


BEST Riflescopes EVER

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Photos Courtesy of Author

A woman wearing a wide-brimmed hat and a blue jacket is smiling while looking through a rifle scope. The background is a clear blue sky.

*If you can't see
three percent
difference, why
pay for it? Same
reason you fret over
3-inch groups.*

Maine's forest lay black around my stand at dusk when the bear appeared. Trembling I lifted the headnet and my .303. Squinting over the sights I felt the trigger and the veil fell. The bear looked up. Lifting the mesh again, I found the bead. Down came the net. The bear turned. I tore the veil away, pasted the bead on hair and fired. The old SMLE blinked flame. It was my first bear, shot when iron sights were still common.

I couldn't afford a scope.

Scope finishes matching the rifle matter less than lens quality, lens coatings, and mechanical integrity.



You don't need big front glass at dawn and dusk, if you keep magnification at a reasonable 4x to 6x.

150 YEARS AT A GLANCE

Scopes appeared on rifles many moons after Galileo and Lippershay developed telescopes to help them see stars. Still, New England gun-maker Morgan James equipped his match rifles with optical sights before snipers used scopes in the Civil War. Nearly a yard long, these heavy tubes delivered dim images in the best light. Delicate reticles and adjustments failed often.

Around 1901 the J. Stevens Tool Co. began manufacturing riflescopes. Celebrated barrel maker H.M. Pope favored a 16-inch 5x that sold for \$24. In Europe, Zeiss pioneered short scopes with a “prism” model in 1904. It looked like one barrel of a Porro-prism binocular. By the 1920s, as Winchester trotted out its A-5 scope (to become in 1929 the Lyman 5-A), Zeiss acquired Hensoldt and fashioned a line of scopes from the 1x Zeileins to 2-1/2x, 4x, 6x, and 8x models, and even 1-4x and 1-6x variables!

Oddly enough, scope makers proliferated in the U.S. during our Depression. Litschert, Souther, and Wollensak competed with firms that also made rifles: Mossberg, Marlin, and Savage. Among the best-selling scopes was Lyman's Alaskan. It outlived the similar Noske. For many hunters though, scopes cost too much. Bill Weaver tackled that problem in 1930 with his \$19 Model 330. Just 24 when he built the prototype by

hand, Weaver included a “grasshopper” mount that resembled a giant paperclip. The 330's steel 3/4-inch tube had internal adjustments: One-minute clicks for windage, two-minute clicks for elevation.

During the 1930s, a Zeiss engineer found a layer of magnesium fluoride dramatically improved light transmission through lenses, which can lose four percent of incident light at each air-glass surface. A riflescope has several lenses, so Mr. Smakula's discovery was a hit with optics firms after WWII pried it from the Nazis. Multiple wave length-specific coatings would follow, for ever-brighter images.

The war finished many U.S. scope companies. Weaver and Lyman, Redfield and Bausch & Lomb survived. Leupold & Stevens (L&S), established by German immigrant Frederick Leupold in 1907, was yet to make a riflescope. Son Marcus gave L&S new direction in 1947 with the Plainsman scope. As did other scopes of the day, it fogged in wet weather. Using a technique applied by the Merchant Marine, Marcus replaced air in the tube with nitrogen. In 1949, Leupold became the first American company with a fog-proof scope. The 1950s brought constantly centered reticles. One-inch (25.4 cm) alloy tubes supplanted 3/4-inch and 7/8-inch tubes stateside, though 26mm steel tubes remained on Lyman's Challenger and others.

WHAT MATTERS MOST

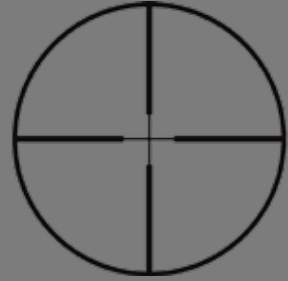
Europe's reputation for carriage-class optics dates to early cameras and binoculars. Riflescopes have piggybacked on their improvements. Image quality hinges mainly on glass type and lens polishing and coatings. Swarovski uses 100 types of glass in its optics, which transmits up to 97 percent of incident light, though the human eye can't distinguish a three percent difference! Objective (front) lenses have grown to match demand for more power, to ensure a big exit pupil (EP: the diameter of the shaft of light reaching your eye). EP is one measure of brightness, and is equal to lens diameter in mm/magnification. A healthy eye dilates to about 7mm at night. Figure

Guiding hunters, I've seen chances lost because scopes were cranked up, limiting field and making the poor fellow's tremors so visible he didn't fire, or in frustration yanked the trigger.

Best Reticle Options

Plex-style reticles offer the most versatility to hunters. You will find numerous variations of the plex reticle in the marketplace.

PLEX

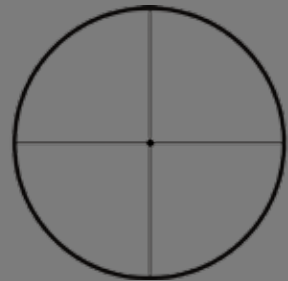


EUROPEAN #4



Some prefer dot reticles, but make sure to take into account the dot size and what works best for you.

DOT



The space between each dot is milliradian apart, which is equivalent to 3.6 inches at 100 yards. A quick math equation will give you range.

MIL DOT



You carry a rifle many hours to fire it once. A cumbersome scope is a burden, impairs rifle balance.

5mm at dim shooting light. A 3-9x40 scope has an EP of 5mm at 8x. No need for bigger glass. A 4-16x scope benefits from a 50mm lens at 10x or higher in poor light. In bright light your pupil shrinks; a big objective delivers more light than it can accept. Front lens size has no effect on field of view, which depends on power, internal design, and ocular lens diameter.

Most variable-power scopes for the U.S. market have the reticle in the second (rear) focal plane, so it appears one size across the power range. First-plane reticles, popular in Europe, expand and shrink when you change power. They're hard to see at the low magnification you want for quick shots in cover. At high power, they can hide small, distant targets. Advantages of the first-plane reticle are that it stays the same size relative to the target—a rangefinder at all power settings; and there's no possibility of reticle shift, low power to high. To be fair, second-plane reticle shift has been all but eliminated.

Parallax remains present in all riflescopes. It's the apparent movement of the target as you move your eye off the scope's optical axis, when the target is not at the scope's "zero parallax" distance. The reticle meets a *focused* image only at one distance. Scopes for hunting rifles are commonly set for zero parallax at 150 yards. Even if your eye is off-axis, the bullet will follow your aim at that range. Change the distance however, and you must keep your eye centered in the scope to eliminate parallax error. *With your eye on-axis, you needn't fret about parallax, no matter the distance.* Though an adjustable objective (AO) sleeve corrects for parallax as it brings the target into sharp focus, a turret-side AO dial is handier and

increasingly common. AO is most useful on scopes for shooting far.

In my view, "far" is beyond point-blank range. Given a 200-yard zero, dead-on hold with most modern loads will land bullets inside coffee-saucer targets up to 270 yards or so. Well inside big game vitals. For such shooting, many hunters dial up too much power. What's enough? If you can see the ribcage, 1x for each 100 yards is plenty. Guiding hunters, I've seen chances lost because scopes were cranked up, limiting field and making the poor fellow's tremors so visible he didn't fire, or in frustration yanked the trigger. High power also reduces light transmission. A big objective boosts brightness but adds weight and bulk. Among my favorite scopes are Leupold's 2-1/2-8x36 and Swarovski's 3-9x36. Trim and lightweight, they sit low and don't impair rifle balance.

RETICLES, MINUTES, AND MILS

Parallax correction on high-power scopes can share the turret with the control for an illuminated reticle. Such reticles are cute, but I'm no battery fan. Tritium/fiber optic lighting in Trijicon's AccuPoint line eliminates batteries. I used an AccuPoint to kill an elk with fast shots in timber, the reticle a beacon.

Among traditional reticles, the plex reticle is perhaps the most versatile, with thick outer bars leading your eye to a fine center wire for precise aim. By the way, it's not a *Duplex* unless it's from Leupold! The European #4 is of similar design, with a thin wire only above the intersection. I like dot reticles, but they must be big enough for quick aim. The dot in my Lyman Alaskan wasn't, when long ago an elk appeared during dusk. Unable to see it

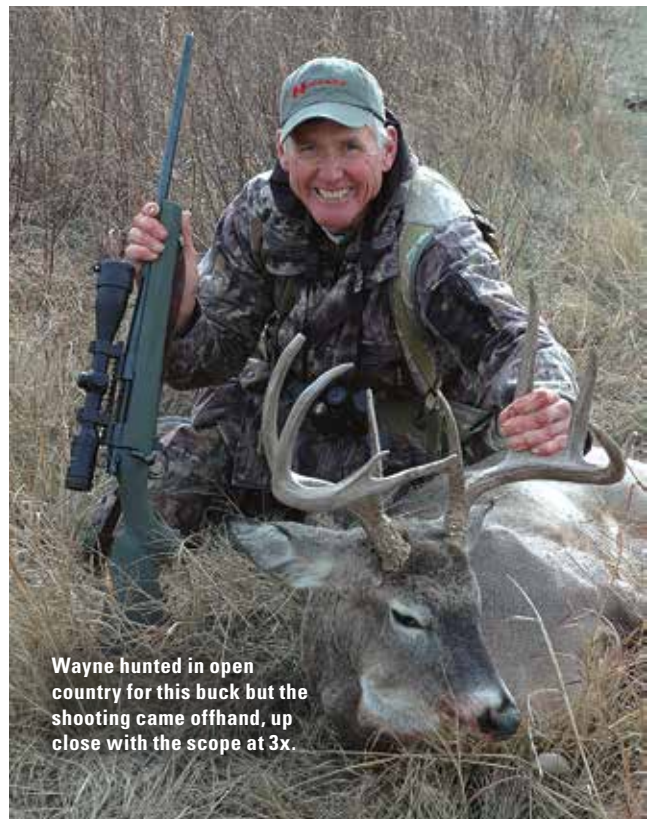
Early scopes fogged. Backup: Auxiliary sights like this bolt peep on a Springfield by Nate Heineke.



In Wayne's view, a low-mounted 3-9x or 4-12x scope, 40mm up front, is hard to beat for big game.



Wayne hunted in open country for this buck but the shooting came offhand, up close with the scope at 3x.



Parts that move

Positive, repeatable click adjustments are a blessing. But if you've endured several presidential elections since you zeroed, and Old Betsy is still spot on, those dials are no more useful than idle screws on a carburetor that doesn't need adjustment. If at long range you add elevation by dialing up, leave the windage dial alone. Unlike gravity, wind is not constant. Don't chase it with the dial. "Shade" windward.

To check click values and repeatability, shoot paper "around the square." Fire a three-shot group, dial 20 clicks left and then fire another group. Add 20 of elevation and fire again; then move 20 right and fire yet again; then come 20 down and fire final shots. Final shots should land with the first shots. Measure between groups (five inches = ¼-minute clicks).



Adjustable objective (AO) sleeves up front are acceding to dials that tune focus, correcting for parallax.

Given a 200-yard zero, dead-on hold with most modern loads will land bullets inside coffee-saucer targets up to 270 yards or so. Well inside big game vitals. For such shooting, many hunters dial up too much power. What's enough?



Prairie needn't mean long shots. Leslie crept inside 150 yards, killed this buck with her scope at 4x.



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on the bull, I frantically shifted my aim to bleached grass at the animal's feet. Fixing my gaze on the ghost of the dot, I raised the muzzle and fired. Mercifully, my first-ever bull fell.

That dot subtended three minutes of angle. A minute is commonly rounded to a value of one-inch at 100 yards, two inches at 200 and so on. Picture a slim wedge, the point at your rifle's muzzle. In truth, a minute is 1.047 inches at 100 yards. At 1,000 yards, it spans not ten inches but 10-1/2. "Clicks" on windage and elevation dials are in fractions of minutes, typically 1/4-minute per graduation. European scope makers have favored the metric system and click value of one centimeter (cm) at 100 meters (109 yards). A cm is about .36-inch, or 1/3-minute.

Another useful angular measurement in scopes is the mil, an abbreviation

for milliradian. A mil spans 3.6 inches at 100 yards and three feet at 1,000 yards. Mil windage and elevation adjustments are .36-inch per click. On mil dot reticles, a mil is the measure of each space between dots strung on a crosswire. Using mils to find range, divide target height in mils at 100 yards by the number of spaces subtending it. The result is range in hundreds of yards. Example: A buck three feet at the shoulder (ten mils at 100 yards) appears in your scope to stand two dots high. Divide two into ten and you get five; the deer is 500 yards away.

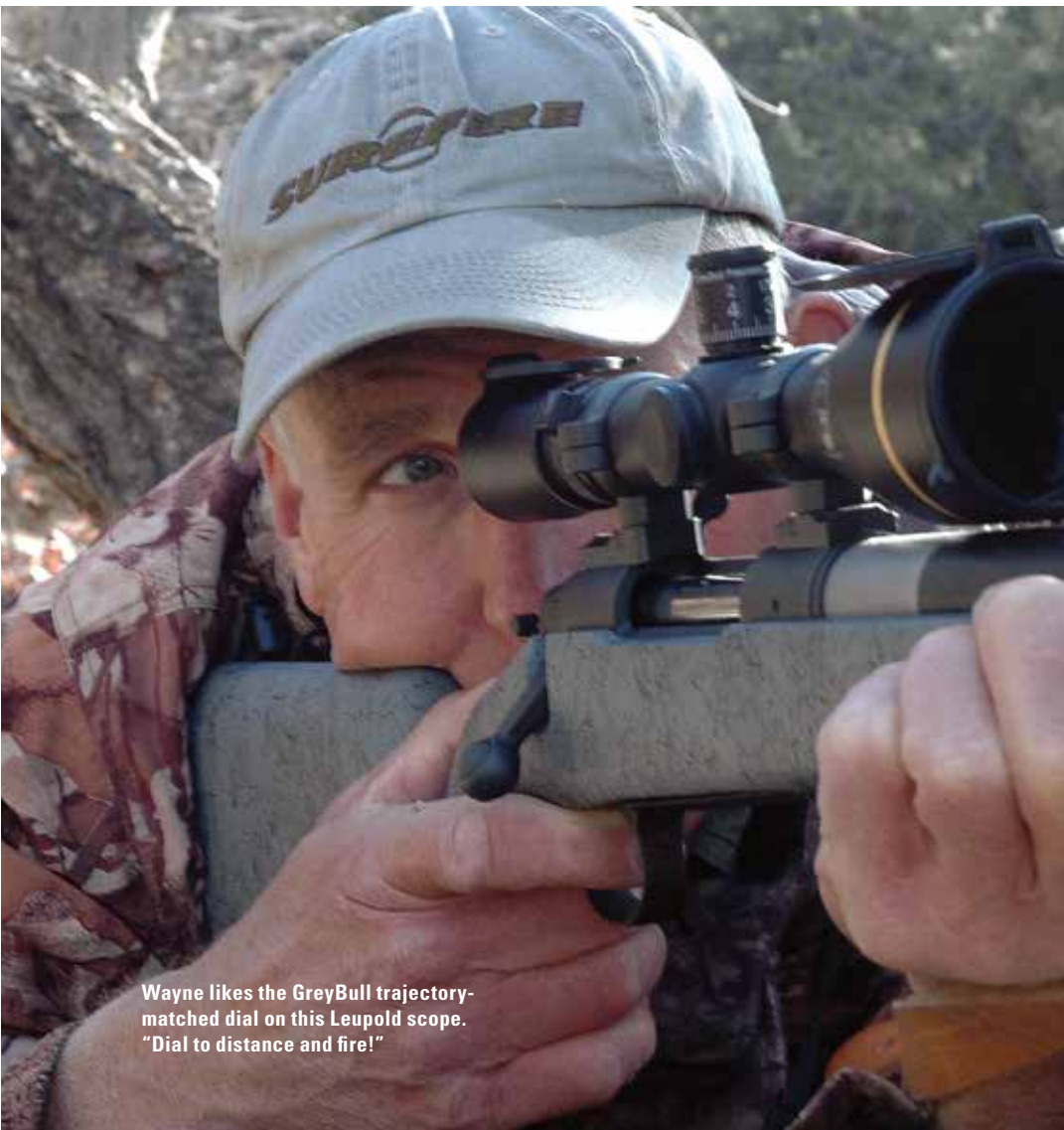
You can also divide target size *in yards* by the number of reticle mils subtended and multiply by 1,000 to get range in yards. For the deer in our example, that's one divided by two multiplied by 1,000.

In variable scopes with rear-plane reticles, mil dots accurately range the

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target at only one power setting—usually the highest. First-plane mil dot reticles can be used at any magnification.

Beyond the math, and no matter the power or pedigree of your scope, accurate shooting depends mostly on your ability to aim in the right place and keep your rifle there as you fire. Verily, no optic can trump the hunter who can hold inside three minutes of angle afield. ■



Wayne likes the GreyBull trajectory-matched dial on this Leupold scope. "Dial to distance and fire!"

Click to the distance

I got my introduction to trajectory-matched dials at GreyBull Precision, with a modified Leupold VX III 4.5-14x scope. Don Ward fitted an elevation dial cut and marked to match the path of a 140-grain 6.5 Creedmoor load. "Spin to the distance and hold center," he said. Prone behind a GreyBull-built M700 Remington, I dialed a click shy of 800 for the 780-yard gong and fired. The dot in the distance shimmered. Seconds later, the "whup!" of a hit floated back. Now Leupold, Nikon, Vortex, and other brands list such dials. I like GreyBull's. Don replaces 1/4-minute clicks with 1/3-minute detents, so you get more distance per dial revolution. To ensure accuracy you must provide actual muzzle velocity and ballistic coefficient.



This GreyBull elevation dial permits dead-on hold at long range—with this .308 ME load only.