisoning at the Wild Skies Raptor Center east of Missoula. Initial blood analysis showed lead levels more than twice the lethal level, requiring weeks of chelation and physical therapy.

rooms while moving through the body, dropping small chunks and tiny lead pieces along the way. Some fragments veer a foot or more from the wound channel into the meat or viscera. The gut pile left after field dressing can be littered with lead particles.

Over the past two decades, wildlife biologists have learned that when golden eagles, bald eagles, and other scavengers feed on gut piles, they sometimes ingest that lead. Scientists have also found that ingested fragments nearly as small as the period at the end of this sentence can sicken, disable, and even kill nature's most powerful winged predators. "If we hunters are leaving the remains of lead bullets behind in gut piles that then get into the food chain, that's on us. We need to get ahead of the problem," says

Chris Parish, a big game hunter, co-founder of the North American Non-Lead Partnership, and a director at The Peregrine Fund.

Late last winter, veterinary technician Brooke Tanner at the Wild Skies Raptor Center, east of Missoula, received a lead-poisoned golden eagle found in the Bitterroot Valley near Corvallis. It was unable to stand and collapsed on the ground, both feet clenched tightly into fists. "She just sat there for days," says Tanner, the rehabilitation center's founder and director. "You'd walk by and she would make eye contact but couldn't even lift her head. It was heartbreaking."

Other lead-poisoned eagles brought to Wild Skies and Montana's three other raptor rehab centers, in Bozeman, Kalispell, and Helena, have also displayed partial leg paral-

ysis, muscle loss, tremors, and convulsions.

Blood analysis showed lead levels in the Corvallis eagle at 165 micrograms per deciliter. "That's off the charts," Tanner says, explaining that anything above 60 mcg/dl is considered potentially lethal.

Somehow that eagle was still alive.

LACED WITH LEAD

Golden eagles and bald eagles are inadvertently being poisoned by ingested lead across Montana. After finding research linking lead to bald eagle and California condor illness and death in the early 2000s, Rob Domenech and colleagues at the Missoula-based Raptor View Research Institute captured, over several years, 178 migrating golden eagles. After running blood tests, they found elevated lead levels in 58 percent of the eagles captured in the fall and 95 percent caught in the winter. "I was shocked," says Domenech, the institute's director.

Becky Kean, rehabilitation director of the Bozeman-based Montana Raptor Conservation Center, says that all eagles admitted to her facility are checked for lead toxicity. Ninety percent test positive for elevated levels. Most are treated with chelation therapy, which binds the metal to a special drug so it can be excreted through urine. Most of the raptors survive, but some don't. "As a rehabilitator, it's really hard when there's nothing we can do to save an eagle," Kean says.

Lead is a naturally occurring metal that shows up at low levels in all animals. It can enter the environment in several ways, such as via old discarded paint and lost fishing sinkers. But it appears that the lead responsible for poisoning eagles comes from gut piles left by big game hunters, as well as the carcasses of ground squirrels, prairie dogs, and other small mammals shot by varmint hunters. Kean notes that people start bringing lead-poisoned eagles to her facility in late October, when the big game hunting season begins. "We rarely see high lead levels in the summer," she says.

A 2006 study by The Peregrine Fund X-rayed 38 white-tailed deer shot by hunters and found that 74 percent contained more than 100 visible lead fragments each.

Tom Dickson is the editor of Montana Outdoors.

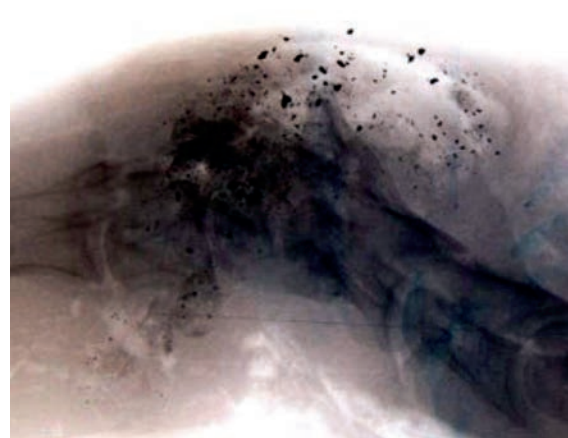
“When hunters field dress their animal and find the bullet, it seems mostly intact. They don't see what remains in the meat and the gut pile.”



Lead bullet

All-copper bullet

SHATTERED Above: X-rays of lead and copper bullets fired into gelatin show the splintering common in all-lead projectiles compared to the lack of fragmentation in a copper bullet. Right: A CT scan of a mule deer buck's neck shot with a lead bullet shows how fragments disperse several inches or more within a carcass. The particles can end up in meat eaten by hunters and their families and in gut piles left behind and scavenged by golden eagles and bald eagles, species particularly susceptible to lead poisoning.



MALFORMED MAJESTY Above left: A golden eagle shows the clenched claws and resulting inability to stand that indicate lead poisoning. Wildlife rehabilitators and veterinarians believe that lead swells and fragments myelin nerve sheaths, causing foot paralysis. Above right: A bald eagle displays the drooping head associated with high lead levels. Lead-poisoned eagles may also exhibit wheezing, wing weakness, tremors, and convulsions.

A 2008 study by the Minnesota Department of Natural Resources found 82 to 141 lead fragments in each of the euthanized domestic sheep carcasses that researchers had shot with lead bullets. Many fragments were 9 to 11 inches from the wound channel.

To test fragmentation of small-caliber bullets used to shoot small game animals, researchers in Idaho and Montana found lead fragments in 65 percent of the 87 Columbian ground squirrels shot using .17 HMR and .22 LR ammo. "Varmint hunters tell me they are feeding the raptors," says Jesse Lee Varnado, Tanner's rehab assistant. "What they don't understand is that they're actually poisoning the raptors."

PARTICULARLY VULNERABLE

American scientists have known that lead is toxic to birds for more than a century. But it wasn't until the 1960s that biologists began linking health problems in waterfowl to the lead BBs used for duck hunting that ended up in shallow lakes. Ducks and swans picked up the spent shot, mistaking it for grit needed to digest food. In 1991, after

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studies showed that federally endangered bald eagles were dying after eating lead-poisoned waterfowl, the U.S. Fish & Wildlife Service banned lead for waterfowl hunting. That led manufacturers to develop the steel and other nontoxic loads that waterfowlers now use instead.

Worldwide, scientists have identified more than 130 wildlife species sickened by lead bullet fragments. Eagles are particularly vulnerable. Strong stomach acids that break down prey bones also dissolve lead particles, allowing toxins to more easily enter the bloodstream. The birds, which weigh only about 13 pounds, rarely die outright, instead succumbing to a slow death.

As a neurotoxin, lead impairs an eagle's

entire body, including sight, reproduction, immune function, foot strength, and judgment, making the birds more vulnerable to predation, starvation, disease, and collisions with objects. "Let's say a lead-impaired eagle is feeding on a roadkill deer, and a car comes along at 70 mph," says Tanner. "These large birds are already slow to take off, so adding even a slightly delayed reaction time means it's more likely to get hit."

Domenech suspects that neurological impairment may also cause eagles to scavenge more than usual. "An eagle that can't hunt effectively has to feed on gut piles—where it then ingests even more lead, making it even harder to hunt."

Eagle experts can't determine what all this means on a population scale. Domenech notes that habitat loss, declining prey populations, collisions with vehicles, and illegal shooting remain the major factors that may be—scientists still don't know for sure—limiting golden eagle population growth. "But lead toxicity doesn't help, that's for certain," he says.

Golden eagle tallies in Alberta and Montana

PHOTOS: NATIONAL PARK SERVICE

PHOTOS: JESSE LEE VARNADO



DANGEROUS DINING Golden eagles, bald eagles, and corvids like magpies and crows commonly feed on the occasional deer and elk shot but not recovered by hunters. Posing a greater risk are tens of thousands of deer and elk gut piles, many laced with lead particles, left behind by hunters each fall.

dropped 30 to 50 percent between the early 1990s and the 2010s before leveling off at that reduced level. Western Montana is a major migration corridor, especially along the Rocky Mountain Front, where tens of thousands of eagles fly south from Alaska and northern Canada through the state each fall. “Based on our sampling, it’s likely that most of those eagles have dangerous levels of lead in their systems. It’s a major concern,” Domenech says.

A CASE FOR COPPER

A growing number of hunters who share that concern—and worry how lead may affect their own health (see sidebar on page 15)—are switching to all-copper or copper-alloy bullets. Urging them on is the North American Non-Lead Partnership (NANP), a coalition of several western wildlife agencies including the Utah Department of Natural Resources and conservation groups such as the Montana Wildlife Federation and Backcountry Hunters and Anglers. The NANP sets its sights only on lead bullets used for hunting, not target shooting. “Our only concern is with bullets that end up in the food system used by scavenging raptors and other wildlife,” says Parish, the NANP

“Voluntarily switching from lead is a chance for hunters to step up to another conservation challenge.”

co-founder. He explains that shooting ranges concentrate lead either indoors or in dirt piles where wildlife rarely feed.

The group does not support lawsuits or ballot initiatives aimed at banning lead. “We adamantly oppose litigation or legislation that would restrict any type of ammo. What we advocate is a completely voluntary approach to switching,” Parish adds.

A ban wouldn’t be possible in Montana anyway. In 2011 the state legislature prohibited the Montana Fish and Wildlife Commission, which regulates hunting ammunition and firearms, from placing restrictions on lead bullets.

Craig Knowles, a hunter who runs a bison ranch near Townsend with his wife, switched to all-copper bullets 15 years ago. “We were concerned about lead toxicity in wildlife and in the venison we eat,” he says.

Knowles says that at first he was skeptical of copper’s efficacy. But he quickly changed his mind once he began dropping deer with single shots using his .270 Win., just as he had with lead. “We also use copper bullets for field slaughtering our bison. Again, great results,” Knowles says.

Jim Chaffin of Missoula agrees. The retired plumber switched to all-copper for his .338 and .300 Win. Mag. rifles six years ago after seeing X-rays of deer and elk carcasses laced with lead bullet particles. A demanding benchrest shooter, Chaffin says the thousands of rounds he has shot at the range have proved to him that copper bullets are plenty accurate for deer or elk.

Copper bullets have been around since the mid-1980s, when Barnes Ammunition developed an all-copper projectile with a hollow nose that expanded into four petals upon hitting a big game animal. For years, hunters had been frustrated that soft lead bullets broke up on impact, losing up to 40 percent of their mass and thus reducing penetration and lethality. Because premium all-copper loads retain 95 to 100 percent of their mass while expanding to twice their initial diameter, many ballistics experts say they generate greater killing power.

What about human consumption?

Lead is a heavy metal that’s harmful to both humans and animals. Lead exposure is especially dangerous to infants and children, including pregnant women and developing fetuses. According to the Centers for Disease Control and Prevention (CDC), there is no safe blood lead level in children. Children exposed to even low levels of lead can have decreased mental development that affects learning, intelligence, and behavior. Exposure during pregnancy can result in premature birth. In adults, accumulating too much lead can cause brain, kidney, and cardiovascular damage, reduced fertility, and cancer. Since the 1970s, lead has been banned in paint, children’s toys, water pipes, and gasoline.

The health effects of ingesting lead from bullet fragments while eating venison are not well understood. Nor do scientists know how much lead from bullet fragments is absorbed into the bloodstream of adults or children. However, there is no doubt that people who eat venison from deer or elk shot with lead bullets can ingest lead, often too small or soft to be noticed.

A 2008 study conducted by the Minnesota Department of Natural Resources surveyed the presence of lead fragments in commercially processed venison. In a sample of 1,029 packages of ground venison and 209 packages of whole-cut venison, 27 percent of the ground and 2 percent of the whole-cut meat contained lead fragments.

A study by the Wisconsin Department of Natural Resources that same year found elevated levels of lead in 15 percent of 199

JEREMY ROBERTS, CONSERVATION MEDIA



FULLY INTACT Comparison of a copper-jacketed lead bullet and fragments after firing into water jugs, and a polymer-tipped all-copper bullet that retained 100 percent of its mass in the same test.

their bloodstream. A 2011 study by the U.S. Geological Survey that fed tiny copper pellets to American kestrels concluded that the metal did not harm the small raptors.

CARING ABOUT WILDLIFE

For a while, it looked like the Corvallis eagle recovering at the Wild Skies Raptor Center would survive. After two weeks of administering chelation therapy, Tanner began massaging the bird’s legs and gently opening

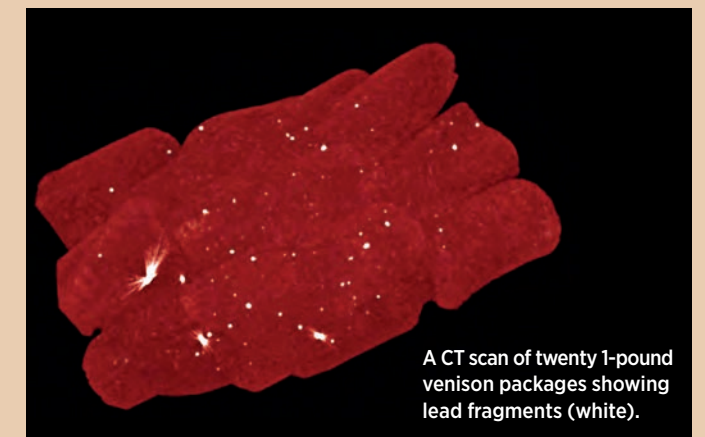
and closing its clenched feet. Soon the eagle could stand, then take short flights attached to a tether. Two months after it arrived, the eagle was fitted with a satellite transmitter and released at the MPG Ranch.

Scientists followed the eagle for two months as it flew south into Idaho and back to the Bitterroot Valley. Then its signal stopped moving for several days, indicating the bird had died. A toxicology report determined chronic lead exposure as well as exposure to rodent poison. “This is so disappointing. These poor birds have so much working against them,” Tanner says.

When Parish hears such stories about lead-sickened eagles, he hopes his fellow hunters will see how easy it is to prevent raptor deaths and demonstrate their conservation ethic. “Historically, we hunters have been willing to take action on behalf of wildlife,” he says. “Voluntarily making the switch from lead to copper is a chance for us to step up to another conservation challenge,” he says.

commercially processed samples of venison and 8 percent of 98 hunter-processed samples.

Despite the lack of conclusive evidence linking major health problems with consuming deer and elk shot with lead bullets, more and more hunters are playing it safe by switching to copper and other nonlead projectiles. “We eat venison because we want healthy, organic meat,” says Pam Knowles, who runs a bison ranch with her deer-hunting husband near Townsend. “Why would we want to knowingly add lead to that?” —Tom Dickson



A CT scan of twenty 1-pound venison packages showing lead fragments (white).

PHOTO: UNIVERSITY OF NORTH DAKOTA SCHOOL OF MEDICINE

ESTELLE SHUTTLEWORTH