

# Fibers and Fabrics

Level  
1

## Oregon 4-H Clothing Construction Fact Sheets: Basic Skills—Level 1

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### Natural and man-made fibers

Fibers are the basic component of fabrics. Each type of fiber has unique characteristics, and fabrics have the same characteristics as the fibers they are made from. Learning about fibers is important because it helps you understand how the fabric will perform and what care the fabric needs. Fibers can be natural or man-made.

#### Natural fibers

Natural fibers come from natural sources, such as plants and animals. There are four natural fibers: cotton, linen, silk, and wool (figure 1). These fibers are naturally absorbent and porous. This is why fabrics made from natural fibers will be comfortable to wear in a variety of temperatures. However, natural fibers will also shrink if they are not handled carefully.



Figure 1. Cotton is an example of a natural fiber.

#### Man-made fibers

The term “man-made fiber” refers to all fibers not found in nature. Man-made fibers are made from a synthetic source (chemicals, such as petroleum) or a cellulose source that has been enhanced in a lab (figure 2). Man-made fibers include nylon, polyester, olefin, rayon, acetate, triacetate, spandex, and acrylic. These fibers are highly resilient, so they resist creases. However, because they are not very absorbent or porous, they may be uncomfortable in hot or humid weather.

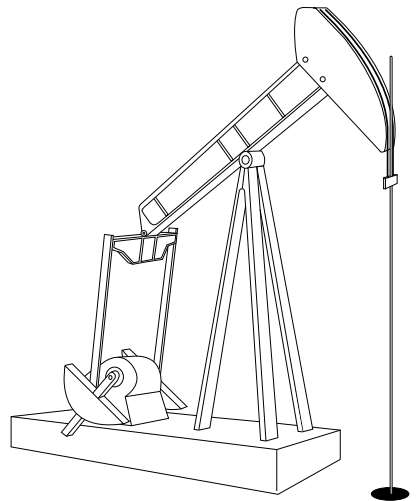


Figure 2. Some man-made fibers are made from a synthetic source, such as petroleum.

### Woven, knitted, and other fabric construction

Fibers or yarns made from fibers can be used in many ways to make fabrics. Fabric construction methods include weaving, knitting, felting, lacemaking, and bonding. Since the way a fabric is constructed determines how it looks, handles, and behaves, it is important to be able to recognize and tell the difference between common fabric construction methods.



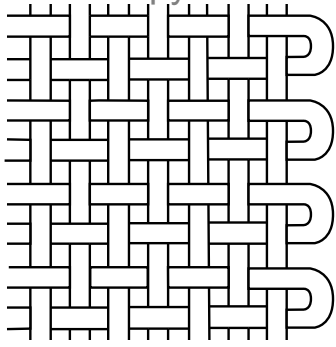


Figure 3. Woven fabric (general).

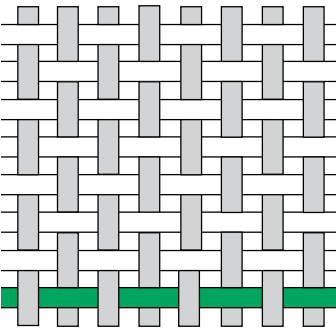


Figure 4. Plain weave.

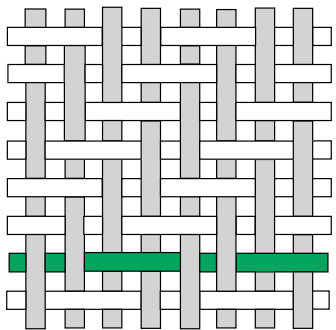


Figure 5. Twill weave.

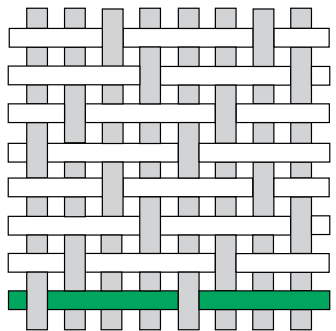


Figure 6. Satin weave.

## Woven fabrics

Woven fabrics are made from two sets of yarns crossed over and under each other (figure 3). The lengthwise yarns are called the “lengthwise yarn direction,” “lengthwise grain,” or “warp.” Lengthwise yarns extend the entire length of a piece of fabric. Crosswise yarns weave back and forth from side to side and are called the “crosswise yarn direction,” “crosswise grain,” or “weft.” Any diagonal intersecting between the lengthwise grain and the crosswise grain is called the bias. The lengthwise edge of the fabric, a tightly woven strip, is called the “selvage.” The selvage is extra strong and does not ravel.

Lengthwise grain has very little stretch. The lengthwise grain runs vertically (from shoulder to hemline) in most garments. Crosswise grain has more give. The crosswise grain is used vertically only to achieve a certain design effect, such as a border placement. Bias stretches the most. Cutting a garment on the bias is usually done to achieve a soft drape. Bias-cut garments tend to be unstable at the hemline.

When you buy woven fabric, check to see that the lengthwise yarns and crosswise yarns are at right angles to each other. This is called “on-grain.” Fabrics that do not have yarns at right angles to each other are called “off-grain.” Most of today’s fabrics have finishes that will not allow you to straighten or put yarns at right angles to each other if it was not done during manufacturing.

Yarns can be woven in different patterns called weaves. Each kind of weave is made using different fibers, yarn sizes, and spacings between yarns, and by interlacing the yarns in different patterns. The various fibers, yarns, and weave patterns affect the handling and behavior of the fabric. There are three basic weaves: plain, twill, and satin.

**Plain weave** is used frequently because it produces a strong, firm fabric. Plain weave is created with a simple under-and-over pattern (figure 4). Lightweight plain-weave fabrics include chiffon, voile, and organdy. Medium-weight plain-weave fabrics include muslin, calico, percale, and gingham. Heavyweight plain-weave fabrics include duck, canvas, and burlap.

**Twill weave** is created by crosswise yarns going over two to four lengthwise yarns (figure 5). On each line, the pattern moves one step to the right or left to make a diagonal line or ridge. Twills are more durable than plain weaves. Common twill fabrics include denim and gabardine.

**Satin weave** is created by a crosswise yarn going over four to eight lengthwise yarns (figure 6). On each line, the pattern shifts to the left or right. This yarns that go over the top of other yarns are called “floats.” Common fabrics made from a satin weave include satin, velvet, velveteen, and crepe-back satin. Sateen fabric is a variation in which lengthwise yarns float over crosswise yarns.

## Knit fabrics

Knit fabrics are produced with a series of interlocking loops or stitches. There are two main types of knits: weft and warp.

### Weft knits

This type is similar to hand-knitting. The knitting loops are made one at a time and added to each other in a crosswise direction (figure 7). This row of loops is called a “course” and is similar to the crosswise grain in woven fabrics. As loops are added, the yarn moves horizontally across the fabric. The fabric is constructed as these horizontal rows of knit loops (courses) are added on top of each other. Each vertical line of loops is called a “wale” and is similar to the lengthwise grain in woven fabrics.

Knit fabrics come in two forms: flat and tubular. Knits do not have a selvage. Some flat knits have a perforated lengthwise edge, which is similar to the selvages on wovens. However, this edge is not dependably straight so you must rely on your eye to tell whether a knit is even and aligned.

**Single knit (jersey)** has knit loops facing only one side of the fabric. It is a fairly stretchy fabric, and each side has a different appearance. The face shows the “V” (the knit loop), and the back shows the horizontal part of the loop. Single knits have more stretch crosswise than lengthwise. Patterns that are designed for knits will specify the amount of stretch needed.

**Rib knit** is a special type of single knit. It has lengthwise rows that face opposite sides of the fabric. Rib knit looks the same on both sides. Rib knits fabrics are bulkier but have better recovery from stretch than other single knits. Rib knit is often seen on the cuffs, neckline, and lower edge of sweaters.

**Double knit** is made by machines with two sets of needles and additional sets of yarns, giving a double thickness to the fabric. Double knits are generally run-proof and firmer, less stretchy, and more stable than single knits. They are as bulky or bulkier than rib knits. Double knits are often used for patterns for woven fabrics, rather than patterns for stretchy knits.

**Interlock** is a common type of double knit. Because interlock knits have a smooth surface, they often have printed designs. They are less stretchy than single rib knits but more stretchy than other double knits. The yarns will run easily in one direction. Measure the knit with a stretch gauge for pattern selection.

### Warp knits

This type uses many more yarns than weft knitting. Each lengthwise yarn is guided by a needle and flows a zigzag path through the fabric (figure 8). Warp knitting makes a run-proof fabric that is flatter and less bulky than fabrics made by weft knitting.

**Tricot** is an example of weft knitting. Tricot is typically made with two sets of yarns. It is lightweight, does not run, and is often used for making lingerie.

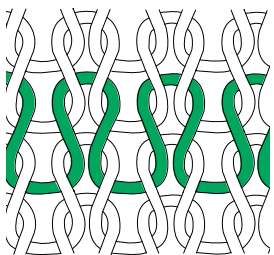


Figure 7.  
Weft knit.

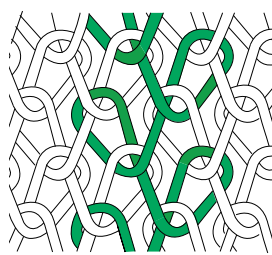


Figure 8.  
Warp knit.

### Considerations for knit fabrics

There are many characteristics of knit fabrics that will influence what pattern you choose and what sewing techniques you use. Knits vary from lightweight to bulky and from tightly to loosely knit. The amount of stretch varies from minimal (stable knits) to very stretchy. Knowing the stretch and recovery characteristics of a fabric is a very important first step and will affect your other decisions.

To determine fabric stretch and recovery:

1. Fold the yardage on the crosswise grain in the middle of the fabric (not near the selvage or cut edge).
2. Mark a 4-inch section with pins.
3. Match one pin with the end of a ruler and stretch just as far as the fabric will stretch easily. Note the measurement length at the second pin.
4. Each additional inch of stretch is equal to an additional 25% stretch:
  - » 5 inches = 25% stretch
  - » 6 inches = 50% stretch
  - » 7 inches = 75% stretch
  - » 8 inches = 100% stretch
5. While still holding the fold, let the fabric relax to check recovery. It should measure 4 inches. A fabric that does not fully recover may sag or stretch out of shape during wear.

Figure 9 illustrates stable, moderately stretchy, and very stretchy knits.

- Knits that stretch to  $4\frac{3}{4}$  inches or less are generally considered **stable**.
- Knits that stretch up to about  $5\frac{3}{8}$  inches (35%) are considered **moderately stretchy**.
- Knits that stretch to  $5\frac{1}{2}$  inches and beyond are considered **very stretchy**.

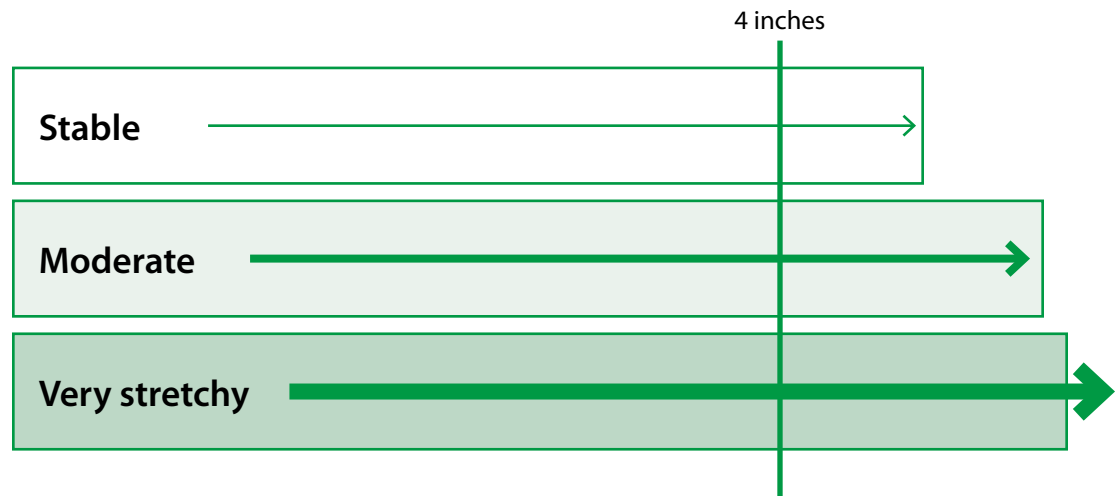


Figure 9. Guideline for stable, moderate, and very stretchy knits.

### Other fabric construction

**Felt** is made by matting together wool, other hair fibers, or certain man-made fibers. Felting is done by applying heat, moisture, and pressure to a layered web of tangled fibers. Felt does not ravel and does not have a yarn direction or grain. Felt is not durable as a garment fabric, but it is often used in decorative projects for home furnishings.

**Lace** is made by twisting, intertwining, and sometimes knotting threads around each other to form a mesh of holes and pattern. Lace ranges from simple nets to complex floral patterns and from narrow trims to dress-width yardage.

**Fusing, laminating, and bonding** use adhesives to interlock short fibers or glue fabrics together. Interfacing is an example of fused fibers. A laminated fabric may be a bond of fabric to fabric, fabric to foam, or a combination fabric and foam. Fabrics are laminated or bonded to increase warmth, reduce cost, improve handling, reduce shrinkage, and increase the uses of the fabric.

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This publication is based on and replaces OSU Extension publication 4-H 92114, *Woven, Knitted, and Other Fabrics: 4-H Clothing, Skill Level 1*, by Ardis W. Koester, Extension textiles and clothing specialist emeritus; and Barbara J. Sawyer, Extension specialist emeritus, 4-H Youth Development; both of Oregon State University.

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