

Superwas

By Meyla Bianco Johnston

Superjumbo jets. The Super Bowl. Supernatural. Superlative.

Supercalifragilisticexpialidocious. The prefix “super” makes every word sound impressive. But when “super” is paired with wool and washing in the outdoor recreation garment market, it means something else entirely.

BIG Business

First, it helps to understand the scope of the market. In 2016, the worldwide outdoor apparel industry generated \$172.3 billion USD in retail sales, and it is projected to generate \$230 billion USD by 2021. In the United States alone, total sales in the outdoor apparel category totaled \$9.5 billion in 2016.

Characterized by styles made for

competition-level athletes and active adventure seekers, consumers of these clothes are typically interested in wearing the coolest clothes made from the most innovative materials. Comfort, style, durability and ease of care are also key buying factors. This is a segment whose devotees will pay a premium for quality. The clothes must perform in extreme weather to protect from snow and ice, heat, moisture and even abrasion.

Outdoor and adventure clothing styles are typically form-fitting base layers that feature modern, flat seams created with machines to increase comfort and ease of wear. Consumers want to be able to ski all day in their performance long underwear, then throw it into the wash

for the next session.

Interestingly, the athleisure garment market is closely related to the performance wear industry. Styles are being manufactured with both genuine performance athletes and suburban putters in mind. These multipurpose garments can go from the gym to the grocery store to the office and back again. Weekend warriors, it turns out, are just as apt to purchase these high-end clothes as sports heroes.

A significant part of the outdoor clothing and sportswear market and some of the athleisure market is now centered specifically on Merino wool. Superwashing Merino wool is a routine practice in the performance wear clothes manufacturing sector.

Athleisure: casual, sporty clothing designed to be comfortable enough both for exercise and everyday wear.



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Superwash wool is created by processing wool in a low Ph acid bath or exposing it to chlorine gas.

What's *Really* Old is New Again: Merino Wool

Merino sheep originated in southwestern Spain in about the 12th Century and have been intensively bred ever since.

Exactly why has the market chosen Merino wool as its poster child? To start, Merino is very, very fine. Extra ultrafine Merino wool is defined as 16 microns and finer. Plus, the sheep that produce it do so consistently, in volume. A single animal, depending on its subtype, may produce from 13-40 pounds of wool annually.

Merino wool shares many characteristics with alpaca fiber, including fineness, wicking capability, durability, inflammability, thermoregulation and breathability.

As a result, many outdoor recreation brands are now looking at natural animal fibers, primarily Merino, as the public demand for them grows.

The Merino wool performance wear segment is gaining traction all the time, and Merino is now seen as an important natural performance material.

Large and successful manufacturers such as Smartwool, Patagonia, Icebreakers and others are embracing natural animal fibers and sustainability, a combination that has proven to be very successful.

The True Cost of Fast Fashion

While the price tag of that cheap garment tempting you at the box store may be small, the cost to the environment and the people who made it may be very large.



WASTE

\$400 billion of clothing is wasted every year, and the public views clothes as "disposable." One garbage truckload of clothes is sent to a landfill or burned every second (enough to fill one-and-a-half Empire State Buildings every day).



RESOURCES

It takes 2,700 liters (713 gallons) of water to produce one cotton shirt, which is the equivalent amount of water one person drinks over the course of 2.5 years. Manufacturing and washing one pair of jeans emits the same amount of CO2 as driving for 69 miles.



ECONOMICS

The average consumer bought 60% more clothes in 2014 than in 2000 but kept each item only half as long. Demand is increasing and an expected 400% rise in annual GDP will be realized by 2050 which will increase textile demand. The number of garments produced annually has doubled since 2000 and exceeded 100 billion for the first time in 2014: nearly 14 items of clothing for every person on earth.



WORKFORCE

97% of clothes made for Americans are produced overseas by 40 million garment workers, and 85% of them are women working without rights or protections that would be mandatory in the U.S. The average garment worker in Bangladesh earns less than \$100 per month, which covers just 30% of household expenses.

THERE IS HOPE



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“... Alpaca fiber is one of the most high-performance natural fibers in existence.” ~ John Gage

Increasingly, the consumers who favor outdoor performance gear are considering not only style and fit but the impact their clothes are making on the world beyond themselves. This shopper is notable for embracing responsible manufacturing and buying outdoor performance goods with an eco-conscience.

What these savvy consumers may not know is that the Merino wool being used in next-to-skin wear performance products is routinely superwashed.

Washing Wool

Traditional wool, whether knitted or woven, worsted or woolen, must be dry-cleaned. Most of the public knows the chemicals used for dry-cleaning are not environmentally friendly at all, and trends show consumers increasingly opting for clothes that can be washed at home using normal washer and dryer cycles.

But laundering wool has its hazards, even if you're careful and use cold water.

When any natural wool is exposed to water, or water plus heat and agitation, the tiny barbs, or scales on each fiber interlock with one another and cause permanent shrinkage and microscopic fiber bonding, called felting. Sheep's wool typically has higher scales than alpaca which increases its tendency to felt. Alpaca will felt, as well, but it generally takes more agitation and heat because the microscopic fiber scales have less relief (see right).

While felt is a remarkable materi-

al and useful in many ways, picture your favorite sweater. Now imagine it inadvertently being chucked into the dryer. Unfortunately, it probably came out sized for a preschooler, dense, heavy and ruined forever because felting can't be undone.

The Dirty Secrets of Superwashing Wool

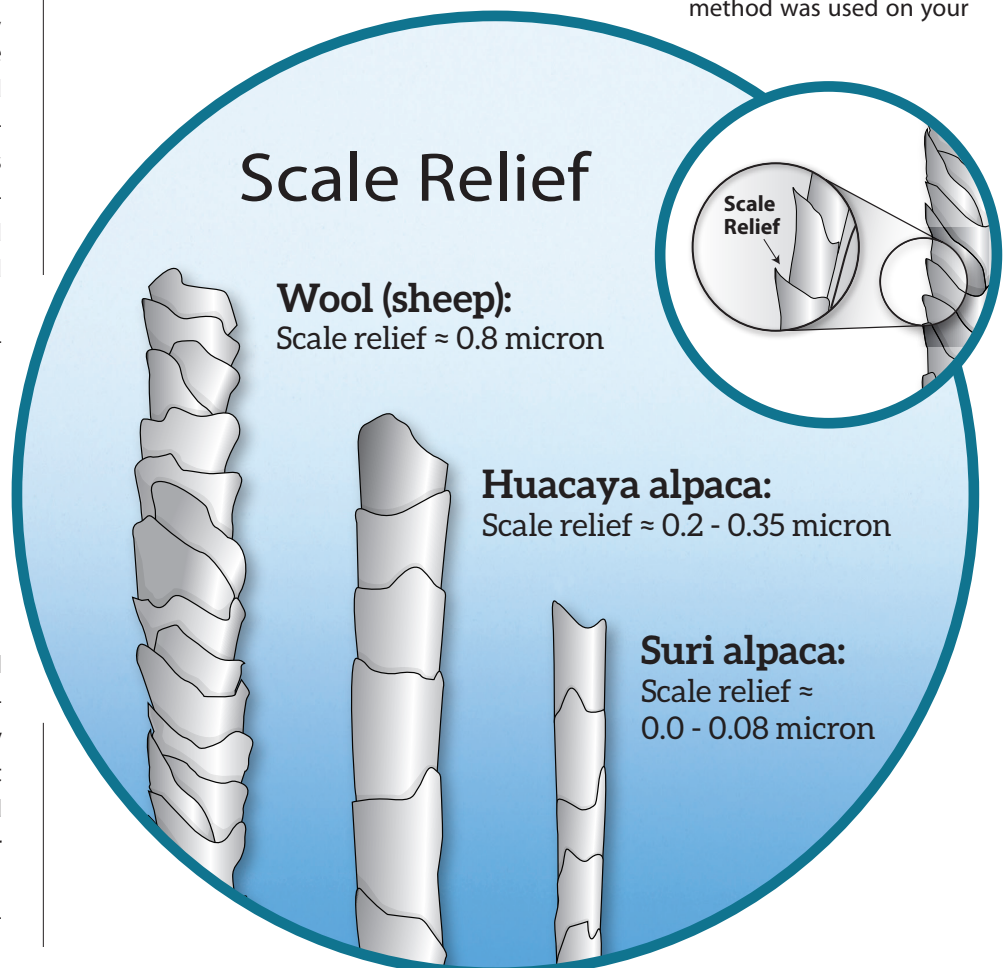
Washable wool is made from wool exposed to superwashing, a specific textile industry process. Superwash wool was developed to make wool less risky to launder in home machines and to increase consumers' desire for wool.

Superwash wool is created by processing wool in a low Ph acid bath or exposing it to chlorine gas. This reduces the height of the natural scales from wool so they don't intermesh when exposed to agitation or water, the typical washing machine environment.

Wool is also made washable by coating the fiber with a synthetic polymer that keeps the scales from the wool's cuticle from being able to join together or shrink.

Typically, this polymer is Hercosett 125, a polyamide-epichlorohydrin polymer.

You probably won't know which method was used on your



superwash wool garment when you buy it in the store, but you might be able to tell if you are knitting your own garments with superwashed wool because polymer-coated yarn tends to be notably slicker than regular wool.

Unfortunately, superwashed wool treated in these ways creates toxins. The pollutants must be treated before being released into the environment. If local laws are protective and regulated, chemicals are disposed of correctly. If laws are lax or non-existent, harmful chemicals are released directly into the air and water.

It turns out that when environmental factors are considered, superwashing is not so super after all.

Patagonia's "Footprint Chronicles" explains how superwashing is harmful to the environment:

Unfortunately, [superwashing] results in wastewater with unacceptably high levels of absorbable organohalogens (AOX) – toxins created when chlorine reacts with available carbon-based compounds. Dioxins, a group of AOX, are one of the most toxic substances known. They can be deadly to humans at levels below one part per trillion.

There are a few ways of removing the tips of the barbed scales without using chlorine. Ozone and hydrogen peroxide are two alternatives that break down into oxygen and water when their wastewater is treated.

The report goes on to point out that superwashing is mostly outsourced:

Wastewater from the wool-chlorination process contains such high concentrations of chlorinated chemicals, that

most wastewater treatment facilities in the United States do not accept it. Therefore, most chlorinated wool is processed in other countries, then imported.

In fairness, some superwashing facilities have created a way to keep the pollution out of the environment.

From Icebreakers' Transparency Report:

Superwash is a process we use to treat Merino that allows it to be machine washable. First, Merino is chlorinated to remove scales from the fiber. It is then washed and goes through an anti-chlorination process to ensure the chlorine is completely neutralized. This process is managed by a closed-loop process. Fumes are captured and treated by an air extraction system. Waste water is also captured and treated in an on-site waste water plant. This management system minimizes environmental impact.

But what if there were a natural animal fiber that could be used in performance outerwear that does not require superwashing?

Does Alpaca Transcend Superwashing?

Major brands point to the natural qualities of wool to sell Merino activewear. But if the public knew more about the reality of alpaca fiber, it seems logical that they would be even more likely to embrace alpaca performance wear.

Alpaca has all of the beneficial properties of many natural fibers such as: strength, resilience, thermoregulation, antimicrobial properties, UV suppression, biodegradability and flame-resistance.

But alpaca also offers added softness, very low scale relief for com-

fort and a high warmth-to-weight ratio. The scales are typically so low they don't need to be knocked down or coated with chemicals, virtually eliminating superwashing.

Alpaca fiber offers profound environmental benefits because of a few unique factors related to alpacas' bodies.

First, the evolution of alpacas' bodies means their digestive systems wring more nutrients out of less browse than other fiber-bearing livestock.

Alpacas' soft, padded feet do not cause divots and erosion like hard hooves do on soft turf. Further, when alpacas pluck grass from the earth with their lower teeth and flexible lips, plant roots are left intact, keeping erosion to a minimum and allowing perennial browse to recover quickly.

Once alpaca fiber does enter manufacturing, it can be scoured with simple, biodegradable soaps because it contains very little lanolin and what it does contain is removed easily.

Appalachian Gear Company

John Gage co-founded Appalachian Gear Company with Mike Hawkins, sports enthusiasts who have worked in the textile industry for more than thirty years.

They manufacture lightweight 100 percent alpaca "All-Paca" fiber garments in North and South Carolina.

Gage says that one of the reasons he started Appalachian Gear was that he wanted to find a better alternative to other fabrics. He believes alpaca is destined for greatness in the larger outdoor market.

"We think products made from alpaca fiber are poised to be a major contender in the technical/performance clothing market. Alpaca has

Microplastics: A Mega Problem

As the public learns more about the harmful effects of microplastics used in many synthetic fabrics and recycled plastic garments, the ramifications of continued manufacture are becoming more and more apparent.

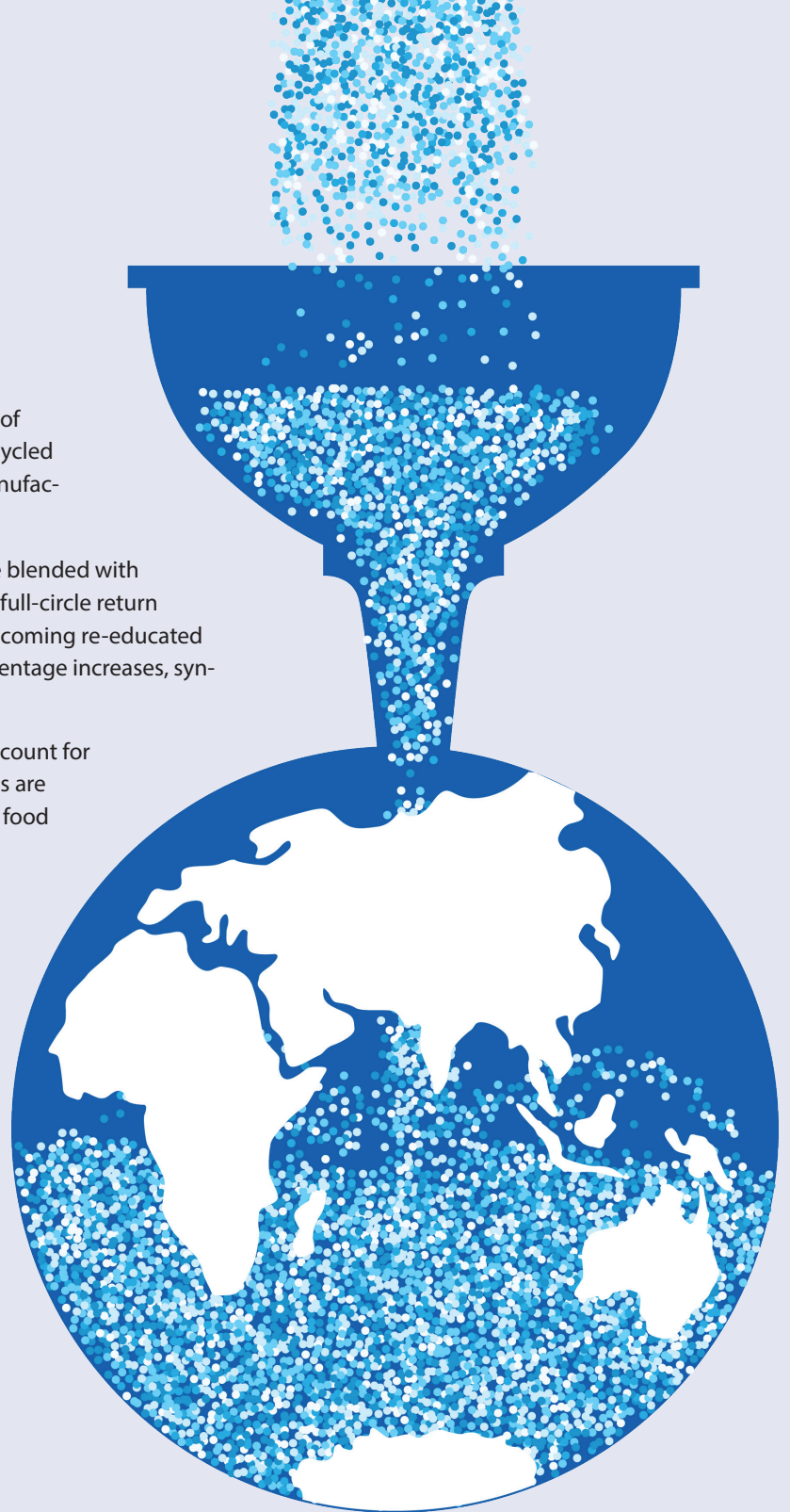
While some natural fiber garments (even alpaca) are blended with a percentage of synthetics for proper fit and wear, a full-circle return to ancient materials is trending as consumers are becoming re-educated about natural animal fibers. And if natural fiber percentage increases, synthetic use can decrease.

Polyester, nylon, acrylic and other synthetics now account for 60% of clothes manufactured worldwide. The oceans are becoming more and more polluted, and the human food supply and human health are directly threatened.

"Many ultra-light Merino wool products are produced by blending nylon or polyester into the yarn," John Gage of Appalachian Gear Company says. "As we now know, the massive global use of synthetic fibers has caused a major emerging global environmental issue in that microplastics are invading our environment and are becoming part of the food chain. Every time you wash your synthetic clothing, you are creating microplastics that wind up in the environment.

"Many people do not consider polyester and nylon as plastic — but they are. Both of those fibers are derivatives of crude oil, and they contribute to the growing plastic environmental problem. Further, nylon and polyester are not naturally breathable fibers or 'wicking' fibers.

"In order to provide that type of fiber performance, nylon and polyester have to be treated with other chemicals — which also wash off little by little in the laundry, thus entering the environment and reducing the performance of those fibers as you wear them. Plus, as we all know, nylon and polyester eventually get 'funky' after you have worn the garments extensively in sports/leisure activities. The result of the permanent 'funk' that causes synthetics to smell bad is that they get thrown in the trash — further adding to the environmental problems."



"Alpaca fabrics do not get funky," Gage says. "In fact, I wear my 'All-Paca' shirts for weeks without washing; I just hang them up in-between, and they freshen-up by themselves. It's pretty amazing."

Gage says alpaca fiber's physical properties allow for a very lightweight performance fabric without the use of synthetics.

© Lee Trebotich



Above: Lee Trebotich is a professional mountaineer and also an Appalachian Gear employee, shown here in Asheville, North Carolina. Learn more about him at www.nattyadventurer.com. He is wearing the All-Paca hoodie, available for both men and women and sized slightly larger to be worn as a layering piece with an All-Paca shirt underneath. Machine washable All-Paca Hoodies dry quickly, keeping you warm even when conditions are wet.

Right: The best-selling short-sleeved All-Paca shirt, for men and women. It provides maximum airflow while exercising so moisture evaporates quickly and you stay warm whether you're moving or standing still. Flat seams provide ultimate comfort and range of motion.



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traditionally been seen in smaller craft and fashion niches. However, alpaca fiber is one of the most high-performance natural fibers in existence.

“There are numerous published studies as well as centuries of Peruvian textile history that prove alpaca fiber’s incredible physical properties. It is strong, lightweight, breathable, hypoallergenic, bacteria resistant, insulating, climate regulating and flame resistant. Based on studies, compared to Merino wool, weight for weight, it is stronger, lighter and

more insulating. Another key alpaca performance factor — even though alpaca fabric breathes and allows for excellent climate control — it also doesn’t absorb much water.

“In general, alpaca fiber absorbs approximately 10-11 percent of moisture which is approximately one-third that of Merino wool. This is key because water equals weight, and fibers soaked with water do not perform as well.

“We think there is a grass-roots movement of people in the ‘outdoor’

market to find natural alternatives that provide high performance and are not damaging to the environment. I would just suggest that people who are considering fibers and fabric do a good bit of research on processes such as superwashing — as well as research on the environmental impact of synthetic fibers — to make their own judgments.”

As Appalachian Gear’s new customers try alpaca, they have overwhelmingly positive feedback.

“Even though we already know the wonderful benefits of alpaca, we are continually amazed at the messages we get back from customers who have been using our All-Paca products in extreme conditions,” Gage says.

Altera Alpaca

Shawn Malloy and his wife, Lori, have been designing natural fiber yarns and products since 2007. The pair has been involved in Flaggy Mountain Fiber Works, US Natural Fiber Works and Royalty Fiber Farm.

Malloy also created two alpaca accessory brands: Kentucky Royalty, which makes sportsman’s hats, adventure and active socks and Altera Alpaca, which specializes in performance socks.

His companies buy alpaca fiber from small and large farms in the United States, but if they can’t find fiber to suit their needs, they source it on the global market.

They also design and develop

yarns themselves as well as manufacture yarns and alpaca products in the United States.

“Alpaca yarn helps with technical problems that occur in harsh envi-

Below: The Conquer sock in action on the trail with Coloradan bowhunter Fred Bohm. The lightest weight sock in the Altera line, it has superb wicking capability and superior flame resistance. It is made with terry loop construction in the USA and designed to honor those who work in the military, search and rescue and forest service. “I’ve had issues with those boots causing blisters,” Bohm says, “but after switching to alpaca socks, the blisters never came back. Not sure why, but I’ll only hunt the backcountry in alpaca socks anymore.”

Below inset: The Explore sock by Altera, in tweed sage.



© Fred Bohm

© Lori Malloy

ronments,” Malloy says, referring to alpaca’s ability to maintain warmth, wick moisture and minimize odor because it is antimicrobial.

Altera’s typical customer is a hunter looking for maximum protection from the elements. They also serve runners, bikers and hikers and “people who want the comfort of our socks for everyday wear.”

Malloy believes the outdoor recreation market demands high performance products and that alpaca fiber is suited to meeting the demands. He says alpaca is naturally suited to performance socks.

“I feel the next wave of innovation will come from alpaca fiber with a combination of other materials to create better products for the outdoors,” Malloy says.

Another Kind of Scale

Alpaca has all of the incredible natural fiber benefits in spades, plus additional unique environmental benefits. But the question arises: how can alpaca compete with the immense clip and therefore, lower cost of Merino in performance garments?

For perspective, the typical Merino herd lives on about 40,000 acres in Australia or New Zealand with about 15,000 other animals. Merino sheep are famous for producing a vast quantity of wool per animal — they were bred specifically for maximum wool production. And the worldwide population of Merino sheep dwarfs that of alpacas.

The annual wool clip, or annual yield, is also immense. In 2017, about 386 tons or 772,000 pounds (nearly 350 million metric tonnes) of wool was harvested from Australia’s sheep. 2018 was the third consecutive year of production growth.

4 billion pounds or 2,000,000 tons of wool is produced worldwide each year.

But it’s not just Merino sheep themselves driving this incredible supply. The infrastructure and supply chain in place for wool is old and well established Down Under. It is a cultural and socioeconomic force — they’ve got production of wool down to a science.

With an annual U.S. alpaca clip estimated at about 1,125,000 to 1,250,000 pounds of fiber, we are not producing a fiber volume anywhere near that of wool. Australia is producing more alpaca than the U.S., of course, but the number of alpacas there is estimated at between 170,000-450,000 while the total number of sheep is around 70 million.

You may be wondering how Americans can possibly produce way more of a good thing and expand the performance alpaca performance clothing sector.

The good news? Early innovators like Altera, Appalachian Gear Company and many others are already taking advantage of alpaca’s natural qualities and tapping into the growing performance garment market as they successfully manufacture and sell high-performance alpaca garments. ●



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