Pattern Percentage Is the Bedrock of Shotgun Performance Analysis

Pattern Percentage is the most widely referred to (though seldom actually determined) pattern-analysis statistic. To calculate it we divide the number of pellets the shotgun has put in a 30-inch circle at 40 yards by the number of pellets in the shell.

\[
\text{Pattern Percentage} = \frac{\text{Number of counted pellets in 30–inch circle in pattern}}{\text{Average number of counted pellets in five cartridges}}
\]

How to find what pattern percentage your shotgun delivers:

1. **Count the pellets in a few shells** from the same box as those you plan to use.
2. **Shoot five or (preferably) ten shots** at paper targets at a measured 40 yards from the muzzle, one shot per sheet of paper.
3. **Determine the centers of the patterns** as best you can and draw 30-inch circles around those “pattern centers.”
4. **Count the pellets** in those circles.
5. **Calculate the pattern percentage.** Divide the number of pellets in each 30-inch circle by the number of pellets in the load and average the results of the five or ten counted targets.

Once you have done this, you will, perhaps for the first time, know something certain about the performance of your gun, which, when paired with knowledge of the gun’s point-of-impact, will tell you whether to go back to work improving your shotgun and refining your shell selection or leave one or both alone for now.

**Step 1**

**Count the pellets in a few shells.**
Yes, you really have to count the pellets in the shells you are planning to use. Sure, you can look the data up in the *Winchester Reloading Components Manual*. It provides a table with a dizzying number of examples, for instance a 1¾ ounce of standard 7½ shot is credited with 393 pellets. But you can’t use that in your pattern percentage calculations, since it is often not even close. Here are the average (of five) pellet counts from 1¾ ounce, 7½ shells from the 2015 Grand:

<table>
<thead>
<tr>
<th>Shell brand</th>
<th>Average number of pellets in five 7 1/2 shells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winchester AA</td>
<td>364</td>
</tr>
<tr>
<td>Noblesport NS1 Target</td>
<td>395</td>
</tr>
<tr>
<td>Federal Gold Medal Paper</td>
<td>404</td>
</tr>
<tr>
<td>Federal Gold Medal Plastic</td>
<td>404</td>
</tr>
<tr>
<td>Remington STS</td>
<td>414</td>
</tr>
<tr>
<td>Mirage Super target</td>
<td>414</td>
</tr>
<tr>
<td>Rio Elite</td>
<td>448</td>
</tr>
</tbody>
</table>

![Fig.1 Table of pellet counts](image)

The variation among the brands of shells is due, to a very small extent, to variations in the actual weight of the shot charges. It is, however, far more influenced by differences in the size of the shot, since the smaller the shot, the more of them are in a particular weight of charge.
Step 2

Shoot five or (preferably) ten shots at individual paper targets.

- You need to analyze more than a couple of patterns because they vary in pattern percentage, shot to shot. A 10% range, say 70% to 80%, is typical in a string of ten patterns. If you shoot just one or two, you have no idea whether they are “typical” or not. To determine what typical is, you need the average of several, ideally at least 10.

- The result you get will depend not just on the gun and shells used, but also on the conditions of the test. Warmer weather, and, to a lesser extent, higher humidity lead to higher pattern percentages, as does higher altitude. So if you want to usefully compare guns or shells, you need to keep as much constant as possible.

Step 3a

Draw the 30” circle.

Here are a couple of ways to draw the circle. One way is to tie two loops in a string 15 inches apart. Stick a pushpin in what appears to be the center of the pattern and, using the string as a spacer, swing a circle around the pin with a Sharpie® marker to surround the pattern with a 30-inch circle. In this picture, the black cross a few inches below the pin was the aim-point. This gun centered this pattern about five inches above the aim-point and dead-on, right-to-left.

Fig. 2 Pen and looped string to draw circles

Step 3b

Inscribe a 20” circle inside the 30” circle by using 10” spacing between the loops in the string and using the same center point to swing the pen around.

Another method uses a cardboard ring to guide your pen in drawing two circles.

Secure some big sheets of cardboard from a target pallet at the gun club and, using the looped string described above, draw concentric circles on a cardboard sheet. With a pair of scissors, cut a 30-inch circle from the sheet of cardboard. Then cut out a centered 20-inch circle from that 30-inch circle of cardboard, leaving a “torus,” or ring, with an inside diameter of 20 inches and an outside diameter of 30 inches. You will use that to draw your circles on the pattern. Center the cardboard ring on the densest part of the pattern as best you can and draw two circles, one inside the ring, one around it.
Step 4

Divide the drawn circle into quarters and count the pellets.

Once you have the circle, divide it into quarters with a horizontal and a vertical line through the center, and count the holes, marking them with the Sharpie® to keep track of what you have already counted. Record the pellet counts in each area on the pattern-sheet itself. You now know how and where your gun really shoots — you won’t have to guess anymore!

Step 5

Calculate the pattern percentage.

Say you counted the pellets in five of the shells you want to test and got an average of about 400, plus or minus two or three. Your first pattern had 300 pellets in the densest 30-inch circle. Your pattern percentage of this pattern, under these conditions, is 300/400 or 75%. That’s a “full choke” pattern at 40 yards.

Try a better and faster way.

If you do this for even a couple of types of shells, ten or twenty shots, you will be looking for a better way and that is using the computer program Shotgun-Insight® which will be outlined later in the TERMS EXPLAINED section of claytargettesting.com.
Caveats:

- **You really must count the pellets in the shells you are planning to use.** As the “Table of pellet counts” (figure 1) showed, the number of 7 ½ pellets in typical shells from the 2015 Grand American varied from brand-to-brand, ranging from a low of 364 to a high of 448. If you were to just work from the book value of 393 pellets per cartridge, your pattern-percentage calculation would range from 8% lower than correct to 12% too high.

- **You need to analyze more than a couple of patterns because they vary in pattern percentage, shot to shot.** A 10% range, say 70% to 80%, is typical in a string of ten patterns. If you just shoot one or two, you have no idea whether they are “typical” or not, and to determine what typical is, you need the average of several.

- **You need to keep the test conditions as consistent as possible.** The result you get will depend not just on the gun and shells used, but also on the conditions of the test. Warmer weather, and, to a lesser extent, higher humidity, lead to higher pattern percentages, as does higher altitude. So if you want to usefully compare guns or shells, you need to keep as much constant as possible.

What does pattern percentage do for us?

- **Knowing the performance of your gun** allows you to put it in one of the categories of shotgun-choke performance, to see if it is, in general, “good enough” for the purpose you intend to use it. If it “prints” about 75% at 40 yards you can think of it as a “full” choke, a good choice for trap. Much less than that is not “full,” but more than that is not necessarily “super full” since plenty of full chokes beat 75%, though 80%-shooters are very rare.

- **When you know how your gun shoots** the premium factory shells you count on for handicap, you can knowledgably compare temptingly-priced bargain shells or your own reloads to see what, if anything, you would be giving up by using them.

- **Knowing the performance of your old gun** will let you find out if the new one you just bought is the same, better, or worse (and it can be any of those) than what you already have. And the same goes for barrel modifications. Find out what you really got for your money.

- **Finally, knowing how your gun performs** lets you concentrate on what is really important in your quest to improve your trapshooting. If your gun/ammo package is shooting 75%+ patterns at 40 yards and putting the shot in a reasonable place, that is, where you want it vertically and not much right or left, you are probably not being held back by your equipment. So spending more time or money on that is unlikely to help. Put worries about your gun out of your mind for a while and direct your efforts to upgrading your shooting, not your gun.

Determining the pattern percentage produced by your gun/ammo combination is a lot of work, but you’ll gain confidence from knowing that all is well. Or you’ll use the information to whip your equipment into shape. It’s a great stepping-stone to better shooting, telling you either that there’s a hardware problem which needs to be fixed or that the gun and ammunition are fine and you can quit fussing about the performance of your equipment and move on to simply learning to shoot better.

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