

# 2012 Tippet SHOOTOUT

**Lee Wulff** WAS ONCE ASKED, "WHAT IS THE GREATEST IMPROVEMENT YOU'VE SEEN IN FLY FISHING?" His reply, "The tippet."

In A. J. McClane's *The Practical Fly Fisherman*, published in 1953, the author included a tippet chart that rated 0X as 2-pound-test! Today, the best 6X tippets have tested nearly double that, with an average breaking strength of 3.78 pounds.

Fly-fishing tippet, as well as the equipment to test it, have also come a long way since 1986, when my father George Anderson conducted his original "Tippet Materials Shootout" in the June issue of *FLY FISHERMAN*. Back then, fluorocarbon did not exist. To record breaking strength, George used a bronze, spring-loaded Chatillon fish scale, "eyeballing" tippet breaking strength to the half pound. Somewhat crude, but surprisingly effective, it was groundbreaking at the time.

More than 25 years later, George and I knew we needed a more scientific way to test tippet materials. Luckily, our friend John Bailey, owner of Dan Bailey's fly shop, provided us with his impressive Chatillon TCD-200 testing machine, which easily costs more than my drift boat. Equipped with a digital force gauge, it accurately records peak breaking strength to the hundredths decimal place, in pounds. It also provides a measure of stretch, before breakage, to the thousandth of an inch.

Here in the US we designate an "X" to our tippet sizes, based on thousandths of an inch. The X system itself can be confusing to beginners. For example, 6X does not mean the tippet is 6-pound-test, it means that tippet diameter is .005 inches. 0X tippet is .011" and each step "up" in X size is .001" in diameter smaller.

Most extruded monofilaments are produced in Germany or Japan, and some tippet labels designate materials in millimeters.

*A close look at the critical link between you and your fish*

## Executive Summary

**Best nylon:** RIO Powerflex

**Best fluorocarbon:** TroutHunter

**Strongest nylon:** (based on knot strength) Stroft GTM

**Strongest fluorocarbon:** (based on knot strength) Seaguar Grand Max

**Most economical nylon:** RIO Powerflex

**Most economical fluorocarbon:** Hardy Mach

**Best spool design:** TroutHunter

**Nylon vs. fluorocarbon:** Nylon produces stronger knots while fluorocarbon is denser and more abrasion resistant.

**Weakest knot:** The Davy knot. Although quick to tie, and popular with competition anglers, it was one of the weakest knots we tested.

**Strongest knots:** San Diego jam or double improved clinch. Both are rarely used.



Photo ] John Sherman

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0.01 to 10mm. This gave us the ability to measure materials more accurately than we could on our dial micrometer measuring to .001". For example, 4X, which is .007", measures .178 mm. If you are in the market for a micrometer, try to find one that reads in mm. Good ones cost between \$200-\$400.

John Stiehl from TroutHunter was kind enough to lend us a micrometer from Japan, which measures from

If cost were not an issue, an Instron tester, the world's foremost machine for testing tensile strength would have been the best for collecting our data.

However, at a rumored \$50,000, these machines are not easy to come by. No doubt, the data collected would have been more accurate, but we did the best we could with the technology we had available.

## Testing Procedures

Chances are, you work for a living and have neither the time nor the resources to test tippet all day. We took the time, and after a month of

## FLUOROCARBON RESULTS

BRAND TESTED	Standard Industry Average	Advertised Diameter (mm)	Average Tested Diameter (mm)	Advertised Breaking Strength (lbs)	Tested Breaking Strength (lbs)	Averaged Diameter (mm)	Averaged Breaking Strength (lbs)	Stretch Before Breaking (inches)	Stiffness / Suppleness	Country of Origin	Meters per Spool	Retail Cost / Price per Unit	Guide Spool Meters per Spool	Guide Spool Price per Unit	Spool Design	
Seaguar Grand MAX	2X	0.229	0.235	0.238	12.5	11.14		2.2	Stiff	Japan	22.8	\$15.95/69¢	N/A	-	A-	
	4X	0.178	0.185	0.187	7	7.01	0.186	7.31	2	Stiff	Japan	22.8	\$15.95/69¢	N/A	-	A-
	6X	0.127	0.128	0.133	3.7	3.79		2.1	Stiff	Japan	22.8	\$15.95/69¢	N/A	-	A-	
TroutHunter	2X	0.229	0.235	0.234	11	10.45		2.8	Stiff	Japan	50	\$22.95/45¢	N/A	-	A	
	4X	0.178	0.185	0.191	7.1	7.06	0.186	7.11	1.8	Stiff	Japan	50	\$22.95/45¢	N/A	-	A
	6X	0.127	0.14	0.133	3.6	3.83		2.1	Stiff	Japan	50	\$22.95/45¢	N/A	-	A	
Scientific Anglers	2X	0.229	0.229	0.245	9.8	10.67		2.1	Stiff	Japan	25	\$14.95/59¢	N/A	-	A-	
	4X	0.178	0.179	0.187	6.2	6.95	0.188	7.02	2.2	Stiff	Japan	25	\$14.95/59¢	N/A	-	A-
	6X	0.127	0.127	0.132	3.2	3.46		1.9	Stiff	Japan	25	\$14.95/59¢	N/A	-	A-	
Orvis Mirage	2X	0.229	0.229	0.251	12.5	11.03		2.7	Medium Stiff	Japan	30	\$9.95/33¢	100	29¢	B	
	4X	0.178	0.178	0.187	7	6.61	0.188	6.97	2.1	Medium Stiff	Japan	30	\$9.95/33¢	100	29¢	B
	6X	0.127	0.152	0.127	3.6	3.29		1.9	Medium Stiff	Japan	30	\$9.95/33¢	100	29¢	B	
Frog Hair FC	2X	0.229	0.223	0.249	10	9.97		2.6	Stiff	Japan	25	\$13.95/56¢	100	33¢	B-	
	4X	0.178	0.178	0.191	6.6	6.81	0.191	6.76	2.3	Stiff	Japan	25	\$13.95/56¢	100	33¢	B-
	6X	0.127	0.127	0.132	3	3.5		2.2	Stiff	Japan	25	\$13.95/56¢	100	33¢	B-	
Seaguar Grand MAX FX	2X	0.229	0.235	0.233	12.5	9.98		2.2	Supple	Japan	22.8	\$15.95/69¢	N/A	-	A-	
	4X	0.178	0.185	0.195	7	6.59	0.188	6.71	1.9	Supple	Japan	22.8	\$15.95/69¢	N/A	-	A-
	6X	0.127	0.128	0.136	3.7	3.76		2	Supple	Japan	22.8	\$15.95/69¢	N/A	-	A-	
RIO Fluoroflex	2X	0.229	0.229	0.258	12	11.19		2.9	Medium	Japan	27.4	\$14.95/54¢	100	39¢	A-	
	4X	0.178	0.178	0.187	7	5.62	0.191	6.73	2.4	Medium	Japan	27.4	\$14.95/54¢	100	39¢	A-
	6X	0.127	0.127	0.129	3.6	3.4		2.3	Medium	Japan	27.4	\$14.95/54¢	100	39¢	A-	
Varivas Super Tippet	2X	0.229	0.235	0.238	9.6	9.87		2.3	Medium stiff	Japan	30	\$15.00/50¢	N/A	-	C	
	4X	0.178	0.165	0.164	5.1	5.32	0.178	6.23	1.9	Medium stiff	Japan	30	\$15.00/50¢	N/A	-	C
	6X	0.127	0.128	0.131	3.4	3.51		2.1	Medium stiff	Japan	30	\$15.00/50¢	N/A	-	C	
P-Line Shinsei	2X	0.229	0.26	0.252	8	11.09		1.9	Stiff	Japan	25	\$8.99/35¢	N/A	-	D	
	4X	0.178	0.17	0.172	4	5.72	0.184	6.72	1.9	Stiff	Japan	25	\$8.99/35¢	N/A	-	D
	6X	0.127	0.13	0.128	2	3.36		1.7	Stiff	Japan	25	\$8.99/35¢	N/A	-	D	
P-Line CFX	2X	0.229	0.26	0.258	8	11.04		2.3	Stiff	Japan	25	\$7.99/31¢	N/A	-	D	
	4X	0.178	0.17	0.164	4	5.66	0.183	6.7	1.9	Stiff	Japan	25	\$7.99/31¢	N/A	-	D
	6X	0.127	0.13	0.129	2	3.4		1.9	Stiff	Japan	25	\$7.99/31¢	N/A	-	D	
Umpqua Super Fluoro	2X	0.229	0.229	0.232	11	9.87		2.1	Medium	Japan	30	\$13.95/46¢	91	41¢	B	
	4X	0.178	0.178	0.179	7	5.88	0.178	6.04	1.9	Medium	Japan	30	\$13.95/46¢	91	41¢	B
	6X	0.127	0.127	0.122	3.5	2.39		1.7	Medium	Japan	30	\$13.95/46¢	91	41¢	B	
Airflo Sightfree G3	2X	0.229	0.21	0.225	8	8.93		1.8	Medium	Japan	50	\$16.99/33¢	N/A	-	B	
	4X	0.178	0.18	0.185	6	5.84	0.186	6.29	2	Medium	Japan	50	\$16.99/33¢	N/A	-	B
	6X	0.127	0.14	0.148	4	4.1		2.1	Medium	Japan	50	\$16.99/33¢	N/A	-	B	
Climax	2X	0.229	0.23	0.239	9	9.26		2.2	Stiff	Germany	30	\$9.95/33¢	N/A	-	B	
	4X	0.178	0.18	0.185	5.5	5.64	0.192	6.32	1.7	Stiff	Germany	30	\$9.95/33¢	N/A	-	B
	6X	0.127	0.12	0.151	3	4.08		1.9	Stiff	Germany	30	\$9.95/33¢	N/A	-	B	
Cortland Precision	2X	0.229	0.23	0.239	8	9.29		2.1	Stiff	Germany	27.4	\$10.95/39¢	N/A	-	B	
	4X	0.178	0.18	0.186	5	5.39	0.192	6.23	2	Stiff	Germany	27.4	\$10.95/39¢	N/A	-	B
	6X	0.127	0.13	0.151	3	4.02		1.9	Stiff	Germany	27.4	\$10.95/39¢	N/A	-	B	
Dai-Riki	2X	0.229	0.229	0.228	11.25	9.34		1.9	Medium	Japan	30	\$8.95/30¢	N/A	-	C	
	4X	0.178	0.178	0.172	5.6	5.2	0.176	5.87	1.9	Medium	Japan	30	\$8.95/30¢	N/A	-	C
	6X	0.127	0.127	0.13	3.4	3.08		1.6	Medium	Japan	30	\$8.95/30¢	N/A	-	C	
Hardy Mach	2X	0.229	0.216	0.214	7	7.26		1.9	Supple	Japan	50	\$14.99/29¢	N/A	-	D	
	4X	0.178	0.175	0.165	5	5.16	0.168	5.24	1.9	Supple	Japan	50	\$14.99/29¢	N/A	-	D
	6X	0.127	0.137	0.127	3	3.31		1.9	Supple	Japan	50	\$14.99/29¢	N/A	-	D	

## NYLON RESULTS

BRAND TESTED	Standard Industry Average	Advertised Diameter (mm)	Average Tested Diameter (mm)	Advertised Breaking Strength (lbs)	Tested Breaking Strength (lbs)	Averaged Diameter (mm)	Averaged Breaking Strength (lbs)	Stretch Before Breaking (inches)	Stiffness / Suppleness	Country of Origin	Meters per Spool	Retail Cost / Price per Unit	Guide Spool Meters per Spool	Guide Spool Price per Unit	Spool Design	
Stroft GTM	2X	0.229	0.229	0.239	11.2	11.53			Stiff	Germany	24.7	\$5.95 / 24¢	100	9¢	D	
	4.5X	0.178	0.165	0.175	6.6	8.13	0.182	7.87	1.9	Stiff	Germany	24.7	\$5.95 / 24¢	100	9¢	D
	6X	0.127	0.127	0.133	4	3.96		1.9	Stiff	Germany	24.7	\$5.95 / 24¢	100	9¢	D	
RIO Powerflex	2X	0.229	0.229	0.228	10	10.67		2.2	Medium	Japan	100	\$4.50 / 16¢	100	9¢	A-	
	4X	0.178	0.178	0.175	6.4	6.6	0.175	6.93	2	Medium	Japan	100	\$4.50 / 16¢	100	9¢	A-
	6X	0.127	0.127	0.123	3.4	3.52		2.1	Medium	Japan	100	\$4.50 / 16¢	100	9¢	A-	
Dai-Riki GTS	2X	0.229	0.229	0.236	11	10.83		2.3	Medium	Japan	30	\$3.95 / 13¢	N/A	-	C	
	4X	0.178	0.178	0.168	6	5.64	0.178	6.53	2	Medium	Japan	30	\$3.95 / 13¢	N/A	-	C
	6X	0.127	0.127	0.13	3.5	3.14		1.7	Medium	Japan	30	\$3.95 / 13¢	N/A	-	C	
Frog Hair	2X	0.229	0.223	0.251	11.1	9.48		2	Stiff	Japan	30	\$7.95 / 26¢	100	33¢	B-	
	4X	0.178	0.178	0.182	6.2	6.22	0.189	6.49	2.3	Stiff	Japan	30	\$7.95 / 26¢	100	33¢	B-
	6X	0.127	0.127	0.134	3.7	3.78		2.6	Stiff	Japan	30	\$7.95 / 26¢	100	33¢	B-	
Cortland Precision	2X	0.229	0.23	0.237	10	9.41		2.1	Stiff	Japan	27.4	\$4.25 / 15¢	N/A	-	B	
	4X	0.178	0.18	0.183	6.2	6.63	0.184	6.44	1.9	Stiff	Japan	27.4	\$4.25 / 15¢	N/A	-	B
	6X	0.127	0.13	0.131	3.2	3.29		2	Stiff	Japan	27.4	\$4.25 / 15¢	N/A	-	B	
Orvis Super Strong	2X	0.229	0.23	0.245	11.5	9.6		3	Medium	Japan	100	\$4.25 / 14¢	100	9¢	B	
	4X	0.178	0.17	0.181	6	5.84	0.187	6.3	2	Medium	Japan	100	\$4.25 / 14¢	100	9¢	B
	6X	0.127	0.13	0.135	3.5	3.47		1.8	Medium	Japan	100	\$4.25 / 14¢	100	9¢	B	
Umpqua Nylon	2X	0.229	0.23	0.24	10.7	10.45		1.9	Medium	Japan	27	\$4.25 / 15¢	92	10¢	B	
	4X	0.178	0.18	0.171	6	5.29	0.18	6.28	2	Medium	Japan	27	\$4.25 / 15¢	92	10¢	B
	6X	0.127	0.13	0.128	3.5	3.11		2	Medium	Japan	27	\$4.25 / 15¢	92	10¢	B	
TroutHunter	2X	0.229	0.235	0.239	10	9.49		2.8	Supple	Japan	50	\$6.95 / 13¢	N/A	-	A	
	4X	0.178	0.185	0.186	6.9	5.96	0.187	6.27	2.7	Supple	Japan	50	\$6.95 / 13¢	N/A	-	A
	6X	0.127	0.14	0.135	3.3	3.36		2.7	Supple	Japan	50	\$6.95 / 13¢	N/A	-	A	
Dai-Riki Dynamic	2X	0.229	0.229	0.241	11	10.17		2.5	Supple	Japan	30	\$3.95 / 13¢	N/A	-	C	
	4X	0.178	0.178	0.172	6	4.95	0.181	6.06	2.1	Supple	Japan	30	\$3.95 / 13¢	N/A	-	C
	6X	0.127	0.127	0.13	3.5	3.08		1.8	Supple	Japan	30	\$3.95 / 13¢	N/A	-	C	
Varivas Master Spec	2X	0.229	0.235	0.235	9.1	9.53		2.2	Medium	Japan	30	\$14.00 / 46¢	N/A	-	C	
	4X	0.178	0.165	0.169	5.1	4.94	0.178	5								

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to affect our test results. After pulling 3 to 4 feet off the spool, and slowly pulling the tippet through the rubber jaws of the micrometer, we could clearly see the material was not an exact uniform diameter. This was true of every product from every company. For example, RIO Powerflex 2X ranged anywhere between .225 mm to .230 mm. We tried to use the best average we could and in this case we averaged RIO Powerflex 2X at .228 mm, which came in just under the industry standard of 2X, or .229 mm.

In testing the different diameters of these materials, we stated what the manufacturers advertised, but we also reported on how this size varied from the industry standard for a given X size. For example, 4X, which should measure .007", equals .178 mm. Obviously if a material is substantially larger (or smaller) than the advertised X size, it will test significantly stronger or weaker, which we took into consideration when rating materials. In our charts you'll see the exact size of each material and how it varied from the norm. You can find more commentary on each product at [flyfisherman.com/?p=10182](http://flyfisherman.com/?p=10182) and [yellowstoneangler.com](http://yellowstoneangler.com).

In the "Final Results" sidebar on page 27, you'll see which materials we feel are the best and why. In addition to all the laboratory-style tests, we were

able to use these materials on the water the summer of 2011, and of course we have fished several of these for years now, providing us with a baseline of knowledge to help judge overall tippet performance.

## Difficult to Measure

Over the years, people who have tested monofilaments have come to some general conclusions that we found difficult to prove one way or the other.

**Abrasion resistance.** Most fly fishers agree that one of the big advantages of fluorocarbon over nylon is abrasion resistance. This makes perfect sense because the material is denser. From our own fishing experiences, especially in salt water, it seems that fluorocarbon is slightly more abrasion resistant, but nothing is going to hold up to a 10-pound bonefish or 25-pound permit running through coral.

We tried to simulate this kind of abrasion resistance by rubbing materials back and forth (with equal pressure) over different grits of sandpaper. It was difficult to see, let alone measure any difference. Since fluorocarbon is denser than nylon, we'll take the manufacturers' word for it. All the comments we have gotten from other anglers support the opinion that fluorocarbon is more abrasion resistant than they nylon. Perhaps down the road someone will come up with a better test for abrasion resistance.

**Visibility.** Manufacturers regularly claim that fluorocarbon is nearly invisible underwater. Seaguar's web site tells us that water has a refractive index of 1.33, fluorocarbon has a refractive index of 1.42, and nylon has a refractive index of 1.62. This means that

fluorocarbon refracts light more similarly to water than does nylon, thus making it more difficult to see underwater.

While this theory makes sense, we were unable to come up with a good method to independently confirm this. We tried examining both monofilament and fluorocarbon side-by-side underwater, but to our eyes, there didn't seem to be a huge difference. Of course, that's with our eyes. Who knows what the fish see?

*[Also keep in mind that refraction is the change in light direction as it passes through a material. If light is passing through the material and then to the eyes of the fish, then refraction may be important. If the light is behind the fish, then light is likely reflecting off the tippet material and the reflective qualities become more important in regard to visibility.]* THE EDITOR.]

After years of fishing clear spring creeks, local lakes, and saltwater flats, we have come to the conclusion that the majority of the time, presentation and the action of your fly are crucial to what triggers an eat or initiates a refusal. For the refusals, it is certainly possible the fish was spooked by the light reflecting off the tippet, or that the fish is able to see the tippet itself.

Any advantage an angler can use to get a fish to strike is worth a try. Our own experiences with fluorocarbon in both fresh and salt water seem to confirm that fluorocarbon does make a difference, especially in stillwaters and salt water. We just wish we could have come up with a conclusive test to quantify the difference.

**Flexibility.** We found no easy way to measure the suppleness of fluorocarbon and nylon. We pulled a few feet of

## HOW WE SCORED IT

Final Results	Best in Test	Price \$	Tippet Spool Design	Adv. Size vs. Tested Size	Adv. Strength vs. Tested Strength	Tested Diameter vs. Industry Avg.	Avg. Tested Diameter	Avg. Tested Breaking Strength	Tippet-to-Tippet Knot Strength	Tippet-to-Fly Knot	Wind Knot Strength	Abrasion Resistance	Invisibility to the Fish	Casting Accuracy	Expert Angler's Preference	Grand Total
Rank	Maximum points available in category	20	20	20	20	20	20	20	20	20	20	20	20	20	20	280
1	TroutHunter Fluorocarbon	13	20	20	18	17	17	18	17	17	17	20	20	20	20	254
2	Seaguar Grand MAX Fluorocarbon	10	19	19	17	17	17	19	17	17	17	20	20	20	20	249
3	RIO Powerflex Nylon	19	19	19	19	19	20	17	19	19	19	14	10	15	15	243
4	Stroft GTM Nylon	18	13	16	20	18	18	20	18	18	17	15	10	20	14	235
5	RIO Fluoroflex Plus Fluorocarbon	15	19	15	15	13	15	16	13	13	13	20	20	18	18	223
6	Frog Hair Nylon	18	17	15	16	17	16	15	17	17	17	15	10	17	9	216

## Final Results

### #6 Frog Hair Nylon

Frog Hair proved to be an exceptionally strong and produced some of the loudest tippet "pops" when the material finally snapped. Frog Hair also had the strongest 4X in our test, while still measuring very close to the industry standard diameter. Once we included the 2X and 6X average diameters however, it did run somewhat oversize compared to other brands. Frog Hair is one of the hardest nylons we tested, which lends itself to above-average abrasion resistance.

### #5 RIO Fluoroflex Plus Fluorocarbon

Overall, we found that Rio Fluoroflex Plus offers anglers a good material at a reasonable price for fluorocarbon, but it did run somewhat oversize. While 6X measured very close to the standard, 2X measured slightly larger than 1X, and 4X measured about 3.5X. Even running larger than other fluorocarbon materials tested, its knot strength was weaker. One advantage that hardcore fly fishers and guides appreciate is the fact that it is available in 100-meter guide spools with well-marked spool tethers, making it easy to distinguish the tippet size.

### #4 Stroft GTM Nylon

Our top pick for overall strength, Stroft has found a place in our vests. By incorporating half sizes into their product line, Stroft offers more versatility on the stream. Since it is one of the stiffest materials we tested, beginners may struggle to get a perfect drift with this material, but for casting accuracy, we feel Stroft is second to none. The only downsides are a poor spool design and higher average cost than other nylons.

### #3 RIO Powerflex Nylon

Powerflex offers anglers the best bang for their buck out of any of the tippets we tested. It was one of the top materials for knot strength and stayed close to standard diameters, actually measuring slightly smaller in most sizes. RIO Powerflex is definitely the winner for price-conscious anglers, which is why we see this material in more guide boats than any other.

### #2 Seaguar Grand MAX Fluorocarbon

Seaguar Grand MAX has been very popular here at our shop, providing us with confidence on the water for more than 10 years. Seaguar's double structure design consistently placed it at the top for knot breaking strengths. The only downside is cost. At 69 cents per meter it is the most expensive material we tested.

### #1 TroutHunter Fluorocarbon

In our closest shootout ever, TroutHunter is our 2012 tippet shootout winner by a hair. While TroutHunter's double structure fluorocarbon consistently produced exceptional breaking and knot strengths throughout our tests (like Seaguar), what really set this material apart from the competition is its price and outstanding spool design. While the \$22.95 price per spool may produce sticker shock, at 46 cents per meter it is still a great value. You get 50 meters on each spool of TroutHunter compared to 23 to 30 meters on the competitive spools. This fluorocarbon pulls perfectly with no line memory or damage to the tippet. The color-coded bands are both water- and UV-proof, which protects your material from the elements.

## TIPPET-TO-TIPPET KNOTS

FLUOROCARBON TESTED		Tested Breaking Strength Without Knots (lbs)	J Knot	Double Blood	Improved Blood Knot	Triple Surgeon's Knot	Blood Knot	Seaguar Knot	Double Uni
TroutHunter	2X	10.45	5.55	4.21	4.87	4.88	4.96	4.87	4.04
	4X	7.06	4.79	5.1	4.76	3.45	3.57	4.6	3.55
	6X	3.83	2.84	2.61	2.59	2.19	2.44	2.45	1.91
Seaguar Grand MAX	2X	11.14	6.37	4.97	4.6	4.7	4.46	4.47	4.22
	4X	7	5.01	4.36	4.03	3.63	3.79	3.88	3.8
	6X	3.79	2.83	3.11	2.61	2.35	3.14	2.31	2.09
RIO Fluoroflex	2X	11.19	5.42	5.06	4.33	3.85	4.3	3.53	3.7
	4X	5.62	4.38	5.27	5.09	3.94	3.49	2.96	3.2
	6X	3.4	2.93	2.61	2.1	2.36	2.38	1.87	2
<b>NYLON TESTED</b>									
Stroft GTM	2X	11.53	7.26	5.49	6.59	5.58	5.57	4.88	4.85
	4.5X	8.13	5.19	6.08	5.72	4.68	4.21	4.9	4.17
	6X	3.96	3.89	3.35	3.61	3.69	3.33	3.17	3.45
RIO Powerflex	2X	10.67	5.7	5.57	4.91	5.85	5.05	5.7	5.6
	4X	6.6	5.23	4.95	4.85	3.61	3.71	5.07	3.85
	6X	3.52	2.71	3.25	2.76	3.27	3.05	4.35	3.23
Frog Hair FC	2X	9.48	6.37	5.18	6.42	5.68	5.26	4.62	5.86
	4X	6.22	5.01	5.21	5.64	4.76	4.62	3.61	3.96
	6X	3.78	2.9	3.78	3.5	3.48	2.76	2.71	3.12
Column Sum		127.37	84.38	80.16	78.98	71.95	70.09	69.95	66.6

# 2012 Tippet SHOOTOUT

material off the spool and by handling it, we could feel some difference in flexibility. The “memory” of a material from being wound around the spool made some materials appear stiffer than others, with little or no memory.

One of the ways RIO tests suppleness is to cut lengths of monofilament at exactly 6 inches, and then hang them over the counter. When we tried to duplicate this test it was difficult to tell which materials were softer or stiffer (except for a few extremes).

Also, a material with thinner diameter is by nature more supple, and hangs lower than the others. This is why we shift down in tippet size to get a more flawless, drag-free drift with a dry fly or nymph. In the end, we just went by our gut feeling after handling these materials for long periods of time, running our tests on the machine, and tying all those knots. In general, the fluorocarbons were stiffer than the nylons.

Many good fly fishers have found the stiffness of fluorocarbon to be an advantage in obtaining casting accuracy, especially with fine tippets like 5X, 6X, and 7X. While getting a perfect drag-free drift is the key to technical dry-fly

fishing and nymph fishing, good anglers can usually find ways to induce the necessary slack they need to get a dead-drift by mending, feeding out line, or using casting techniques such as a reach cast or slack-line cast.

For these reasons, we feel stiffer materials are better. However, we know other anglers prefer more supple monofilaments like Dai-Riki Dynamic, or TroutHunter nylon, that more easily flow with swirling currents.

**Water absorption.** Since nylon absorbs water and fluorocarbon is supposed to be impervious to it, we tried a few knot tests with materials that had been soaked for three to four hours. We found both the straight-pull break strength and knot strength for nylons decrease about 20 percent when wet. Breaking strengths for fluorocarbon decreased by 3 to 5 percent.

As a practical matter, most of the time your tippet won't be getting soaked for more than a few minutes at a time, so unless trolling is part of your program, we felt this was non-issue.

**Sink factor.** Anglers sometimes worry about fluorocarbon sinking more rapidly, since it has a heavier specific gravity than nylon. (The specific gravity of water is 1.0, nylon has a specific gravity of 1.05 to 1.10; fluorocarbon is denser and runs 1.75 to 1.90.) To put this in perspective, tungsten, used as a powder in sinking tips, has a specific gravity of 19.25. So there really is not a substantial difference between nylon and fluorocarbon,

especially when most anglers are just using fluorocarbon for the tippet.

A much bigger factor is surface tension. If you are using small-diameter tippets and a small dry fly, the surface tension won't usually allow either nylon or fluorocarbon to break through the surface. This seems to apply for tippets 3X or smaller.

Also, once they are under the water, there is almost no practical difference in the sink rates of nylon or fluorocarbon tippets. If you are using a full tapered leader of fluorocarbon, only then does the weight become slightly more of a factor.

## Top Contenders

For the first round of our shootout we focused on tippet diameter and straight-pull break strength. The materials that had larger diameters, yet lower breaking strengths, went to the bottom of the list. In general, the materials that tested within industry average—yet had the highest breaking strengths—moved on to our knot shootout. We wish we could have tested everyone's knot strength; we simply didn't have the time. For our final shootout, we limited the results to what we determined were the top three fluorocarbons, and the top three nylons.

For fluorocarbon, the top three materials based on average breaking strength and correct diameter were Seaguar Grand MAX, TroutHunter, and RIO Fluoroflex Plus. With RIO holding the greatest market share and having

the most stretch out of all the fluorocarbons tested, we were curious to see how it would compare.

For nylon, Stroft GTM, RIO Powerflex, and Dai-Riki GTS had the strongest average breaking strength by diameter. However we decided to include Frog Hair rather than Dai-Riki GTS, due to Frog Hair's higher breaking strength in 4X and 6X.

## Knot Strength

This article ended up being as much a knot shootout as a tippet shootout. We had not anticipated putting so much emphasis on the knots until we noticed that once knots were introduced into the equation, breaking strength immediately decreased by 20 to 30 percent, and sometimes by as much as 50 percent.

Clearly knot strength is even more important than straight-pull break strength of the material itself. By looking at the tables, you can see what knots perform the best and then learn how to tie them quickly yourself. Some knots are easier to tie than others, and most anglers prefer to stick to the easiest knots, even if they are weaker.

When we crunched the data, the weakest link ended up being tippet-to-tippet knots. This was a surprise, since our angling experience suggests that the tippet-to-fly is the weakest link. But further tests we did with a rod rigged up out on the lawn confirmed that the tippet-to-tippet knot broke more often than the tippet-to-fly knot.

To our surprise, the J knot proved to be the strongest line connection knot, at least for joining materials from 2X to 4X and 4X to 6X. One of our favorites, the improved blood knot proved to be strong as well, and is noticeably smaller than either the J knot or a triple surgeon's knot. The standard blood knot and triple surgeon's knot, used by the wide majority of anglers, turned out to be slightly weaker.

The good news is that the improved clinch, which almost everyone uses, ended up testing the third strongest out of 15 different tippet-to-fly knots. Only the San Diego jam and double improved clinch averaged stronger.

The double improved clinch is similar to the regular improved clinch—you simply double the material before going through the hook eye. Obviously, it is more difficult to tie with small flies. Since most anglers already know the clinch knot, the double clinch is an easy knot to add to the repertoire.

The San Diego jam is a cousin to the 16/20 knot, and instructions are at [netknots.com](http://netknots.com). For the ultimate tippet-to-fly connection and special situations we recommend these, but for

general angling the improved clinch is hard to beat.

We were also surprised to see that the Davy knot, which is fast to tie and therefore popular in competitive fly-fishing circles, actually tested weaker than a wind knot.

In order to determine which material produced the strongest knots, we averaged the breaking strengths of 2X, 4X, and 6X for each of the 22 knots we tested with each material. For our final results, we had to factor in the diameter of the material we were testing, since larger diameters would obviously test stronger. For example, in several cases, Stroft or Frog Hair had the strongest breaking strengths, but we had to handicap them for being slightly over the industry's average diameter.

**Nylon vs. fluorocarbon.** In straight-pull break strength, when we averaged the figures, nylon and fluorocarbon were about equal. But once we started adding knots, nylon was stronger. The differences were not huge, but we gathered enough evidence to declare nylon the clear winner in knot strength. But in our own fishing experiences we have felt that the fluorocarbons have provided sufficiently strong and reliable knots, especially when we've used a lubricant like lip balm in tying the knots.

From experience we know that fluorocarbon tippet ties well to nylon leaders. The best we've found though are Seaguar Grand MAX and TroutHunter because these are made with a “double structure.” A high-density interior resin improves tensile strength and sensitivity, while the softer exterior resin enhances knot strength. This softer exterior is close to nylon, allowing for better grip and stronger knots.

## Conclusions

If price and knot strength are priorities, our shootout proved nylon monofilaments are runaway winners. However, almost every expert fly fisher we know uses fluorocarbon, despite its higher cost. Experienced fly fishers feel that superior abrasion resistance leads to fewer lost fish, and decreased visibility underwater leads to more takes, especially in critical conditions where the fish are getting a clear look at your fly. Break strength and knot strength for the best fluorocarbons, although not quite up to the best nylons, have proved to be adequate, as has the overall reliability of using nylon leaders with fluorocarbon tippets. 

James Anderson worked with his father George and the rest of the staff at The Yellowstone Angler to produce this report.

## TIPPET-TO-FLY KNOTS

FLUOROCARBON TESTED		Tested Breaking Strength Without Knots (lbs)	San Diego Jam	Double Clinch	Improved Clinch	Trilene	Double Imp. Clinch	Non-Slip Knot	Orvis Knot	Double Uni	Palomar	Turtle Knot	Uni Knot	Wind Knot	Clinch	Davy Knot	Eye Crosser
TroutHunter	2X	10.45	7.38	7.43	6.61	6.74	6.83	6.8	7.26	7.13	6	6.15	7.2	6.37	7	6.28	5.71
	4X	7.06	5.07	5.22	4.53	4.75	5.13	4.45	4.92	4.56	4.62	4.98	4.11	4.49	4.8	4.35	3.94
	6X	3.83	2.75	2.81	2.5	2.86	2.85	2.6	2.57	2.43	2.65	2.53	2.51	2.37	2.4	2.46	2.26
Seaguar Grand Max	2X	11.14	7.56	7.85	6.85	7.21	6.95	7.23	6.85	7.16	5.89	6.23	6.18	7.09	7.15	6.39	6.47
	4X	7	4.91	4.72	4.83	4.78	4.85	4.88	4.97	4.82	4.78	4.67	4.66	4.64	4.62	4.85	3.95
	6X	3.79	2.58	2.6	2.55	2.5	2.8	2.72	2.45	2.44	2.55	2.51	2.57	2.25	2.15	2.47	2.28
RIO Fluoroflex	2X	11.19	7.14	7.5	6.95	7.51	7.01	6.94	7.06	6.92	6.93	6.9	7.01	5.56	6.73	5.32	5.9
	4X	5.62	4.03	4.47	4.89	4.69	4.12	3.69	3.62	4.27	4.56	4	3.66	3.42	4.12	4.12	3.89
	6X	3.4	2.58	2.4	2.64	2.72	2.59	2.25	2.45	2.26	2.52	2.32	2.45	1.75	2.32	2.46	2
NYLON TESTED																	
Stroft GTM	2X	11.53	10.59	10.14	9.8	8.18	8.6	9.1	8.35	7.96	8.46	9.5	8	8.32	7.36	6.95	6.98
	4.5X	8.13	5.32	5.57	5.38	5.87	5.48	4.92	4.89	5.53	5.22	5.91	4.42	4.56	4.95	5.31	4.01
	6X	3.96	3.57	3.77	3.81	3.84	3.95	3.44	3.74	3.47	3.62	3.79	3.79	2.84	2.54	2.88	2.72
RIO Powerflex	2X	10.67	8.94	9.61	9.08	8.19	9.74	8.75	7.85	7.95	8.67	6.7	7.47	8.27	7.2	5.6	6.54
	4X	6.6	5.42	5.26	5.13	5.53	5.62	4.98	5.26	4.42	4.84	5.52	4.39	4.97	4.32	4.83	4.8
	6X	3.52	3.39	3.24	3.44	3.47	3.34	2.9	3.12	3.11	3.15	3.18	3.28	2.5	2.33	2.22	2.71
Frog Hair FC	2X	9.48	9.1	8.25	9.24	8.62	7.01	8.26	7.57	8.94	7.97	6.61	7.84	8.47	8.11	6.07	6.4
	4X	6.22	5.83	4.73	5.88	5.26	5.45	5.84	5.73	5.36	5.92	5.59	4.78	5.32	5.22	4.87	4.72
	6X	3.78	3.44	3.29	3.46	3.66	3.62	3.03	3.72	3.54	3.59	3.27	3.57	2.9	2.38	2.18	2.54
Column Sum		127.37	99.6	98.86	97.57	96.38	95.94	92.78	92.38	92.27	91.94	90.36	87.89	86.09	85.7	79.61	77.82