

Snowmass Alpacas



The Making Of Champions Part II

Advancements in identifying variables
in huacaya fleece types. What we have
learned about genetic predictability
within these variables...

Each year Snowmass Alpacas strives to advance and strengthen the predictability of their herds overall excellence in genetic potential both in conformational elements and fiber quality.

We have come to better understand both the valued genetic improvements as well as differences we are seeing after more than 20 years of successive breeding. Our greatest achievements are seen in the advancements of a comparable true type alpaca to that which was domesticated prior to the Incan empire. Snowmass Alpaca's breeding selections have been very stringent from the start concentrating on breeding alpacas which are both phenotypically and genetically reliable as the pure alpaca and the vicuña in production of a consistent fine bright and healthy fleece. At the same time we have come to understand that many of our alpaca's genetics coming from South America

are hybrids meaning there is a strong possibility that they have some other Camelid genetics besides alpaca and vicuña which are the llama and guanaco. Scientific testing has proven that less than 10% of the South American alpaca herd is pure so in fact we would be naive to think we have herds of pure alpaca in the US.

In our 22 years of breeding we have discovered in our diverse genetic pool some very exciting and equally valuable fleece types coming from alpacas that we are convinced are derivative of more hybridization than our true alpaca types.

Here in we wish to expand on the notable variables of the true alpaca, which we have in the past referred to as Incan alpaca or Vicuña type alpaca, in hand with the unique differences of other types of alpaca both in fleece presentation and frame of body.

Classification is an important part of our breeding program. The more we can identify the unique presentations both in genetic make up and phenotype the more we understand the true diversities that exist. This, in turn, gives us the advantage to expand our breeding programs with advancements in various fleece types for a world market of elite alpaca fiber and genetic breeding resources.



▲ Vicuña type alpaca



▲ Vicuña type alpaca



▲ Hybrid type alpacas



First and foremost FINENESS of fleece has been our strongest goal. This is one of the advancements we have achieved as some of our alpacas are assessed with Mean Diameter (average micron count AFD) as low as 12 and our herd average is 19 AFD. At the same time our follicle testing has proven that with our advancements in fineness, we are increasing follicle density as well as secondary follicle to primary follicle ratios (S/P ratios). This is one of our greatest achievements and we hope to broaden the scope of this testing in the future.

It is interesting to find that often fineness is not recognized by the greater alpaca community here in the United States. It has not been determined to be as important a factor as weight and crimp style (reflected in the National show judging criteria). Some theories provide that cer-

tain types of crimp are related to fineness while others suggest that alpaca fiber with greater amplitude in crimp is the predictor of an advanced fine elite fleece.

The testing we have had done on our herd has shown that only the very high frequency crimp with lower amplitude (less bold) and smaller crimp (which is harder to see) shows consistent relation to fineness and in hand consistently has the highest curvature readings of all our fleece types. This style of fleece character we have come to call Vicuña type as it most resembles the wild vicuña fleece.

The next stage up from this fleece that maintains a high frequency but shows more clustering of the follicles creating slightly deeper amplitude of crimp with less frequency is what we call the



Merino type. There are also crosses that have both Merino and Vicuna characteristics which are crosses in fiber types resulting in a fleece with great fineness and slightly bolder crimping than a vicuna type but not as bold as Merino (see pictures on page 4).

It is these two fleece characteristics we have found that best maintain fineness as the alpaca ages regardless of the environmental factors placed on them well above any of the other fleece types. We are convinced that these types of fleeced alpacas are more closely related to the vicuña. Their frames are by and large smaller and more compact as well. We have been able to breed fineness into the bolder fleece types yet we have found this to be an evolutionary breeding selection process where as the nature of the finer and higher frequency crimped alpacas are inherently finer fleeced much like their wild progenitor – the vicuña.

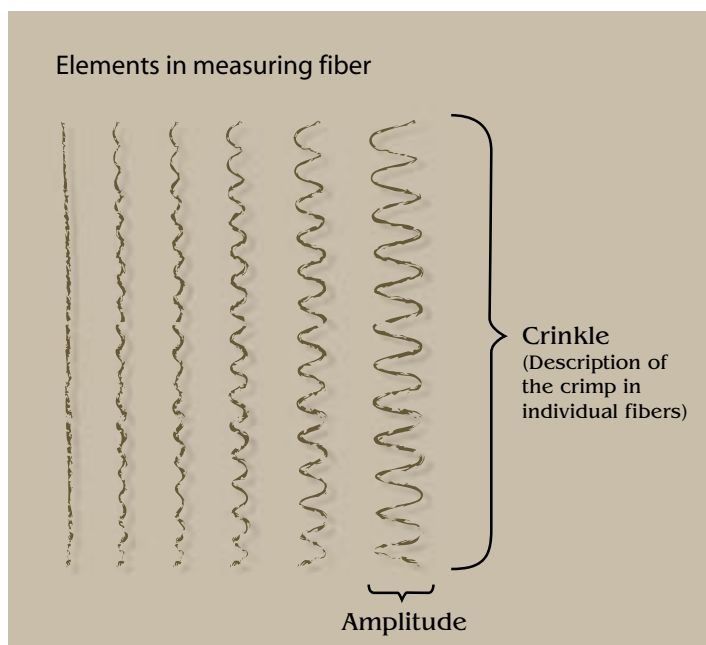
Crimp can be a very confusing subject especially when there are so many speculations about the variables that exist within the alpaca breed. Crimp is generally assessed in two ways. One is by the degree of the bend or curve pattern along the individual fiber shaft as defined in the fiber world as crinkle.

Crinkle: used to describe the wavy characteristics of each **individual fiber** as opposed to those characteristics of crimp found in all fibers aligned together uniformly...as defined in the Camelid Quarterly (CQ) Volume 4 #3.

Crimp: The degree of corrugation or regular wave found in locks of fiber. This can vary from an extremely tight crimp with many closely spaced corrugations to a lock that is completely straight with no wave or crimp whatsoever. CQ Volume 4 #3.

One assesses crimp by looking at the bulk of fibers as they are expressed from the skin to the ends of the fibers as a whole.

There are two important terms used to describe the crimp or crinkle of alpaca fiber. The first is **frequency of crimp**. This is the number of waves or corrugations or bends as one may describe the deviation on the fiber shaft along the



vertical length of the fiber. Some measure crimps per inch along the fiber, others crimps per centimeter. The other term is **amplitude of crimp**. This describes the degree of bend or corrugation depth in the fiber horizontally as seen above.

In the Making of Champions Part I, we describe alpaca fleeces with varying styles of crimp structure comparatively to established sheep breeds. Like these various sheep breeds there are a wide variety of crimp styles found in our huacaya alpacas. This creates a lot of questions and controversy as to which styles of crimp are superior which unfortunately has distracted many from focusing on the more important elements in play. There is much more to fiber than its style of crimp... its mean fiber diameter, medulation, curvature, scale height and length, staple length, etc. Our goal as alpaca breeders has been to identity and chart these differences by comparative science testing that is available for measuring all these variables found within our alpaca fleeces.

We employ various forms of testing our fiber for these elements. These methods have been well documented in various publications as well as proven and established through laboratory tests. In short we will describe the methods we have employed.

First and foremost is the histogram giving us a visual scientific look at the measurements of fibers within an overall average sampling of our

alpaca's fleece. This is done through Yocom-McColl testing laboratories in Denver, Colorado with the OFDA 100, and Sirolan LaserScan. Their test methods are approved by the International Wool Testing Organization (IWTO) and the American Society for Testing and Materials (ASTM) and are performed in laboratories under standard conditions for testing textiles, i.e., 70° F, and 65% relative humidity (+2% RH).

Yocom-McColl tests individual animals using two millimeter snippets obtained across the base of the two inch square submitted sample. In this way, they are able to provide estimates of the genetic uniformity of the sample at a precise environmental time. The Laserscan and the OFDA 100 test from 2,000 to 4,000 individual snippets per sample either core sampled (minicored) or guillotined. When guillotined at the base of the staple, all fibers measured were produced at the same time and in the same environment.

Such a measurement indicates the genetic fineness and uniformity of the animal (at a specific age) which is extremely valuable for selection purposes and the main method we use across our herd.

We also test for curvature which is done by taking the 2mm snippets and measures the degree of curve in the fiber per mm. The greater number of degrees per millimeter the greater the curve / crimp. For wool, low curvature is described as less than 50deg/mm and high is 100deg/mm. There are several other sources that describe curvature ratings such as described in the Camelid Quarterly Glossary of fiber terms.

Curve: The degree of curve in a fiber. There is a direct correlation to crimp. E.g. a reading of 40+ deg/mm represents excellent crimp in Alpaca fiber." Volume 4 #3 Camelid Quarterly.

Curvature readings were also described in a chart of 96 elite huacaya fleece samples analyzed by Cameron Holt and Mike Safely titled *Curvature/Crimp Results (2005)* found in Autumn 2005 Alpacas Magazine, which describe the high end of sampling to be at 52 deg/mm and 34 deg/mm medium.

Conclusively we learn that alpaca fiber is considerably lower in curvature ratings by nature than wool. What all this relates to most impor-



Yearling 1.8 yrs 19.2 3.5 18.2 0.9
Merino A CF 99.1 CURV 50.9



Adult 6 yrs 21.1 3.6 17.2 1.5
Merino B CF 98.5 CURV 48.8



Yearling 1.5 yrs 16.6 3.8 33.8 0.3
Vicuña A CF 99.4 CURV 54.5



Adult 4 yrs 15.7 3.8 24.4 0.8
Vicuña B CF 99.2 CURV 69.6



Yearling 2 yrs 17.7 3.5 19.9 0.8
Merino Vicuña A CF 99.2 CURV 50.5



Adult 3 yrs 19.7 4.3 21.8 2.3
Merino Vicuña B CF 97.7 CURV 50.9

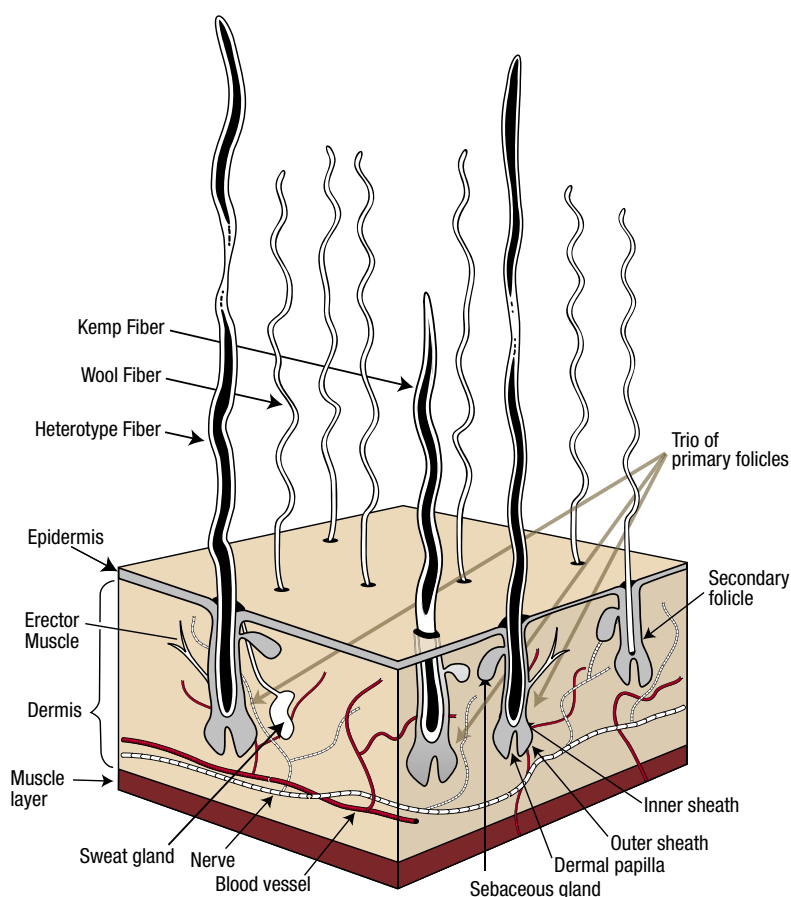
tantly as far as textile ratings, is the ability of the fiber to resist compression and how much memory the fiber has. I like to use the analogy of a spring. Curvature is like understanding how tight the spring is in our fibers crimp. If it has a tight coil, it has a high curvature and greater resistance to compression and will spring back hard and fast. A loosely coiled spring does not compress well and it has little spring back.

So for textiles using the **woolen** system for knitwear and knitting applications in making sweaters and loftier garments, **higher curvature fibers** are better applied. Some types of alpaca crimp styles naturally have higher curvature like the Vicuña and Merino types.

There is no question that the tighter the crimp the higher the curvature and as the crimp in our alpaca fiber broadens the lower the curvature substantiating that crimp is related to curvature. Measuring crimps per inch you will find the higher the number the greater the crimp and the greater the curvature. It is easy to count the crimps per inch in most all fibers except for the Vicuña type where the crimp is not well defined in amplitude marking the start and stop of the curve. Our testing has shown that the **Vicuña type** crimp has the **highest ratings in curvature**. This is good news for us to know that this fiber, that so many overlook as crimpless, is in fact one of the highest crimped fibers overall. How many of us go away from a fleece show with very low scores for character of crimp with this type of fleece?

CRIMP and Character of Crimp is rated as one of the highest scoring attributes of our fleece. This is because crimp directly relates to how well the fiber will spin which is directly related to curvature ratings as well as by number of crimps per inch. All of this directly correlates to textile spinning factors.

The statistics of Vicuña type fleeces are showing the greatest numbers in all respects to spinning factors and crimp. Our judging criteria and teaching systems do recognize the fineness in these types of fleeces fairly well however, when judging the character of crimp and density, they are most often misrepresented as well as misjudged.



Judging Density is done in 2 ways. One simple version is to weigh the fleece wherein $\text{Density} = \frac{\text{Weight}}{\text{Volume}}$. A more complex science based version is to measure the number of follicles/fibers per given skin area wherein $\text{Density} = \text{greater follicle production}$.

The assessment of follicle density of fiber production at the skin level is referred to as "follicle testing." This is a more cumbersome and expensive test to undergo as it requires an 8mm skin biopsies from the mid side of the alpaca. These skin biopsies are looked at under microscopes to measure the number of overall follicles being produced as well as measuring the ratios of secondary wool producing follicles (which produce the finer wool fibers) to the ratio of primary follicles (which produce the stronger fibers associated with sweat and oil glands designed to protect the alpaca from weather as well as an aeration system).

Follicle testing shows that the density and fineness of fibers is controlled by the size of the

pre-papilla cell clusters formed in the foetal skin while fiber length is thought to be regulated by the 'signal strength' of mitogen(s) produced by these cells (simply speaking the greater number of follicles per sq mm the greater the density).

The problem with this system in diagnosing overall density levels at this stage is that there are quite a few variables that can greatly change the outcome of the density level test per sq mm. One factor is age. The younger the alpaca



the greater the density levels will read. As the alpaca ages the skin stretches and fewer follicles are produced per sq mm. For this reason we only tested older alpacas. The other variables have to do with where and how the samples are taken. Variables can occur from the sampling technique just as they can vary with sampling for micron testing from one part of the alpacas fleece to the next. It also can vary on how the sample is actually taken. For example the way we took our 8mm biopsies is we stretched our alpacas as we do to shear by using a rope and pulley restraint system. The alpaca is securely held lying on its side. We then measured the exact location so all the samples were taken midside at the same place. We then injected the skin with lidocane to help reduce pain and bleeding.

This all seemed to be very smart protocol as we were better able to be more scientific about the location of the sampling from one alpaca to the next. We also could take the sample quickly and cleanly and suture the holes made from taking the skin plugs to reduce any chance of infection and scaring (testing requires 2 sample sites per alpaca).

We later found that this was not common protocol and in fact stretching the alpaca in this fashion also stretches the skin (while advantageous in shearing to reduce cutting the skin) subsequently reduce the density readings. We also learned that the lidocane injection was not advisable as it can distort the skin, reducing the reading of follicles per sqmm. The fact that we employed this method throughout our samples gives us a common disadvantage when our samples are compared against the rest of the SRS tested alpacas that were not stretched. We could not imagine any other way of successfully restraining an alpaca to get an accurate sample without sedation which would further increase the risk and expense of taking these samples. So in all there is much room for improvement and standardization of this particular testing system.

The most important readings associated with these biopsies is assessing the number of secondary follicles that are being produced to primary follicles. This measurement would not be affected by our method of sampling (as would the overall density measurement) so we felt more confident we had valid scientific measurements afterall. Even with having stretched the skin our density measurements were very high and the ratios of secondary to primary follicles superior. The greater the number of secondary to primary follicles per sq mm means greater uniformity of wool production with less primary fiber production which in fact is what we are all trying to achieve.

The SRS (Soft Rolling Skin) breeding protocol designed by Jim Watts has an interesting rating system which emphasis that there are 3 stages of follicle development.

The highest density levels found on average in alpacas to date are seen, according to Jim Watts's writing, to be in **stage 2**, with a **follicle**



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recorded follicle density of 79 follicles per sq mm. These ratios directly reflect SRS stage 3 alpacas.

Watts's studies on the SRS system have shown in all the wool breeds that when the primary fiber itself decreases below 25 microns the greater number of secondary fibers are produced and when the primaries are above 25 the number of secondary fibers decreases. Ferguson and Watts (1999).

The one conclusion we drew from this test was not to be prejudice to any one style of crimp as a factor of excellence. As long as we continue to select for fineness, staple length, lack of medulation, and high luster we are in fact creating excellence in all fleece characteristics along with improving density and S/P ratios.

The other test in terms of measuring volume of production is by weighing the shorn fleece produced on an annual basis. What we all know about this is that the more fleece produced, the better for the producer or breeder if the market is buying alpaca fleece simply based on weight (as was employed for many years in South America). This system directs growers to breed for heavier fleece weight and larger framed alpacas and herein breeding for fineness is an inhibiting factor.

The dilemma still facing all alpaca breeders is how much do we focus on fineness and how much on weight and volume and how much do we focus on crimp and curvature. For us as breeders it has been a matter of understanding

ratio range of **9 to 12 S/P** (secondary follicles per primary) and **density reading** of **45sqmm** (follicles per square mm).

The ideal model suggests a **stage 3** were the S/P ratios are as high as **20.1 S/P** with **follicle density** of **75 sqmm**. The type of fleece that is pictured and described by Watts to be an SRS stage 2 & 3 are seen in International Hand book published by Alpaca Publishing Services of Australia as well as on the SRS website. The fleece types in our description would be at best the Merino and advanced Vicuna types respectively.

Of all the various fleece types we tested our highest alpaca tested in 2003 for S/P ratio read 13.7 S/P and our lowest test was 9.9 S/P with follicle density as high as 64 sqmm even with stretched skin. The oldest tested alpaca was 11 years of age and had fiber closest to that of a vicuna alpaca we have ever tested. This test resulted with one of the higher S/P ratios at 11.7, leaving us with more questions than answers as to which crimp styles reflects the SRS alpaca as ALL our fleece types tested very close in range.

Most, including Watts, are under the impression that the vicuña is thought to be a very primitive 2 coated fiber producer. How can this be when they, in fact, produce the lowest primary fiber diameter (well below 25 microns) and have



▲ Bundles of fresh clipped wool.



how they are all related and what fiber types hold in terms of ideal textile properties for specific textile applications.

Everyone agrees (as does the market for elite fiber) that **FINENESS** is the most essential. The second most important element is that the hand of the fiber does not detract from the true micron, which is relative to scale, size, height and uniformity of micron.



We think measuring scale height and scale size will be the next most significant test employed by the alpaca Industry. Like follicle testing, it is expensive and somewhat cost prohibitive as it takes a sophisticated photon microscope to perform these tests. However it will help to better determine further classification systems for alpaca textile applications. During the writing of this article Suri Network published a test study utilizing SEM scanning from the Electron Microscopy Center as undergone and reported by Andy Tillman, titled "Surface Scanning Electron Microscopy of Suri Alpaca Fiber."

These test confirm what is commonly understood, which is that the lower the scale height and the longer the scale length on an alpaca fiber, the greater the light reflection making it bright to the eye as well as giving the fiber a softer less abrasive hand.



This we feel makes crimp all the less important than scale and brightness and why Suri fiber is as much in demand as Royal Baby Huacaya. Why? Because it is one of the lowest scale most lustrous fibers which in itself equates to ELITE. So why are we leaving the importance of luster to Suri. For us this is one of the KEY elements to huacaya and the secret to what makes all alpaca in all crimp styles an ELITE fiber.



Soft hand and luster does not belong to Suri alone and we have the huacaya alpacas to prove it. The testing that is being done on Suri will initiate others like ourselves that this science is as valid and important in determining what makes alpaca, both Suri and Huacaya, Elite fibers and help us to select for the traits that are proven by testing to be more desirable. These are the things we should all be focusing on – not arguing on preference of crimp. Selecting for crimp alone can cause a production of harsh scaling and dullness. These fleeces can be as fine as the next, but are harsh to the hand and skin and can be as much an irritant in prickly factor, as found in all the other wool breeds.

Crimp in itself has much to do with how scale is recognized and felt against the skin and another reason to identify which crimp styles have lower scale. Various sheep fleeces and styles of crimp have been determined by the wool industry to have different scale heights and lengths as we will find similarly in alpaca.

“Wool with the larger fiber crimp amplitude is associated with a softer handle. Wools exhibiting a coiled (helical) crimp configuration receive harsher handle scores than wools with sinusoidal (wavy) crimp configurations.” Bruce McGregor Australian Farm Journal, July 2003.

Hand reflects how the fiber will feel against the skin and is a huge factor in determining a desired elite fiber. Why do you suppose they still use skilled woman’s hands in Peru to sort alpaca fiber for fineness? It’s called next to the skin factor and is a completely different factor than the number of fibers over 30 poking out of the yarn.

Scale and hand is the factor for alpaca we need to give much more attention to!

In our determination to continue to select for fineness and uniformity we have also selected to breed in hand with alpacas that have a longer staple length and specifically to select for fleeces with low scale, fine hand and intense brightness.

The results of this breeding selection has not only produced a successful outcome in increasing fineness, but the extension of fineness into extremities is far superior and is seen to be positively linked genetically to production of longer staple length.

The results in all our fleece types are that we have not lost fleece weight with lower micron but gained weight.

At the same time we have produced some of the brightest huacaya fleeces we have ever seen including our comparisons to the brightest Suri’s in both whites and colors.



▲ Snowmass Royal Ember

▼ Snowmass Porteus



What most all these bright fleeces have in common is a low curvature reading. Those that are finer in micron can be as fine as the higher curvature fleeces, however, the luster and brightness of the lower curvature fiber tends to be far greater. The brighter the fleece... the softer the hand.

For example a 23 micron high luster, low scale fleece can handle with the same fineness as a 15 micron Vicuña type fleece. In the same type of comparison a 16 micron Merino fleece (which has a considerable high curvature and by nature abrupt scale in comparison) can handle with the same hand as a 26 micron alpaca.

Like Suri and Silk, these very bright Huacaya fleeces (depending on the fiber fineness) will have very specific textile applications and be in high demand for production of worsted textiles (shawls, suit coats, and long draping elegant fabric).

We are certain that the test results from our samples sent to the Electron Microscopy center will show that many of these fleeces are very similar in scale to the best of the Suri's. Even without these sophisticated microscopes it is quite easy to see and feel the difference between a bright fleece verses a dull fleece and we are certain that SEM tests will further support the importance of selecting for brightness.

As we move forward in our breeding selection, more science will become available to better direct us to which style of huacaya fleeces prove to apply better to certain types of textiles. What we have learned thus far is that woolen garments need loft, memory, and resistance to compression. So, the higher curvature the better (and why wool is still one of best known sources of woolen textiles). However, alpaca fiber that shows the same high



▲ Snowmass Silver Signature

curvature readings in hand would be best for woolen application.

To better understand the variables found within all our fleece types, we tested our entire herd with Yocom McColl testing laboratories for both fineness and curvature (using methods described above) and charted the results according to the fleece types. The results both support our methodology

that there are unique distinctions between these fleece types and that valid classification would better serve the industry when it comes to a better understanding of what we want to be breeding for. We know that each type is valuable and important but it is way to soon to be making prejudice judgments claiming one to be superior to another. The judgments we should be making are related to specific textile applications.

Diagram A. Snowmass Alpacas Fiber Selection Guide

(S) Huacaya Silky Types	Suri ————— Poor Huacaya —————				(S) Lincoln	(S) Lincoln	(S) Romney	(S) Rom/Cor	Corriedale	Merino	Merino	Vicuña/ Alpaca	(S) SVA	Vicuña
Alpaca Fiber Crinkle ⇕ Amplitude ⇕														
Curvature Deg/mm	0	5-10	10-15	15-20	20-30	25-35	35-40's	35-50's	40-60's	40-60's	40-70's	50-70's	30-50's	50-90
Micron Range (Huacaya)	24-35	24-35	24-35	24-35	16-28	14-28	14-28	14-28	14-28	14-28	12-26	12-22	14-26	10-15

▼ Vicuña type



▼ Vicuña type



Our test revealed that the fiber with the highest curvature readings were both the Vicuña type and what we describe as the Merino type. The fiber that related the best to fineness in hand with higher curvature into greater age brackets was by far the Vicuña type.

Our Merino type was as high in curvature rating as the vicuña type and, in one case, had the highest reading at 73 deg/mm. The Corriedale type was the next in line for rate in curvature, then Romney and then Lincoln type, as shown in diagram (A) and test results on following pages.

Our testing statistics conclude that the bolder (or broader) the crimp the lower the curvature and, typically, the lower the frequency and the tighter the crimp the higher the curvature and the higher the frequency.

So for woolen textiles one would conclude that the high curvature Vicuña and Merino types are the best suited. For worsted the lower curvature, Corriedale, Romney and Lincoln would apply.

The other advantage of lower curvature for worsted textiles is that there is an obvious correlation with lower scale and more pronounced luster and softer hand in the lower curvature fiber types.

The fleeces shown on this and following pages represent fleece samples as tested by Yocom McColl testing labs for Mean Diameter (average micron count AFD) and curvature.

Starting with Snowmass Vicuña type fleeces most all represented are colored fleeces as

Table 1. VICUNA

AFD	Curvature	Color	Name	Year Born
15.7	69.6	L Fawn	Snowmass Avalon	01
15.8	63.8	Fawn	Snowmass Bit of Honey	03
16.1	64.0	L Brown	Snowmass Sizlin Hot	02
16.3	62.1	Beige	Snowmass Harley Davidson	03
16.4	62.8	Beige	Snowmass Chacchoyo	03
16.4	59.1	Brown	Snowmass Royal Bronze	02
16.7	56.2	Brown	Snowmass Olympia	98
17.0	61.3	M Fawn	Snowmass Golden Serenity	00
17.6	60.9	Beige	Snowmass Comanchero	02
17.5	59.6	L Fawn	Snowmass Nova's UbiSoft	03
17.5	50.7	Black	Snowmass Nova's Ghirardelli	02
17.8	54.4	D Fawn	Snowmass Andean Sky	03
17.8	56.7	D Brown	Snowmass Nova's Dawn	02
17.8	50.4	Black	Snowmass Tolkien	02
17.9	55.3	D Fawn	Snowmass Royal Accent	02
19.8	59.0	Grey	Snowmass Silver Spirit	02

charted on **table 1**. Clearly this fleece type overall is the finest in Mean Diameter and in hand shows a direct correlation with highest curvature. Undoubtedly this fleece type has a high S/P ratio as this type of fleece tested in our follicle studies are seen to have extremely low to non-existent percentages of fibers over 30 micron which represents extreme uniformity and greater production of secondary wool fibers.

Comparatively the next highest rate of curvature in character are what we describe as the **Merino type fleeces** which follow very similarly to the description in the Making of Champions Part I. It is a very distinctive well structured crimp that is forming in small clusters and has more pronounced amplitude in its crimp in comparison to the Vicuña type crimp.

The Merino type is the next stage at being as fine with comparatively high curvatures. One particular fleece had the highest curvature tested yet. The only concession is that this fleece type does not remain as fine in mean diameter as the vicuña type as the alpaca ages, but it is the closest we have come. With further breeding we are convinced we will get their with this type of fleece.

Table 2. MERINO

AFD	Curvature	Color	Name	YearBorn
13.4	59.9	White	Snowmass Chimbote	04
14.0	63.6	White	Snowmass Supreme Impact	04
14.3	64.8	White	Snowmass Zero Gravity	04
14.5	59.8	LFawn	Snowmass Olympic Gold	04
15.0	54.9	White	Snowmass Winter Wind	04
15.5	56.8	White	Snowmass MareeLove	98
15.5	68.3	Light	Snowmass FawnEpiphany	03
15.6	59.4	Beige	Snowmass Matrix	03
15.8	62.0	White	Snowmass QuechuasIsis	03
15.9	68.8	White	Snowmass Absolut	02
16.0	69.2	Beige	Snowmass Solitude	02
16.1	63.5	LFawn	Snowmass Olympic Belle	03
16.4	73.8	Beige	Snowmass Sabatier	03
17.2	60.8	White	Snowmass Subzero	03
17.2	63.3	White	Snowmass Inspiration	03
17.4	60.2	White	Snowmass Loven Perfection	03
18.5	58.6	White	Snowmass StarQuest	02
18.4	52.9	White	Snowmass Oracle	03
18.1	52.8	White	Snowmass Porcelain Princess	03
18.7	54.5	White	Snowmass Synthesis	01
19.7	54.4	White	Snowmass Perfection	00
20.1	54.1	White	Snowmass Sabrina	00
20.6	50.0	White	5Peruvian Hallmark	96
20.6	53.3	White	Snowmass Accoyo Lineage	02
23.7	46.3	MFawn	Snowmass RoyalRose	98



This Merino type fleece can be as fine in Mean Diameter (average micron count AFD) however does have a slightly lower curvature than the Vicuña type crimp.

The next sequence of numbers (table 3) represents the bolder style of crimp with one of the deepest amplitudes which we refer to as the Corriedale type. These particular numbers are reflective of those we have selected for fineness and brightness. The curvature of this fleece is lower and the mean diameter (average micron count AFD) slightly higher.



Table 3. CORRIEDALE

AFD	Curvature	Color	Name	Year Born
14.5	50.1	White	Snowmass Navigator	04
16.7	52.9	White	Snowmass Trilogy	03
17.6	49.0	White	Snowmass Intuition	03
17.8	45.1	Brown	Snowmass Victoria Secret	03
18.1	55.6	White	Snowmass Hallmarks Heritage	03
18.2	44.0	Black	Snowmass Drambuie's Braveheart	02
18.3	50.2	White	Snowmasters Silhouette	01
19.4	47.1	Beige	Snowmass Mondavi	02
19.2	51.8	Brown	Snowmass XXXtreme	01
19.2	50.9	White	Snowmass Artic Wind	02
20.3	53.3	White	Snowmass Royal Accoyol	02
20.5	51.6	White	Snowmass Camelot	01
21.5	47.3	White	Snowmass Snowmaster's Omega	01
21.6	45.2	White	Snowmass Tycoon male	99
22.4	49.2	White	Snowmass Primestar	99
22.3	46.9	White	Snowmass Snow King	98
23.0	42.8	White	Snowmass Snowmaster's Protégé	01
24.3	45.3	White	Snowmass Sparkle	98
24.0	42.3	White	Snowmass Campenato	02
24.0	42.0	White	5Peruvian Harley	94

The distinguishing feature of this fleece is the depth of its amplitude. This fleece type tends to be shorter after the first years growth much like the vicuna types when relaxed. If you stretch this fleece you get more length in measurement due to the depth of the curve in the crimp along the entire shaft of the fiber. Merino and Vicuna are not as deep and typically have more crimps per inch. This Corriedale type is much like a larger spring with deeper coiling. A Merino and Vicuna, in comparison, are smaller springs with tighter coils.

Table 4. SILKY

AFD	Curvature	Color	Name	Year Born
13.6	49.0	White	Snowmass Best Man	04
14.6	52.6	Brown	Snowmass XXXquiste	04
15.1	47.2	Brown	Snowmass Porteus	04
15.0	47.8	White	Snowmass Chateau	04
15.6	48.9	White	Snowmass Moonstruck	04
15.8	47.9	White	Snowmass Loves Enduring Promise	04
15.8	58.0	White	Snowmass Elite Reflection	03
15.8	53.1	White	Snowmass Handel's Messiah	02
16.8	42.2	White	Snowmass Accoyocusanti	04
16.5	42.5	Black	Chima	02
16.5	40.2	Brown	Snowmass XXXtremely fine	04
17.6	33.5	Black	Snowmass Midnight Fox	04
17.8	41.5	White	Snowmass Infint Elegance	04
18.6	39.0	White	Snowmass Prince of Peace	04
19.5	44.9	White	Snowmass Delightful Duet	02
19.4	29.9	Black	Snowmass Midnight Shadow	04
19.8	37.3	Black	Snowmass Eagle Crest	03
20.0	34.2	Black	Snowmass Incan Royalty	02
21.6	45.7	White	Snowmass Accoyocusani	98
22.1	35.0	Black	Snowmass Morning Moon	02
22.1	49.5	White	Snowmass Elite Monet	02
22..5	40.4	White	Snowmass Takla Makan	04
23.0	42.8	White	Snowmaster's Protégé	01
23.8	40.5	Beige	Snowmass Legacy's Legend	00

This last described fleece type is markedly different in that it has less crimps per inch along with shallower depth in amplitude. It is also described as Lincoln and Romney in character as seen in The Making of Champions Part I. This fleece type has intense brightness along with desired longer staple. It is a fleece type that is less understood and less recognized for its true potential as an Elite fleece because it lacks the high rate of crimp and curvature as the styles above.

We have selected to breed this fleece for fineness (as we have all alpaca fleeces) and have



been successful as seen at left – it has as fine an AFD rating as the higher crimped fleeces yet has a much higher luster and softer hand which is why we have further described this fleece as the “**Silky type.**”

The results of curvature measurements are the most variable in this type of fleece as reflective in the variety of broader and shallower crimping. They can be equally as fine as the higher frequency, higher crimped fleeces proving that we must be careful in judging crimp styles. **Crimp** and **curvature** are not necessarily related to fineness as we evolve into breeding for Elite fibers.

The main point in case here is that we have many variables in what we are selecting for and they do not all fit into a simple equation to make a case that crimp should be a deciding factor in creating an Elite Fleece.

Snowmass Alpacas breeding selection program is engaged to define the qualities in each crimp style and refine the breeding selection to enhance them

all in fineness, uniformity, scale, and staple length. The end goal for us is to produce Elite fleece... meaning Royal Baby in Peruvian standards, handling as if 18 micron and lower, long staple length and uniform in follicle production with little to no solid core medulation. Thus, uniformity of fleece on the body of the alpaca should extend over the entire blanket and even into the neck and upper leg. This would result in greater weight of Elite producing, bright and soft handling fiber. Whether the fleece has bold or fine crimp, we hope to make it all sort as Elite. As the Elite is refined we may have a selected sort for Elite Woolen products and then another for Elite worsted products.

The Making of Champions Part I, makes relative analogies to what we are seeing and what values we find in the varieties of fleece types in the Huacaya alpaca in terms of character, fineness and staple length as important textile characteristics.

We feel it is more important to recognize these very unique characteristics that are being presented and to address them scientifically in

terms of their unique potential for variable textile qualities verses trying to chose a general type for purposes of marketing and or for standardization such as creating a US breed type or standard.

If you look at all the breed standards of other live stock you will see specific detail to the elements of every part of the breed. The closest we could come to a form of livestock that has an official breed standard for wool bearing animal is the sheep. Yet the sheep industry has refined their breed further and classified them into hundreds of individual breeds, each with a very specific breed standard defining detail to the type and style of crimp, micron values, fleece length, luster, and overall extension qualities of their breeds fleece. You will also see great detail to the head, which includes specific size of ears, and ear set, size and shape of muzzle, the quality of

wool cap, color and shape of eyes etc. Many define the neck, shoulders, chest, back, loins, side quarters, thighs, legs, feet, teeth and gentiles. Also included are body weight, fleece weight, and birthing statistics along with color genetics found within the breed.

We have one breed – ALPACA – with as many variables in fleece and size as over a hundred breeds of sheep.

We have heard the argument that we need a breed standard to direct our breeding programs to model after and one for our judges to adhere to in the show ring.

We as breeders have yet to see an ideal model that represents the vast variables within our ever advancing breeding programs here in the US. To standardize a single ideal for these purposes is not only restrictive but would threaten a bias which could easily misdirect breeding programs as happened tragically in South America as explained below.

Dr. Jane Wheeler has revealed in her studies that alpaca and llama have suffered from such extensive hybridization that fewer than 10% of the alpacas and 60% of the llamas remain pure from the original native breeding herds.

“Intentional cross breeding to obtain greater fiber weight and hence increased economic gain, has been general practice during the last quarter century. As a result the inbred quality continues to decrease, threatening the livelihood of native herders, as well as the survival of the pure alpaca. The short term economic gains obtained through hybridization, in combination with other social, political and economic realities, have produced a crisis of major proportions that effects everyone involved. ... A central, underlying cause is the devastating loss, during the Spanish conquest, of ancestral knowledge about conservation, management and breeding of all four South American Camelids, knowledge which can only be recovered through solid interdisciplinary scientific research.”

Camelid Research in Peru by Dr. Jane C. Wheeler; Ph.D. CQ quarterly June 2005.





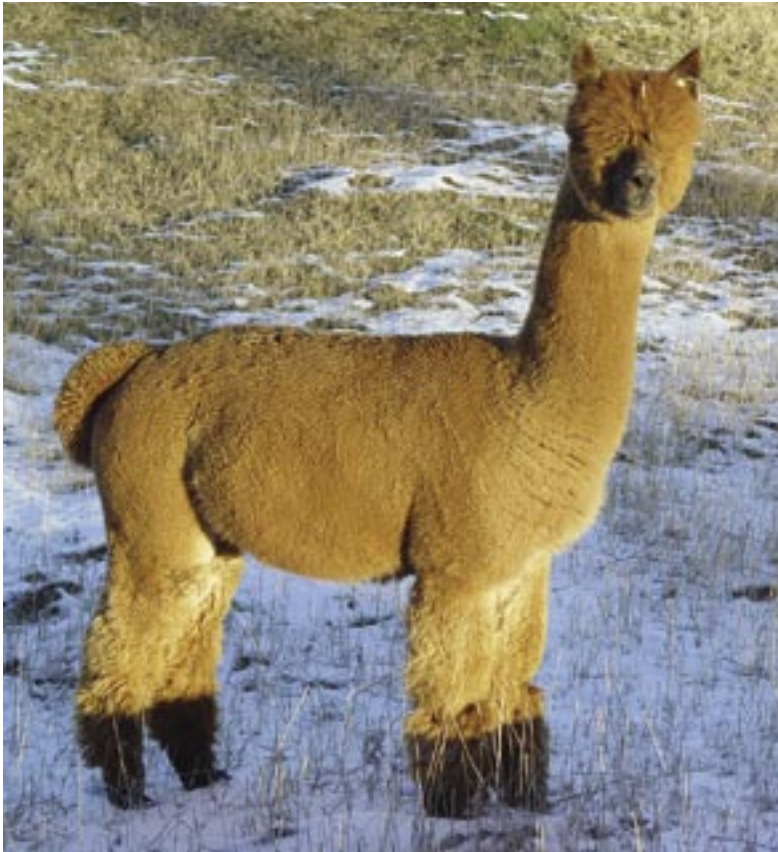
In a recent conversation with Dr. Wheeler she reported she had just finished with an intensive two day course on molecular genetics and alpaca selection with the breeders in Canchis Province, Peru who participated in the project. She reported further that the results from Canchis, based on a stratified statistical sample of approximately 160,000 alpacas, revealed that only 5.8% of the 600 animals tested for purity were not hybrids. It is shocking to think how close we are to losing the genetic base of the pure alpaca and is something we should all consider seriously. Upon the results of these tests (and supported by the efforts of Dr. Jane Wheeler and CONOPA) Peru, along with neighboring countries, are taking a much greater interest in selective breeding protocols along with efforts to preserve the pure alpaca.

The story of the pure alpaca (*Vicugna paco*) as a subspecies of the Camelid Family is a long and fascinating one. If we follow the steps we see they evolved all the way from the original Camelid from North America, the *Hemiauchenia*, which lived some 9 Million years ago. This Camelid traveled to South America and in God's and nature's own breeding program evolved to become the two native species of South America which survive to date as the vicuña (*Vicugna vicugna*) and guanaco (*Lama guanicoe*). Man's interest in getting involved in the evolutionary development of such wondrous creatures was known to happen as long as 6 to 7 thousand years ago. The data being retrieved by Dr. Wheeler and her colleagues is unraveling one of the most fascinating histories of the South American Camelid and represents the key to truly understanding the finest breed of alpaca that ever existed. It also explains the vast amount of diversity we have within the population of the breed in this day and age. Truly the sophistication of the Incan and pre-Incan breeding programs were far superior in their ability to keep the 2 wild species and 2 sub species pure as proven by the DNA testing Dr. Wheeler performed. The Incan and Pre-Incan alpaca are a domesticated pure mutation of the vicuña and the llama a domesticated guanaco. Fine textile production was their form of currency and purity of fineness was as important as purity of gold and why the two subspecies were kept apart and pure in their breeding selections. It is this breed of alpaca that produced the finest textiles the world has come to know and what made the Incan and pre-Incan cultures the envy of the world. It is also why Peru is on a mission to resurrect this breed of alpaca. To Peruvians, it not only represents a symbol of their past, it represents a trade of fiber as fine as the vicuña itself which to date is the most valued fiber in the world.

It is no longer a secret that since the demise of the Incan civilization there has been extensive hybridization within the alpaca and llama breeds in South America. We see more and more information being released to testify to this scientifically as is being done by Dr. Wheeler along side many dedicated scientists working with various institutions such as IVITA (San Marcos University's Veterinary Institute for Tropical and High Altitude Research) and CONOPA (composed of Camelid specialist to continue research on alpaca

genetics and sustainable utilization of the vicuña and guanaco populations in Peru.

The fact that we have imported alpacas from a population where only 10% of the mass are pure in genetic nature to the pure alpaca, leaves us all some concern in rushing to create a breed standard. We have much work ahead of us and should open ourselves to breeding protocols and methods of selection which identify alpacas that like in CONOPA are genetically closer to the true



▲ Example of Pure Alpaca

alpaca. Knowing what Dr. Wheeler is revealing is further prompting the Peruvian government to create a registry of alpacas that are genetically related to the vicuña bringing back a true alpaca population for fine textile production to match that which their ancestors had.

While we may not be able to participate or afford such genetic testing to know how much alpaca and vicuña genetics our alpacas carry, the fact remains that the test is available and like follicle testing (which is prohibitively expensive) we should consider using this to further our understanding in developing breeding classifications.

The world around is interested in uncovering and regenerating the pure alpaca. One that is pure by genetic base and has what is more similar to its direct relative the vicuña in both fiber and body type as is seen with programs like CONOPA. These programs are being sponsored not only by Peru, but Scotland, Norway, Chile, Argentina, Great Britain and now as professional US breeders, Snowmass Alpacas is also getting involved and plans to support CONOPA's efforts.

To date we have no real information available to the breeders discussing these issues and or directive to truly reveal which of the alpacas within the US population have true alpaca genetics? One reason for this is the ideal alpaca, as being described, does not necessarily fit the pure alpaca description by those pressing us to create a Huacaya breed standard.

One thing is very certain the interbreeding of these subspecies has created many variables within the genetic pool of both the Llama and alpacas both in the United States and the world over. What are these variables and what value do they hold? Which direction do we take them? These all must be answered before we move forward with a predictable and viable breed standard to model after. This is another reason we reach out to the world community of scientists like Dr. Jane Wheeler and her colleagues to help us answer these questions.

We are no longer a world anew in breeding alpacas outside of Peru. Alpaca breeding programs are being developed world over so we cannot afford to let our nations alpaca breeding ideals be set by a handful of highly motivated marketers here in the US.

The more we open ourselves up to the science and international alpaca interests, the more we will truly evolve and strengthen our breeding protocol here in the United States as we gain a stronger perspective which in this fast growing industry is strongly needed.

For sake of interest let's try and describe what a general breed standard for the "pure alpaca" (Vicugna pacos) being alpacas with no hybridization of other Camelid species other than the vicuña, would sound like. (*Breed Standards of Pure Alpaca*)

Breed Standard of Pure Alpaca

The pure breed of alpaca is seen to be more like it's wild progenitor, the vicuña (Vicugna vicugna) who exhibits the world's finest and densest fleece of all wool bearing animals.

FIBER: The fiber of the pure alpaca (Vicugna pacos) like the vicuña is seen to have a high frequency of crimp relative to high curvature and a strong production of secondary wool fibers with a very dense follicle ratio were in the primary follicles are scarcely above 30 microns. The pure alpaca has a further evolved fleece than its relative the vicuña with greater staple length and extension of fleece quality ideally seen throughout its entire body extending further into the head and legs. The pure alpaca maintains its fineness and brightness into maturity. As a juvenile the average micron is 12 to 16 and stays below 20 microns as adults.

HEAD: The pure alpaca head is smaller with a refined small and square soft mussel and dark almond shaped eyes. The color of the eye is dark brown to dark shade of grey. The pure alpaca has a fine wool cap that is seen to arise with wool fibers at the bridge of the nose just in front to the eyes and extending over the entire top of the head and into the neck. The ears of the pure

alpaca are well proportioned spear shape ears that are equally aligned at back mid side of the pure alpaca's head. By comparison the following traits seen in the Llama and guanaco: (longer ears, cleaner longer mussel with little to no wool cap or face wool, and ears are wider and longer some curve at the tip, referred to as banana ears) are undesirable.

TEETH: Should be well placed in opposition to the dental pad.

TESTICLES: Males should have two even and good sized testicles that are firm not soft and tightly held against the males underside verses loosely held.

BODY: The pure alpaca is well balanced in body proportion with slight angulations and arch to its spine or top line and slightly lower tail set than its cousin the Llama. The body of the pure alpaca is also more narrow and slighter in frame as is its relative the vicuña compared to the Llama and guanaco which has a much stronger frame and bone structure evolved for more extensive travel and existence in high mountain ranges and as a beast of burden for packing.

This is just an example of what a breed standard may sound like for a smaller true to type pure alpaca that is directly related to the vicuña with no hybridization to the guanaco or llama.

The question is if we adopt such a breed standard as an ideal for all alpaca breeders here in the US what we do with the thousands of hybrids showing signs of both species with larger frame and longer muzzels, wider thicker and slightly longer ears and straighter top lines showing greater resemblance to their cousin the llama and guanaco in structure.

Many of these larger alpacas generate a greater fleece weight yearly than the smaller framed alpacas and are also admired for this. Many have been further developed to have excellent fine fleece of which vary in style from broad crimp to high amplitude crimp to a variable range of frequencies, fineness and handle. There are many in-between these two extremes that resemble a bit of both.

The fact remains that there are many hybrids that we find are contributing to many alpaca types. They all are carried under our alpaca registry here in the US however this does not make them genetically pure alpacas nor in many respects undesirable. In many cases there are alpacas with fiber that will come to be superior to the vicuña or pure alpaca in specific textile productions.



▲ Example of Hybrid Influence

The more we understand the values of each variety the better we can make breeding selections in our breeding programs. Our breeding program has identified these various fleece types and has expanded on improving them all. Our strongest selection has been to expand on what would resemble the closest pure alpaca we can. Yet we can not tell you that this is our single ideal standard.

We support the expansion and growth of all these wonderful variables in fleece types verses prejudicing ourselves with limits on what should be the standard. It's the textile scientists we need to further employ to help us better understand the variables before we make standardized breed judgments. We should understand scientifically what the variables are and as we move forward with this understanding we are better prepared to save the original breed of alpaca as we also expand on an evolution of another that can and should be just as valuable.

NEW DEVELOPMENTS IN FLEECE PRODUCTION

We describe the Vicuña and Merino fleece types as the finest and longest producing fine fiber types in our first Making of Champions Part I.

The Vicuña type is the type we have focused on and have successfully advanced the staple length along with increased fineness and extended uniformity – which in hand has created an increase in follicular density. The overall production of primary fibers has been reduced to where we see very fine primary fibers as low as 15 microns and under zero percent over 30 microns.

The greatest improvement seen is that these primary fibers are no longer fully medulated therein producing textile value within the body of fleece and no longer a negative in overall fineness/handle in spun yarn.

This is a huge success that we are very excited about as will be textile manufactures and buyers of fine exotic wools. Remember that medulation is the nature of alpaca fiber and is seen in fibers as low as 6 microns. This is relative to pockets of air within the shaft of the fiber. It is not a negative and provides great insulating factors above oth-

er natural fibers. The medulation we want to get away from is found in fibers that are completely hollow which is considered a hair and referred to as guard hair or kemp and is produced in the primary follicles (See diagram, page 5). This hair like fiber is straight and very stiff and does not spin well and tends to stick out of end products giving what they call prickly factor. Not all primary follicles produce these guard hairs and with more and more breeding selection we find our alpacas are producing finer and finer fibers with less and less medulation and lower percentages over 30 microns in their primary production. The reduction of the primary fiber also allows for greater secondary follicle production.

Fiber fineness and handle has always been our highest priority and it has taken us a good 20 years to get to a very low micron average across our herd. The past 3 years we have seen an overall steady improvement in our entire herd as sampled and tested with Yocom McColl testing laboratory in Denver Colorado. The entire herd results amount to 12 full pages of 30 samples per page.

We condensed our 4 year results (for the sake of not listing 400 individual histograms) by listing the 1st and last histograms of each page to express the ranges/improvements in the last 3 years of testing.

Each page has 30 individual alpaca histograms which are listed in order of fineness. Starting at the top of the page (Top) we listed the first histogram reading and at the bottom of the page (Bottom) the last histogram reading representing the average readings for the entire page of histograms. The results are listed by the year and by micron starting with the lowest test on page 1 and increasing in micron to the last page 1-14.

It is no secret that we as many alpaca breeders in the world covet and try to breed for fiber that is closer to vicuña in overall fineness and loft which we all so love in a Cashmere sweater. This fiber is light weight, warm, and most comforting to wear against the skin with little to no prickly or scratch. How many pure alpaca garments have you tried to wear and find yourself racing to take it off because of the intolerable itch. This is

2002: 1-12 (360 alpacas tested)

Page 1	Top	14.3	3.1	21.4	0.3	Bottom	17.2	4.2	24.5	1.3
Page 2	Top	17.2	3.4	19.6	0.4	Bottom	18.0	3.7	20.3	0.8
Page 3	Top	18.1	3.7	20.4	0.9	Bottom	18.6	4.0	21.5	1.3
Page 4	Top	18.6	4.1	22.0	1.1	Bottom	19.2	4.2	21.9	2.2
Page 5	Top	19.2	3.7	19.0	1.9	Bottom	19.9	4.0	19.9	1.8
Page 6	Top	19.9	0.8	19.0	1.7	Bottom	20.5	5.3	26.1	4.9
Page 7	Top	20.5	4.4	19.2	2.5	Bottom	21.2	4.0	18.9	1.9
Page 8	Top	21.5	3.5	16.5	2.0	Bottom	22.0	3.8	17.1	3.4
Page 9	Top	22.0	3.8	17.0	2.8	Bottom	22.9	3.9	16.8	3.6
Page 10	Top	23.0	4.6	20.0	5.6	Bottom	24.4	4.7	19.2	8.5
Page 11	Top	24.5	4.5	18.4	9.8	Bottom	26.3	4.6	17.6	16.8
Page 12	Top	26.4	4.9	18.5	14.8	Bottom	31.2	4.5	14.5	52.7

2003: 1-12 (360 alpacas tested)

Page 1	Top	14.0	2.8	20.1	0.4	Bottom	16.0	3.1	19.1	0.4
Page 2	Top	16.2	3.2	19.8	0.5	Bottom	17.0	3.4	19.7	0.9
Page 3	Top	17.1	3.4	19.7	0.5	Bottom	17.5	3.8	21.6	1.1
Page 4	Top	17.5	3.5	20.1	0.8	Bottom	18.1	3.7	20.7	0.7
Page 5	Top	18.1	3.3	18.3	0.6	Bottom	18.6	4.0	21.8	1.0
Page 6	Top	18.6	3.4	18.2	0.9	Bottom	19.2	4.4	23.0	2.6
Page 7	Top	19.2	3.8	19.7	1.2	Bottom	19.9	4.3	21.8	2.1
Page 8	Top	19.9	3.7	18.8	0.6	Bottom	20.8	0.4	16.2	1.6
Page 9	Top	20.8	3.7	17.8	1.6	Bottom	21.8	4.9	22.3	5.2
Page 10	Top	21.8	5.4	24.6	6.7	Bottom	22.8	5.5	24.0	7.6
Page 11	Top	22.8	4.5	19.5	5.0	Bottom	24.8	3.9	15.8	7.5
Page 12	Top	25.0	3.9	15.7	8.4	Bottom	31.7	6.4	20.3	52.0

2004: 1-14 (420 alpacas tested)

Page 1	Top	12.9	2.5	19.4	0.2	Bottom	15.7	2.4	15.3	0.2
Page 2	Top	15.8	2.8	17.7	0.6	Bottom	17.0	3.7	21.8	0.8
Page 3	Top	17.1	3.3	19.3	0.5	Bottom	17.5	3.6	20.6	0.7
Page 4	Top	17.6	4.0	22.7	1.0	Bottom	18.2	4.1	22.5	0.9
Page 5	Top	18.2	3.5	18.7	0.8	Bottom	18.9	4.9	25.9	3.4
Page 6	Top	18.9	4.3	22.8	1.9	Bottom	19.5	3.8	19.5	1.2
Page 7	Top	19.5	3.6	18.5	0.5	Bottom	20.0	3.9	19.5	1.5
Page 8	Top	20.0	3.8	19.0	1.8	Bottom	20.7	4.2	20.3	2.2
Page 9	Top	20.7	4.4	21.3	3.4	Bottom	21.3	3.8	17.8	2.6
Page 10	Top	21.4	3.8	17.3	2.0	Bottom	21.9	3.5	16.1	1.1
Page 11	Top	21.9	4.7	21.5	5.7	Bottom	22.4	4.0	17.9	4.0
Page 12	Top	22.4	4.6	20.5	5.0	Bottom	23.7	4.9	20.3	8.0
Page 13	Top	23.8	4.5	18.9	7.9	Bottom	25.8	5.1	19.8	14.7
Page 14	Top	25.9	4.8	18.5	14.4	Bottom	29.2	5.2	17.8	35.3

2005: 1-13 (390 alpacas tested)

Page 1	Top	13.4	3.7	27.4	0.5	Bottom	15.8	3.5	22.3	0.4
Page 2	Top	15.8	3.8	24.1	0.7	Bottom	16.6	3.6	21.7	0.7
Page 3	Top	16.6	3.6	21.7	0.7	Bottom	17.2	4.2	24.1	1.6
Page 4	Top	17.3	4.1	24.0	1.4	Bottom	17.8	3.4	19.0	0.7
Page 5	Top	17.8	6.6	37.1	2.0	Bottom	18.4	5.3	28.8	3.0
Page 6	Top	18.4	4.1	22.4	0.8	Bottom	18.7	4.4	23.3	2.7
Page 7	Top	18.8	4.1	21.8	1.1	Bottom	19.3	3.8	19.7	0.9
Page 8	Top	19.4	3.8	19.5	0.8	Bottom	19.9	4.1	20.7	1.6
Page 9	Top	19.9	4.5	22.5	2.0	Bottom	20.4	4.2	20.7	2.2
Page 10	Top	20.4	4.5	22.0	2.9	Bottom	21.1	4.8	22.8	4.7
Page 11	Top	21.2	4.4	20.5	3.2	Bottom	22.1	4.7	21.4	5.1
Page 12	Top	22.1	4.1	18.7	4.3	Bottom	23.4	4.4	18.9	6.1
Page 13	Top	23.4	5.5	23.4	10.5	Bottom	28.0	4.9	17.5	25.5

where I can testify to the statistics given in the last alpaca magazine showing that over 70% of alpaca fiber produced in Peru is above 26 microns. There are very few sweaters on the market that you can wear in comfort comparable to cashmere. We should consider raising the bar to be the country that can produce them.

We are raising a fiber bearing animal that is kin to the vicuña so why would we steer breeding programs away from this vital element of fineness. The same reason Peru is where they are because someone set the standard for something else and directed financial rewards to support it. Just as our marketing programs and judging programs can and are doing. Our biggest concern is how easy it would be to seal in any particular prejudice or trend if adopted into a breed standard.

Our marketing programs are proving to do just this. Even our show rules have geared show judgment based on prejudicial marketing preparation which sets the judges to score alpacas on fleece preparation from the outside verses fine scientific assessments of what's on the inside. What ever happened to the saying you can not judge a book by its cover. The same goes for the alpaca. What is the purpose of showing if the judges are not trained to have the best available scientific training to truly assess and testify to what is the best fiber bearing and solid alpaca in the class? Judges should be highly trained to measure and assess all aspects of fiber from the skin to the



▲ Silky Fleeces

tip of the alpaca regardless of what condition it comes into the ring.

Why is our National Breed Organization so remiss on bringing in more professionals from the textile sciences to train our judges? We are setting ourselves up to loose the race in creating a national herd of Elite quality alpacas if we keep our judges program corralled by idealizing single breed or club standards. It is really up to all of us as breeders to spend more time professionally looking at what we are breeding for and why i.e. sound science and measurements that truly tell us what we have achieved and where we want our future breeding programs to be headed.

This is precisely why we are motivated to write another publication. We want alpaca breeders nationwide to be encouraged to breed for the finer things in alpacas "their fleece!" What keeps breeders from moving this direction in a serious way is that the finer fleece types of course do not produce the high volume in weight and so are not as well recognized by the judges as being dense and or by the fleece point system in regards to weight ... yet in retrospect they are always at the top of our entire page of histograms starting at 12.9 2.5 19.4 0.2. This fleece being a light to medium fawn Vicuña type simply stated perfectly reflects "The Gold of the Andes" Similarly our following 5 to 6 pages with 18 micron and under, are dominated with the vicuña and Merino types and range in age 1 year to 10 years old. Regardless of how they are being recognized by AOBA judges we know their value and will continue to breed heavily for them. I do believe the tide is turning and we will all soon recognize the value as the world market is demanding **FINENESS**.

As much as it sounds like we are breeding to recreate the vicuña alpaca we also are as much



▲ Proper judging evaluation

dedicated to understanding the values in all the other fleece types that are seen in our huacaya breeding programs. As long as we can create results that lead to as luxurious and fine fleece qualities sought after in all fine fashion houses of the world that vicuña brings, they are valuable.

Diversity is one of the most valuable and most exciting elements of breeding alpacas and why we can afford so many different breeding programs in this industry.

Each year Snowmass Alpacas strives to improve on the uniqueness of each fiber type and are startled at the new developments, such as the "Silky Fleece." It is at the top of our charts in line with our finest Vicuña and Merino types at 13.5 and 14 microns. They are some of our most prized and finest fleeces we have developed in standing with our "Vicuña types." The crimp on these Silkies is very different to the tight and high frequency crimped fleece as seen with the Vicuña or Merino types and varies in degree of amplitude and frequency of crimp as described by the Lincoln and Corriedale. The identifying uniqueness of these fleeces to all those we have identified is their extreme low scale presenting an extreme brightness, silky hand, and most of these have added staple length which to date is the longest we have produced and, uniquely, falls into locks as juveniles unlike the Vicuña or Merino types. The fiber looks very similar to the Suri and or Corriedale or Lincoln fleece as juveniles. The first growth of fiber falls into very similar long well defined staple locks that by 9 months explode with a large abundance of secondary follicle branching seen with a tighter defined high amplitude and high frequency crimp formation. This is related to the expression of late secondary follicle branching in hand with early and strong growth from birth to 3 months of age.

At 6 months you see the start of the branching and the thickening of the staple as it grows before your very eyes, day by day, with greater length than most other types of fleece and unlike any other.

In defining the Silkies we find an incredible brightness as intense and more than some of the finest Suri fleeces giving the most intense soft

hand. It's not just the low scale as we have tested some to be as fine as 13.5 AFD. The other amazing results are staple length in excess of 5.5 inches at 9.5 months with an annualized blanket weight of 4.0lbs as weighed at fleece shows in 2005.

These fleeces are the first fleeces we have produced that at 9.5 months received a full 20 points for weight (as juveniles with microns of 14.8 and 13.5). They also, hands down, should easily receive a full 20 points for fineness and handle, but did not. The brightness is the best we have seen and as bright as the best Suris we have raised and should, in all respects, receive a full 10 points. But, to date, we have not seen any huacaya fleece that has been awarded a full 10 points so we do not know how well this assessment is understood in huacaya.

▼ Baby Silkies





The most exciting thing about these fleeces is that they are the most uniform types in length and style over the entire alpaca that we have bred to date. They truly have blanket quality fleece length and fineness into their entire extremities including the front of the Chest, the Apron, down the legs and even the neck is 3.8 inches long.

Contrary to what some fiber instructors would call this type of fleece (such as SURI/HUACAYA CROSS)

these are not crosses with Suri's. There are more than 3 generations of very strong recorded huacaya breeding in these alpacas with no Suri ever produced or seen in the genetic background to suddenly come out. These fleeces have very well defined crimp and if you look at the way the fleece lays on the body of the alpaca you would not make this confusion. The only concession we would make is the influence of hybridization they most likely have as does the larger popula-

tion of our alpacas in the US. Nonetheless it has the similar luxurious properties of fineness and luster and hand that the Suri has (related to a much lower Scale structure) with added crimp that any textile mill and buyer would love to add to Suri fiber to make it easier to process. Lastly and most importantly is this Silky type is seen to be as fine as some of our Vicuña types. Without question a truly remarkable fleece and very unique and we hope to reproduce it more and more. At the same time we are not directing our entire focus on this type as there is still yet much more to learn as these alpacas age and how well they keep their fineness, and if the staple length continues to be longer in the 3 and 4 year growth. We cannot afford (in our quest for improving fineness, handle, and density) to let our programs steer away from the finest production in our Vicuña and Merino types. Some crossing will be done with the Silkies and these types as well. If in fact we had a breed standard that was exclusive to true alpaca type and or Vicuña type we would not have the open incentive to produce this type of fleece which is just as valuable and more in some applications of textiles.



Our program in all its diversions of crimp style is specifically geared more and more to selecting for extension of fineness. It is here we have found the same genetic pattern linking fineness extension with added staple length over the entire alpacas fleece with similar results in length that we are seeing in the silkies.

We are certain that as we select for fineness in hand with overall extension of fineness in our alpacas that overall density and staple length improves at the same time.

To date our finest fleeces consistently are the Vicuña types which have a slightly higher frequency of crimp than Merino, Silky, or other fleece types. The staple length is not as long however is well within 4 inches on our more advanced Vicuña type alpacas. The average histogram being 14.4 2.5 17.4 0.3 in the juvenile fleeces, the finest being 12.9 2.5 19.4 0.2.

Our true alpaca breeding studs we describe as Vicuña type which maintain the best overall fineness well into maturity (determined by histograms) are seen at left.

Many established breeders in South America like ourselves have come to understand the value in producers of Royal Baby alpaca which

(Snowmass Premier Gold) Beige
17.7 4.0 22.3 0.9 at 4 years
(Snowmass Icy Hot) Dark Fawn
16.5 3.6 21.6 0.5 at 3.5 years
(Snowmass Royal Bronze) Brown
14.9 2.9 19.5 0.4 at 2.5 years
16.4 5.5 33.5 1.2 at 3.5 years and proven breeder
(Snowmass Sizlin Hot) Light Brown
15.2 3. 21.7 0.6 at 2.5 years
16.1 4.0 25.1 0.8 at 3.5 years and proven breeder
(Snowmass Nova's Ghirardelli) Black
15.6 .6 18.2 0.6 at 3 years
17.5 4.3 24.5 1.0 at 4 years and proven breeder
(Snowmass Avalon) Fawn Roan
15.5 2.8 24.5 0.6 at 4 years proven breeder
15.7 3.8 18.3 2.4 at 5 years and proven breeder
(Snowmass Midnight Magic) Black
18.4. 4.7 21.5 3.2 at 4 years and proven breeder
19.2 5.0 26.2 4.4 at 5 years
(Royal Andean Anapamu) Maroon.
17.5 3.5 20.0 1.1 at 6 years

are seen to produce and maintain a Royal Baby fineness value into their older years and this in itself is a very important selection criteria. As mentioned there are programs run by Dr. Jane Wheeler in Peru that are selecting and registering alpacas showing no hybridization and found to have vicuña DNA specifically to increase a stronger genetic breeding herds of true alpacas for these very same fineness production statistics.

Hands down the fashion designers, as well as the fine wool knitwear buyers would select a fleece made from the vicuna type rather than a heavier weighted, stronger micron fleece. At the same time, they would buy any advanced fleece with same fineness, extended staple length and extreme low scale and brightness. These are important elements needed to create Elite fleece for fine fashion garments and something to be considered in our breeding programs.

The demand for this finer alpaca fiber is going up while the stronger fiber is left on the shelf longer. The buyers are now paying breeders more for producing finer micron fleece. This means the

producer of finer fleece – by offsetting quantity for quality – will earn more than the producer of a heavier weighted, stronger micron fleece.

It is now proven profitable for the breeder to breed finer fibered alpacas in South America than it was in the past. The problem is more related to getting the breeders to get out of old breeding habits of breeding for size and volume.

Breeding for the goals that will get alpaca fiber recognized world wide as the most luxurious fiber in the world is one step closer to the goal. We are all seeking to support the WORLD market for alpaca.

We all hope the world to see we produce this here in the US which will strengthen the interest to acquire our genetics as a source to help developing alpaca nations to produce the same. This is what we as breeders should direct our leaders in this industry to take a stronger lead on and, with all our involvement, it will be a great achievement and lend to continued success in the United States Alpaca Industry.



Breeding Selection

Snowmass Llamas and Alpacas began in 1983 and became solely Snowmass Alpacas in 1989. Our herd has been in a continual evolution for all these years. We have devoted ourselves in these years to pursue creating one of the finest breeding herds of alpacas in the World.

Our breeding criteria is based upon the following individual elements in order of importance. All these attributes are there to make a 100% true selection.

- Soundness of body and limb (conformational balance and form and function)
- Fineness of blanket fleece and extremities from the wool cap, neck, and into the leg. Low average micron (ideally midside below 20 in the 1st year and 2nd years, and low 20's for following years. Grid Samples ideally below 20 in the first year and low 20's into maturity.) tested by blanket and grid samples. We are more interested in histogram readings from samples cut directly from the end closest to the skin (butt cut) where it is less affected by weather and environment. This gives you a better understanding of the true genetic potential of the alpaca being tested.
- Uniformity and extension of blanket fiber through brisket, shoulder, hip, head, neck, and leg. (greater secondary follicle ratios showing evolution to more true wool fibers into extremities)
- Lack of medulation (greater secondary follicle ratios and low percentage over 30 microns)
- Luster or brightness (handle and scale height)
- Staple length (minimum of 3 inches a year preferably 4 to 6 inches)
- Volume (the more finer fiber the better; measured by follicle measurements with greater secondary to primary follicle ratios as well as by weight)
- Crimp and character (There are a wide range of crimp styles and we tend to like and breed for them all. Each will represent various textile advantages and as long as the above attributes are present, we are not preferential to any specific type)

We find the finest colored fiber which is 14 to 18 microns (and stays under 18 microns) is what we refer to as Vicuña Alpaca. We have dedicated much of our breeding program to extending uniformity and increasing staple length to this type of fibered alpaca.

We have also bred some exciting Merino type fleeces that are in the same low micron range as the vicuña type. These are 14 to 18 micron which maintain an under 20 micron fineness into maturity. These also have an advanced extension of fine fiber throughout the blankets and into the extremities. They are bred very carefully to enhance vigor and strong body frame (such as seen with our Silkies).

We have also bred for the Corriedale, Romney, and Lincoln type fleeces that have more dramatic amplitude of crimp and typically longer staple length. Currently we are breeding to have these fleece types finer and brighter and have had great success.

North American alpaca breeders are just stepping into the greatest advancements in alpaca breeding and we have many exciting years of breeding ahead. We wish to end this story of our breeding efforts and reflections with inspiration and enthusiasm for all of us as we work together towards giving the United States an International reputation for having the finest concentration of alpacas in the world.

Don & Julie Skinner - Snowmass Alpacas

www.snowmassalpacas.com



Snowmass Alpacas
Genetic Breeding Center

Today's actions shape
tomorrow's outcome...



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