Sheep Shearing and Basic Care 101
Student Handbook

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Photo by Paige Green

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Introduction to this Handbook

This handbook has been written as a supplemental document for students going through the Sheep Shearing and Basic Care 101 course at the UCANR Hopland Research and Extension Center. It is not a standalone how-to book, but rather a document intended to serve as your notes for this course. All of the primary principles covered in this course can be found in this handbook, saving you valuable time and energy that might have been spent diligently taking notes during class. The course is mostly hands-on, as we believe that your best shot at learning sheep shearing in a short period of time is to get as many opportunities to watch and do the process as is feasible.

This symbol will be present throughout **Section 2: Shearing Sheep**. You will find it in the margins when content nearby contains information relating to animal welfare. Your knowledge of these principles will not only make you more effective as a shearer, but you will be able to pass these principles and information onto the individuals you come across when shearing: from producers to the general public. There is a major lack of awareness and understanding among the public when it comes to shearing sheep, and animal husbandry in general. By carrying this information around in your brain you can help fill this void with good evidence-based information, as opposed to the sensationalized propaganda that is increasingly common in today's world.

Words found throughout this handbook that are bold and italicized (***like this***) refer to words that are defined for you in Appendix A: Glossary of Terms.

SECTION 1

Sheep Care and Management

BY ALISON SMITH

Introduction to Sheep

Why sheep? Sheep are perhaps the most versatile livestock production animals in the world. They are raised for wool and fiber, meat and milk. Different breeds are better for different production goals, however all breeds excel at rangeland management and fire fuel reduction with their grazing.

There are over 1,000 different breeds of sheep throughout the world, bred for different purposes. There are breeds such as Merino or Rambouillet, which are bred primarily for their fine wool. Those with medium wool, such as Targhee or Columbias and those with long wool, such as the Border Leicester or Lincolns. Then there are breeds which do not produce high quality wool but mature faster and have better lamb meat production and gain better on farm feeds, such as Suffolks and Hampshires.

Many producers will crossbreed their sheep to produce dual purpose sheep which are best adapted to their climate and terrain. In recent years and with the decline of professional shearers, some have turned to the hair breeds of sheep such as Dorpers or Katahdins for meat which do not produce wool at all but a hair coat. These hair sheep will shed their coats annually and do not need to be shorn.

Some examples of dairy sheep are East Friesians and Lacaunes, which are prized for their high milk yield which contains a high level of milk solids, excellent for cheese making. There are also some Northern European breeds such as Icelandics and Shetlands, which have a dual coated fleece and short tails.

Grazing Benefits

Sheep graze differently than goats and cattle and therefore make excellent companions or alternatives to other ruminants. Sheep prefer to graze on forbs or broadleaf weeds, whereas cattle prefer grasses and goats are browsers, not grazers, and will control more shrubs and taller invasives. Some producers will graze different species together, whereas others find it more effective to graze them in rotation. Sheep, more than any other livestock animal, contribute to the reduction in carbon in the atmosphere and enhance carbon cycling in our environment. Wool is an environmentally friendly and renewable fiber that is not only biodegradable, but also helps reduce greenhouse gases. See the article “Wool and the Carbon Cycle” at the end of this packet.

The ASI Sheep Care Guide has this to say on sheep and grazing “As ruminants, sheep efficiently convert renewable forage resources to high quality food and fiber and can add tangible returns to the environment. In many areas of the country, sheep glean crop residues or utilize agricultural by-products or forage resources that are otherwise unusable by humans or most other livestock. Sheep can play an important role in the control of some noxious weeds, such as leafy spurge.” Sheep have much less impact on the soil and landscape than cattle and ranchers can stock many more sheep on the same acreage as cattle, making them potentially a much higher production animal.

Sheep Anatomy

Sheep are classified as small ruminants. As such, they have 4 chambered stomachs. The rumen is the first and by far the largest chamber of the stomach. As sheep graze, the forage goes directly into the rumen. Once the sheep has finished grazing, they will lie down to ruminate, where the rumen contents are regurgitated as a cud and the sheep will chew its cud. Once finished with this part, the cud is swallowed and this time bypasses the rumen and goes directly into the reticulum, where it then passes to the omasum and abomasum. Because the rumen is so large and takes up such a large percentage of the abdomen, it is imperative that sheep are held off food and the rumen is empty at the time of shearing for the comfort and safety of the sheep.

Reproduction

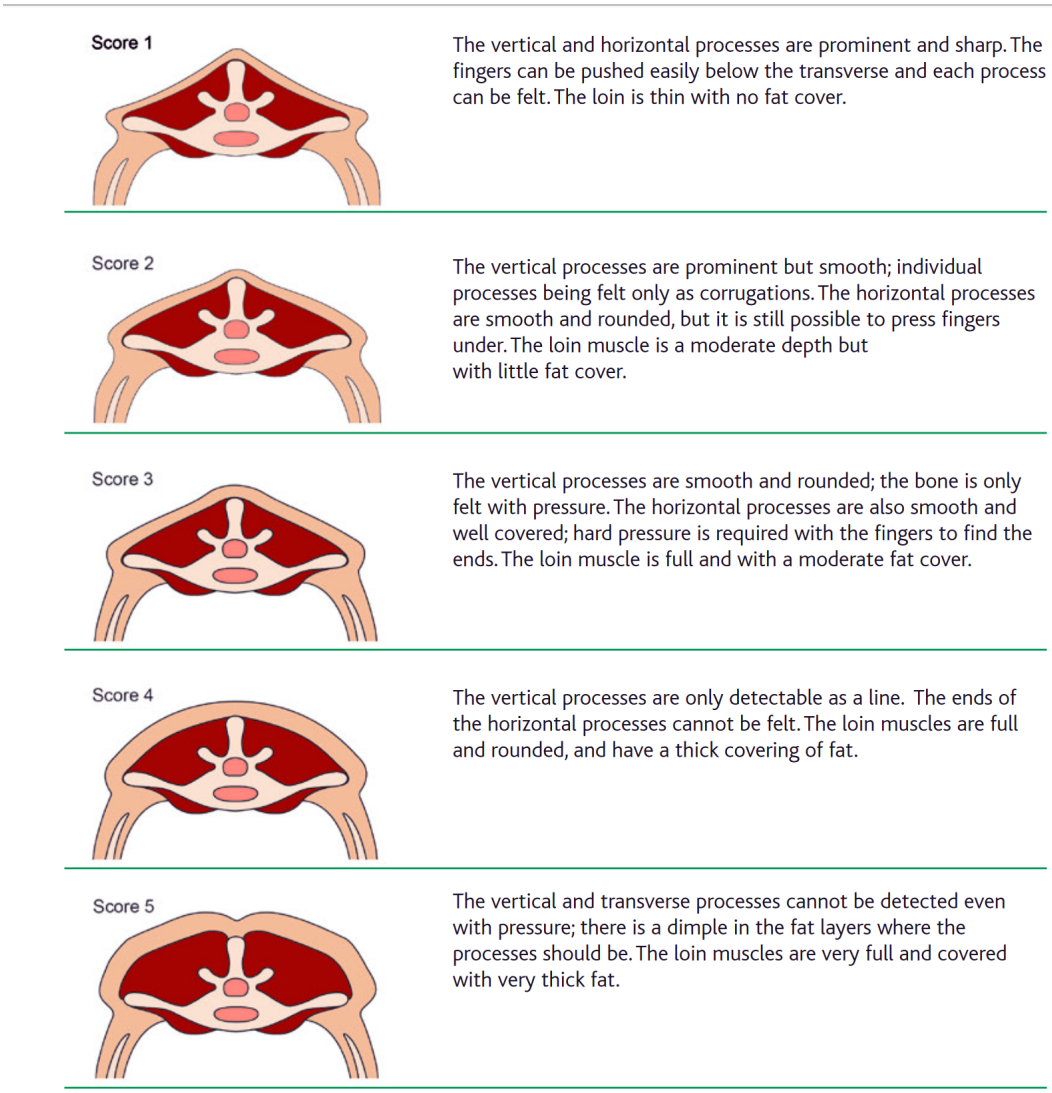
The gestation period of a ewe is 5 months or approximately 150 days. Her estrus cycle is usually around 17 days so for natural breeding purposes, it's advisable to leave rams in with ewes for the length of 2 cycles. Lambing and pregnancy is beyond the purpose of this course but there are many resources listed at the end this handbook or consult one of your instructors for further information.

Body Condition Scoring

The most common and universal method of assessing the condition of livestock is the Body Condition Scoring system. There are many similar diagrams to the one below that essentially have the same descriptors.

You cannot assess the condition of your sheep simply by looking at it. The most obvious reason for this is that unless it has been freshly shorn, the wool will disguise many of the bony angles of the body. Also, depending on if the sheep has recently eaten, the rumen may be very full or very empty, which can change the appearance of the sheep drastically.

The only reliable method of body condition scoring is to feel with the fingers over the loin and hip areas of the sheep. It is also important to get used to assessing body condition pre- and post-shearing so you know what you are feeling when you put your hands on the sheep's back. When assessing the health of the flock or an individual animal, a sudden change in body condition indicates a problem which should be addressed immediately.



Predation

Sheep are prey animals and as such will usually flock together with a herding instinct which makes them easier to herd or move because they prefer to stick together. Some breeds have much stronger flocking instinct than others and are more suitable for range sheep. We will look more at behavior and movement in the next section.

One of the major hurdles to any sheep producer is the issue of predation. Because they are relatively defenseless, sheep have many natural enemies. Coyotes are the major predator in our area and their increase in population has been a major contributor to the decline in sheep numbers. Coyotes will study the behavior of the flock, the shepherd and any guard animals on duty and strike when they think the flock is unprotected. Coyotes can hunt singly or in a pair or pack. Typical signs of a coyote attack are puncture marks and bleeding around the throat or neck area. They are very efficient killers but often signs of a struggle may be present. Lambs may be carried off out of sight but adult ewes and rams will most likely be eaten at the site of the kill.

Other predators of sheep include domestic dogs, mountain lions, bears, eagles and wild pigs. Many producers find that having a guard animal with the flock greatly reduces the losses by predation. Popular guard animals include livestock guardian dogs, llamas and donkeys. The most effective strategy in reducing predator losses however are a combination of tools the shepherd can use.

The Canadian Sheep Federation has an excellent article on predation for further reading:
https://www.cansheep.ca/documents/VTB_Predation%20Section%207.pdf

Behavior

Sheep are prey animals and prey animals have very distinct flight zones. These flight zones will differ based on species, breed, tameness and what or who is approaching them. Below is a diagram of a typical sheep flight zone. How far the sheep can see behind it depends on how wooly the face is. Sheep with very wooly faces cannot see nearly as far behind them as shorn or clean-faced sheep. As you can see, there is a point of balance for all sheep that will get them to move in one direction or another. Once you cross that point of balance, the sheep will move away from you in the opposite direction.

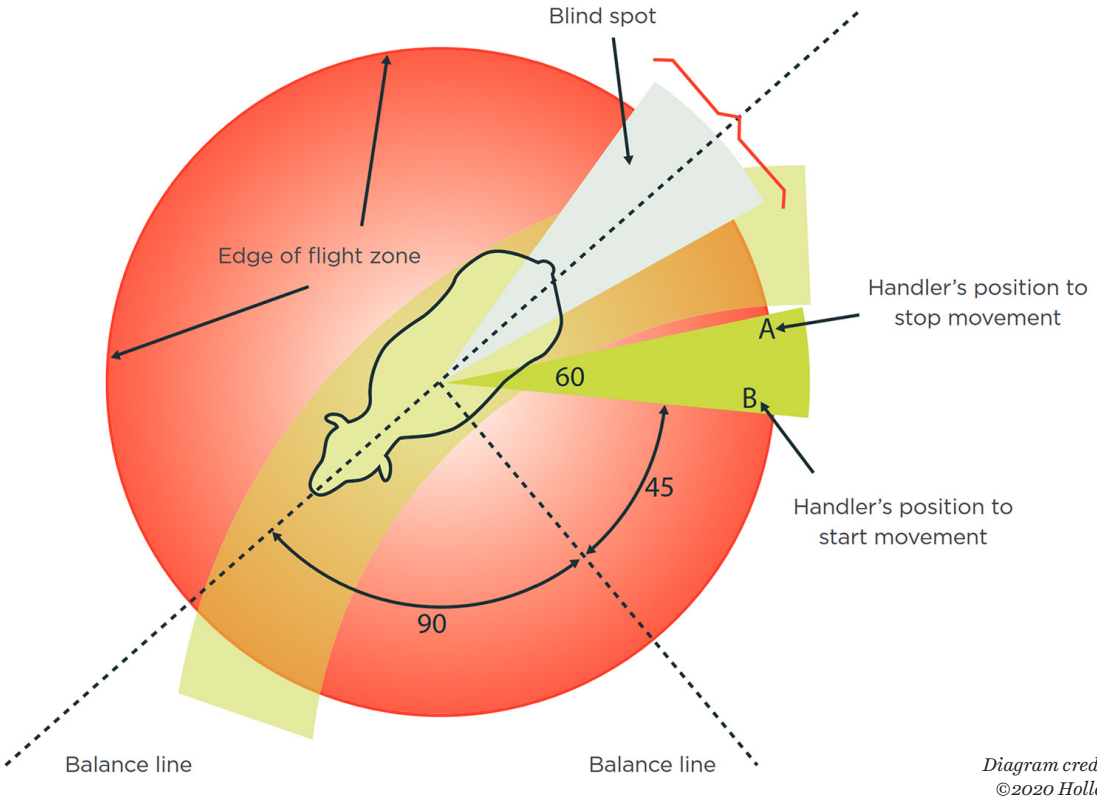


Diagram credit: NZ WorkSafe

Sheep will always prefer to be with other sheep and it can be very difficult to move only one sheep in the direction you want. Because of this, it is always preferable to keep at least two sheep together, even if you only need to perform a procedure on one of them. Below is an example of a large flock of sheep all moving together.

Image credit: Colorado State University

"This picture illustrates the flight zone of a large flock of sheep … Notice that the sheep are circling around the handlers while maintaining a safe distance and keeping the people in sight. Note that the sheep tend to move in the opposite direction of handler movement. Walking in the opposite direction of the direction of desired movement can be used to move groups of animals. Walking in the opposite direction tends to speed up movement and walking in the same direction tends to slow down movements. These principles work with all herding animals. When animals are completely tame they will have no flight zone." ©T. Grandin, Understanding Flight Zone and Point of Balance for Low Stress Handling of Cattle, Sheep, and Pigs. Colorado State University, 2019

Sheep, like many other animals are very sensitive to the humans around them. When you are trying to rush them or get a job done quickly, it's inevitable that it will take twice as long. If you are upset or angry, it's always better to step away and take a break to gather yourself since they will always react negatively when you are in an upset state.

Infrastructure and Movement

When setting up corrals and chutes, it's important to remember that the smallest things can spook an animal and make movement difficult, if not impossible. Whenever possible, have chutes curved or at least gates and doorways angled so that sheep are always moving in a circular direction. No animal wants to walk into what appears to be a dead end and once sheep get bunched up in a corner, it's very hard to get them out. This is the situation that herding dogs have the most difficult time with because it is very hard for them to maneuver the sheep off the edge of the fence and out of the corner. Never stand directly in front of a sheep as it can easily panic them, resulting in injury to the handler or the sheep. Remember, they may not be very big but they are very fast and strong for their size. They often want to run past a handler so turning slightly away and averting the eyes is often effective in getting them to move the direction you want. Again, sheep are calmer and move much easier in groups so it's always preferable to avoid having one sheep by itself.

Surfaces should be non-slip and dull. Non-slip surfaces will give the sheep purchase with their feet so they feel more stable and are less prone to injury. Shiny surfaces can be reflective or sparkling in the light, which sheep do not like and are reluctant to move past. If the sheep are balking or having trouble moving, look from their position to try and figure out what is making them stop. Here is a list of a few common things to look for:

- Clanking metal
- A person standing ahead of them
- Jackets, sweatshirts or other clothing hanging on a fencepost
- Puddles reflecting sunlight
- Contrast – having to move into bright light or darkness from the opposite
- Hissing or high pitched noises
- Grates on the floor or change in texture
- Small objects on the floor that stand out

These are just a few examples but if you notice one of these things and can remedy it, the job of moving sheep will be much more efficient and less stressful for everyone.

Biosecurity

The most important thing you can do to prevent the spread of disease and protect the flock is practice good biosecurity practices:

- Keep a good disinfectant made for use in livestock facilities on hand at all times.
- Wear rubber boots when visiting other ranches, farms and feedlots and clean them before and after with soap followed by a disinfectant. Remember, many disinfectants are deactivated by organic matter such as mud and manure.
- Wash hands thoroughly before and after handling all animals.
- Clean and disinfect all equipment such as shearing equipment, docking and marking equipment.
- Always change equipment after handling an animal that appears sick or has abscesses.
- In areas with high visitor traffic, place a disinfectant footbath and change it regularly.

COMMON DISEASES

It is imperative that you know how to recognize signs of disease in sheep. Often a sick sheep will stand or lie down apart from the others, head down and ears drooping. It may be breathing rapidly or show signs of disorientation or weakness. Since sheep are prey animals however, it's not uncommon for a very sick sheep to use its last reserves of strength to get up and run away when you approach, causing you to think it's fine. The best thing is to bring it in where you can properly assess it. Look at the body condition, breathing and note if it's chewing its cud when it's relaxed and take its temperature (normal temp = 100 - 103°F). Check mucous membranes under the lips or on the inside of the eyelid to make sure they are a healthy color of pink and not pale or white, which is a sign of anemia. There are many other ruminant diseases, including zoonotic diseases (those transmissible to humans) which are not listed here. This is simply a list of important and common sheep diseases to look out for when things go wrong. Always consult your veterinarian for diagnosis and appropriate treatment when an animal is sick.

Caseous Lymphadenitis (CL)

A bacterial disease caused by the organism Corynebacterium pseudotuberculosis. This disease is characterized by abscesses in areas where there are lymph nodes, either internally surrounding organs, or externally. Common places for these abscesses are along the jaw, or the hind legs. Generally, if the abscesses are internal, the disease will be fatal and it may be very difficult to diagnose except by necropsy. It is spread to the rest of the flock when pus from a ruptured abscess comes in contact with a nick or cut on another sheep. Shearing time and any time the flock is gathered in corrals or pens for handling are the most common transmission times so animals with an obvious abscess should be isolated from the rest of the flock. There is now a vaccine for this disease which can be given on its own or in combination with other annual vaccines.

Enterotoxemia

This disease is also known as the "overeating" disease or "pulpy kidney" disease because on necropsy, often the kidneys are swollen and mushy. Usually a disease of young lambs, it is caused by the bacteria Clostridium perfringens. This bacteria is normally present in small numbers in the intestine but when animals overeat or suddenly switch to a very rich feed, the bacteria can multiply rapidly and release a toxin that will kill the animal within hours. This can be prevented by vaccinating against Clostridium types C and D.

Johne's Disease

Pronounced (YOE-neez), this is an infectious bacterial disease caused by the hardy bacteria Mycobacterium paratuberculosis. It is a wasting disease of sheep, goats, cattle, and other ruminants that may or may not be accompanied by severe diarrhea in sheep. It is most commonly transmitted through fecal matter on feed but the bacteria can be shed by animals who are asymptomatic carriers. Often lambs contract it from dirty udders or barnyards. Because of this reason, the only effective method of eradication is to cull and slaughter ewes who test positive and their offspring. This disease is quite prevalent and can be a major cause of lost income. If there are emaciated ewes in a flock, it would be wise to have them tested. There is currently no vaccine.

Mastitis

Mastitis is an infection of the udder of the ewe, often occurring at or soon after lambing. It is characterized by fever, lethargy, and a hot, painful and swollen udder. Immediate antibiotic treatment is required for the ewe to survive. Many times, only one side of the udder is affected but that side will usually not be able to produce milk in subsequent years, even if the ewe recovers fully.

Navel Ill or Joint Ill

This condition is not caused by a specific bacteria but any number of bacteria that live in soil, dirty barns, and feces. The bacteria enter the lamb's bloodstream through the umbilical cord and will progress to a generalized illness, often with swollen joints and weakness, sometimes with sores and abscesses. This can be treated with antibiotics but often the lamb will never thrive and may always have a limp. This can be prevented by dipping or spraying the umbilical cord in a 7% iodine solution immediately after birth and keeping the lambing area as clean as possible. It may be necessary to reapply the iodine if the ewe licks all the iodine off.

Ovine Progressive Pneumonia (OPP)

OPP is caused by a virus which acts slowly and can take several years to manifest. It causes gradual weight loss and lung deterioration. It also commonly can result in lasting mastitis or "hard bag". The only effective method of eradication is to test the whole flock and cull infected animals. It is spread in respiratory secretions but all animals who test positive do not show signs.

Q-Fever

Q-Fever is a zoonotic disease caused by the bacteria *Coxiella burnetti* and can occur in all species of animals, although sheep and goats seem to be the most prone. While there is a blood test to determine the presence of Q-Fever in animals, it is not always reliable. Infected animals do not always test positive and animals that test positive may never actually shed the organism and infect others. It can be a cause of abortion and the time when it is most transmissible to humans and other animals is during lambing. It is advisable to isolate any animals that abort and submit the fetus and placenta for diagnostic testing. There is no vaccine at this time so the only treatment is to cull infected animals from the flock.

Scrapie

While not a common disease, scrapie is an important one to mention. It is a disease of the nervous system caused by prions, similar to bovine spongiform encephalopathy (mad cow disease) or chronic wasting disease in deer and elk. There are multiple symptoms including exaggerated movement, intense itching resulting in biting the wool, or scraping against fences and posts. There is currently a Voluntary Scrapie Flock Certification Program administered by the USDA's Animal and Plant Health Inspection Service (APHIS). They can give you more information and provide you with ear tags for your flock verifying that you are part of the program. When purchasing new animals for your flock, always purchase from a flock participating in this program.

Soremouth

Sometimes known as "orf", it is characterized by scabs and pustules on the lips, eyes, mucous membranes, feet and teats, this is a viral disease and is transmissible to humans. If soremouth is suspected, wear gloves while handling sheep. There is a vaccine available but common practice is only to vaccinate if there is an outbreak.

Tetanus

Tetanus is caused by an anaerobic bacteria present in the soil. It will cause rapid, progressive lameness, stiffness of all muscles and eventually seizures and death. It can be avoided by giving a tetanus vaccine to lambs at the same time as the Clostridium vaccine.

Vibriosis

A bacterial disease caused by the Campylobacter bacterium, this is a major cause of late term abortion in ewes. They will often show no other signs of illness. In cases of abortion, it is always best to remove the placenta and fetus and submit to a diagnostic lab for testing. In flocks where abortion is a regular occurrence, implementing a vaccination schedule several weeks prior to breeding is recommended.

PARASITES

The presence and prevalence of various parasites varies widely over geographic regions. They may appear at different times of year or not at all in different areas. This section will not address all the different parasites but mentions things to look for and some appropriate deworming timing or methods. Some producers may want to avoid the use of chemical dewormers to maintain an organic certification or to improve microbial soil health. Other producers would rather have a set calendar for deworming and use the same medications every year. There are tannin-rich plants that you can plant or occur naturally in some pastures that are quite effective in keeping internal parasite loads down. Some examples of these plants are sainfoin, birdsfoot trefoil, dock and chicory. This handbook urges you to do your own research and adjust your treatment according to your animals, your area and your particular problems. Your veterinarian can be very helpful in suggesting a protocol for you before a parasite problem gets out of control. Even for those who want to avoid the use of chemicals, be aware that it may be necessary in cases of heavy parasite load.

External Parasites

External parasites seem to vary widely between breeds of sheep and according to location. Sheep can be subject to keds, lice, mites, ticks and also fleas. Ticks and fleas seem to be much less of a problem although they can occur. Anecdotally, it seems like the breeds with finer wool tend to have fewer problems with external parasites. When you start to notice excessive itching, wool loss or skin twitching, examine the sheep carefully for signs of parasites. Many producers will use a pour-on dewormer to rid the animals of external parasites.

Flystrike (Blowfly maggots)

Flystrike can happen to any animal but can be particularly devastating to sheep since the maggots breed under the wool and can be difficult to recognize. Warm and wet weather will bring out the flies, which lay eggs in wounds or wet wool and the larvae will emerge and start burrowing under the wool to the flesh beneath. The first and most important treatment is to shear the area and keep it clean and dry. There are sprays that will kill the maggots and also should be applied to any wound after shearing or handling to prevent the occurrence of maggots. It may take several days or weeks to rid the animal of all infestation and for the skin to heal over. Anytime it looks like an animal has a wet spot on its wool, or a particular area of the skin continues to twitch, the sheep should be examined immediately.

Internal Parasites

There are numerous internal parasites that can affect sheep and fall into several categories. There are types of roundworms, flatworms, flukes and protozoa. The only way to accurately determine what parasites are present in your flock is to submit a fecal sample and do an egg count. Many parasites can be present and tolerated in low numbers in sheep and some individuals and breeds are much more resistant to internal parasites than others. In particular, hair breeds of sheep are known for increased resistance to internal parasites. Sheep are more susceptible to parasites during periods of stress: lambing, movement or sale, excessive handling. Therefore, care should be taken during these times to monitor closely or do a preventative deworming when one of the above occurs. Heavy parasite loads can be fatal and progress quickly once their system starts to be overwhelmed. The most important signs to look for are loss of body condition and scouring (diarrhea). The eggs of most parasites will hatch under wet and temperate or warm conditions so it's important to pay attention when sheep are kept on irrigated pasture and during Spring or Fall. Also important to note is that many of the most common parasites have a 3 week life cycle. If it's possible to rotate the sheep so they are not grazing on the same pasture for more than 2 weeks and then rest that pasture for at least 4 weeks before grazing again, this pattern can help break the parasite life cycle.

If using a chemical dewormer, it's important to get an egg count performed since many dewormers target certain parasites. Some of these parasites will also develop a resistance to certain chemicals so many veterinarians will recommend a rotating schedule of dewormers used to maintain effectiveness.

VACCINATIONS

Most vaccinations are given subcutaneously (under the skin) and initially two doses are given 4-6 weeks apart to build immunity. After this, annual boosters are recommended. Read package instructions and consult your veterinarian to determine exact timing. Often a lump and occasionally a small abscess will form at the injection site so it's important to avoid injection in an area where the muscle underneath is a valuable cut of meat. Most commonly, subcutaneous injections are given over the shoulders by the neck. Also acceptable is under the leg near the ribs where there is no wool. This is not practical when vaccinating large numbers or very heavy sheep. When injecting intramuscularly, use the neck muscle.

Clostridial and Tetanus vaccines

There are many different formulations of vaccines but generally, the minimum necessary vaccines for any sheep owner are Clostridium types C and D and Tetanus combination vaccines. This is because these bacteria are present everywhere and they are the most preventable illnesses. They come in 3- 6- and 8- way vaccines. Some also come in combination with a CL (corynebacterium) vaccine. When ewes are given this vaccine 2-6 weeks prior to lambing, the lamb will be protected by immunity passed from the ewe for approximately 8-10 weeks. At that point, lambs should be given a first vaccine, followed by a booster 4-6 weeks later and annually thereafter.

Foot Rot

May be given in flocks where foot rot is a problem or an outbreak has occurred.

Vibrio

Should be given to ewes in affected flocks 2-3 week prior to breeding. If being used for the first time, a booster should be given 2 months later.

DISEASES OF THE HOOF

As outlined in the section on hoof trimming at the end of Section 2, the schedule for hoof trimming and hoof care will vary drastically from flock to flock. It depends greatly on genetics, location, soil moisture, movement, diet, age and many other factors. Some sheep owners will almost never have to touch their sheep's hooves beyond checking during shearing and lambing, while others will have to check and trim them multiple times a year.

Any lameness in a sheep or unwillingness to get up should be checked out thoroughly. There can be a variety of reasons for lameness. Some of those as listed below.

Sprain or strain

If there is no obvious injury, swelling or heat on the hoof or leg, it may be as simple as the sheep has stepped in a gopher hole and sprained her leg. In any case, confine and rest the sheep for a few days to see if there is any improvement. In cases of severe pain or limping, always consult your veterinarian and ask about pain-relieving medications or further workup.

Impacted scent gland

There is a small scent gland on the front of the hoof in between the toes and below the coronary band, which secretes a waxy substance. Occasionally this gland may get impacted and swell, causing pain and tenderness. You can usually squeeze it to remove the clog and the pressure and the sheep should start feeling better quickly. It is also possible that a foxtail can embed itself and work its way into the scent gland so it's important to look for any signs of infection.

Bruising

It is also common for bruising to occur, especially in dry weather or when the sheep have been moving over very rocky terrain. Often you will not be able to see a bruise until you trim the hoof and you may see a purple or darker spot on the bottom of the foot or in the tissues of the sole above the heel.

Foot scald

Similar to athlete's foot, this is caused by a fungus and often is caused by too much moisture around the feet. It involves the soft tissue around and above the toes, in the sole and heel and may be confused with Foot Rot. This can cause a separation of the hoof wall from the sole. Trim hooves aggressively and soak the foot in hydrogen peroxide or zinc sulfate as you would for Foot Rot.

Foot Rot

Foot Rot is a bacterial disease and extremely contagious. It is one of the biggest problems in the sheep industry and can live in the soil for up to 2 weeks. It can spread to the whole flock very, very quickly. The best cure for foot rot is prevention! Quarantine all new animals for at least 2 weeks after purchase. Foot Rot has a very distinct odor and will soften the inside of the hoof to the point that it will eventually turn slimy and dissolve the hard portions. To treat it, you must trim the hoof and stand the sheep in a foot bath of zinc sulfate for at least 5 minutes. If possible, hold the sheep in a dry barn or pasture for 24 hours. If there is Foot Rot present in the flock, it is safest to treat the whole flock since some sheep may shed the bacteria into the soil but show no symptoms. There is now a vaccine to help prevent sheep from becoming susceptible to Foot Rot. If it's a problem in the flock, it may be a cost-effective measure for the producer to take.

SECTION 2

Shearing Sheep

BY TREVOR HOLLENBACK

Why Shear Sheep?

There are two major classes of domestic sheep: hair breeds and wool breeds. Generally speaking, hair breeds have been developed for the production of meat and milk in warm climates. Wool breeds, on the other hand, have been bred for production of meat, milk, *and* wool in cooler/cold climates.

All sheep have both hair and wool, wild varieties of sheep included. Thus, the major difference between domestic wool breeds and domestic hair breeds is not the presence or absence of wool or hair, but rather the proportion of total fibers on the animal that each type makes up.

All wool breeds require shearing at least once yearly. A sheep that goes too long without being shorn can be left subject to the following health issues:

- Overheating (depends on intensity of heat and amount of overgrown wool, can result in death)
- Wool blindness (results in increased predation)
- Reduced mobility (results in increased predation)
- Inability/difficulty mating
- Inability/difficulty nursing young
- Flystrike (Myiasis)
- "Pizzle Rot" in male sheep
- Rot among the tissues on the rear end (where urine can collect in the wool of female sheep)
- Sheep Ked infestation (Melophagus Ovinus)
- Increased incidence of skin cuts during shearing (the sheep's skin becomes very thin and loose under overgrown wool)

"Shrek the Sheep," a Merino ***wether****, evaded* ***mustering*** *for 6 consecutive seasons at Bendigo Station in Otago, South Island, New Zealand. The two major reasons he was able to survive this massive overgrowth of wool are that (1) he was living in a cool climatic region of the country, and (2) no natural predators to sheep exist in New Zealand.*

(Photo Credit: Australian Broadcasting Corporation)

Shearing and Crutching Sheep: A Management Perspective

As a general rule, sheep should be sheared at least once per year. Factors that may change this frequency are: breed types, wool production goals, climate, and management practices, to name a few. There is no hard-and-fast rule for when or how often shearing should take place, but these are some of the more common cases in which producers would choose to shear their sheep:

BEFORE WARM WEATHER ARRIVES

After winter in most regions, the arrival of warmer weather means fresh grass, and fresh grass typically means loose stool if the sheep have been on ***conserved forage*** throughout winter. The onset of warm weather also means a marked resurgence of insect populations, including flies, which, in conjunction with a high incidence of wet stool collecting on the rear end of sheep, can ravage flocks of sheep with ***flystrike*** in short order. For this reason, many flock owners will choose to shear, or at least ***crutch***, their sheep before the onset of these conditions.

As warmer weather progresses out of spring and into the hot temperatures of summer, a more pressing concern for any flock owner is the risk of their sheep suffering from overheating. This is especially important if sheep have nowhere to seek shelter from the heat (shade, creek bottoms, man-made facilities, etc.). Shearing sheep ahead of these hot temperatures will ensure that sheep will not have to suffer through these months in full wool.

PRE-LAMB SHEARING AND CRUTCHING

Pre-lamb shearing is a management practice utilized in many parts of the world, including many top sheep-producing nations such as New Zealand and Australia. Carried out 4-6 weeks prior to lambing, the theory is that pre-lamb shearing can increase lamb survival rates because (1) resultant lambs have heavier birthweights and are stronger than lambs whose mothers did not receive pre-lamb shearing, and (2) ewes that have been shorn are more likely to seek and utilize shelter in adverse weather when lambing. Proponents of pre-lamb shearing claim that the ewes give birth to heavier lambs because during the weeks following shearing, they are subject to more bodily heat loss and will consequently feed more aggressively to make up for that heat deficit; unwittingly feeding more nutrients to the lambs within her than she otherwise would have.

It is important to note, however, that pre-lamb shearing must be carried out carefully. The owner must ensure that extra feed and effective shelter is available to the ewes so as to prevent cold stress and metabolic disease. Research is still being carried out to determine whether or not the purported advantages of pre-lamb shearing outweigh the risks. Ultimately, though, it depends on each specific producer, the types of sheep they are raising, and the environment in which they live.

If pre-lamb shearing will not be carried out, many flock owners will instead choose to ***crutch*** their ewes prior to lambing. This prevents buildup of fluids on the rear end of the ewe during birthing, and provides a clean, unobstructed path to the udder for the newborn lamb(s).

ALLEVIATING SHEEP WITH FLYSTRIKE

Shearing to treat sheep with active cases of ***flystrike*** is done on a case-by-case basis. Afflicted animals will require, at minimum, localized shearing to alleviate the problem. The rest of the wool is left remaining on the animal in order to salvage the yield of wool from that sheep during the next shearing.

SHEARING FOR WEIGHT GAIN IN SHEEP

As mentioned above under “Pre-Lamb Shearing and Crutching,” shearing can be used as a management tool to get stimulate appetite in sheep. This is a common practice in promoting growth and weight gain in lambs intended for slaughter.

CRUTCHING BEFORE BREEDING

Before the ram goes in with the ewes, some producers will choose to crutch their flock. The theory here is that clearing the wool away can make mating easier.

Preparing Sheep for Shearing

KEEPING SHEEP DRY

Sheep must be bone dry for shearing day. Sheep that are wet create hazardous shearing conditions that result in increased injuries to both sheep and shearer. Producers need to have a place to keep the sheep sheltered for shearing day. Even dew and fog can condense onto sheep's backs enough that they will be un-shearable.

FASTING SHEEP PRIOR TO SHEARING

Animal welfare principles, safe working conditions, and wool quality considerations all demand that sheep be held off of feed *and* water prior to shearing so that they have adequate time to empty out. This must be planned and executed prior to shearing because:

- Full sheep experience excessive distress and discomfort during shearing due to the increased volume of contents within their digestive tract, and the pressure the pressure that this creates when putting the sheep in the proper positions for shearing.
- Full sheep will kick and struggle far more during the shearing process (due to the aforementioned distress it puts them in), causing a dramatically increased risk of injury to both themselves and shearers.
- Full sheep weigh significantly more than those that have been fasted, creating excessive stress on the sheep shearer's body throughout the process.
- Full sheep create hazardous conditions by passing a high volume of feces and urine in catching pens and on shearing boards.
- Full sheep increase the incidence of pen stain in wool, and ***pen stain*** can increase the rate of fading in woolen products.

The table below has been created by WorkSafe New Zealand, a governmental body that creates guidelines for industry. It was created in collaboration with and input from the New Zealand Agricultural Health & Safety Council, the New Zealand Shearing Contractors Association, the New Zealand Veterinary Association, and SPCA New Zealand, among others.

The recommendations for emptying out sheep prior to shearing are summarised in Table 1 below. It should be noted that they refer to the minimum and maximum periods of time without feed and water prior to shearing for any individual sheep.

RECOMMENDED MINIMUM AND MAXIMUM NUMBER OF HOURS WITHOUT FEED AND WATER PRIOR TO SHEARING					
	Minimum number of hours without feed	Maximum number of hours without feed	Minimum number of hours without water	Maximum number of hours without water	Special considerations
Ewes (and adult male sheep)					
Non-pregnant, non-lactating	20	32	12	24	Exceeding these maximums may induce metabolic problems and/or precipitate clinical diseases.
Early – mid pregnancy	18	30	12	24	
Late pregnancy and lactation	12	24	8	20	Exceeding these maximums may induce metabolic problems and/or precipitate clinical diseases. Where practical, unweaned lambs should remain with their mothers until ewes enter the woolshed.
Hoggets					
Non-pregnant, non-lactating	18	30	12	24	Use special care when handling pregnant hoggets. Exceeding these maximums may induce metabolic problems and/or precipitate clinical diseases. Where practical, unweaned lambs should remain with their mothers until hoggets enter the woolshed.
Pregnancy and lactation	12	24	8	20	
Lambs					
Pre-weaning	6	24	6	20	Exceeding these maximums may precipitate clinical diseases.
Weaned	12	24	8	20	

Table 1: Summary of recommendations for emptying out sheep prior to shearing

Sheep Shearing: Animal Welfare Considerations

REGULAR SHEARING

As it relates to animal welfare, sheep need their wool removed at least once yearly. Reasons for this can be found in a previous section in this handbook entitled, "Why Shear Sheep?"

SKILLFUL AND CAREFUL SHEARING

Shearing, tagging and crutching should be carried out skillfully and carefully to prevent cutting the sheep's skin; particularly on ***teats***, ***vulva*** and ***prepuce***. Proper technique and proper setup of equipment—outlined in this handbook—are of the utmost importance in successfully mitigating skin cuts to the animal.

SKIN CUTS

Any sheep that does sustain injuries to their body—including cuts to the skin—should have the injuries treated appropriately as soon as is feasible. Treating minor cuts at the completion of shearing (rather than stopping in the middle of the shearing process) will ensure that any topical treatment applied to the cut will not be rubbed off during the shearing process.

INCLEMENT WEATHER

Freshly shorn sheep are especially vulnerable to adverse weather conditions. Sheep should not be shorn if the forecast is for cold wet weather unless the animals are to be given additional feed after shearing and/or provided with suitable shelter to minimize the risk of exposure. Shearing equipment such as "***cover combs***" and ***blade shears*** should be used in areas where sheep will be released into inclement weather, as this equipment is designed to leave more wool on the body of the sheep, thereby providing the sheep with more protection from the elements.

Freshly shorn sheep also require more feed than normal for 3 weeks or more after shearing to sustain body temperature and maintain body condition. Maintenance requirements are usually increased for 6 to 8 weeks after shearing. These effects are more prevalent in winter when shearing increases a sheep's energy requirements by 50-70% compared to 20-30% in summer and fall.

PREGNANT EWES

During the last 4 weeks of pregnancy, a tremendous amount of development happens in the fetal lambs. This being the case, subjecting late-pregnancy ewes to stressful management activities—particularly shearing—should generally be avoided during this time

Equipment

MACHINES

There are two major classes of equipment commonly used to shear sheep: handheld units and overhead machines. Traditional blade shears are still used in the world today, but will not be covered in this handbook.

Handheld Machines

Handheld shearing units have small motors built into them and are designed with portability and rapid setup in mind. They are great for shearing small numbers of sheep, but for prolonged use they can be cumbersome and have a tendency to overheat in unfavorable working conditions.

Overhead Machines

Overhead shearing setups are comprised of (1) a large motor mounted above the shearer, (2) a mechanical handpiece, and (3) a driveshaft that connects the two. Overhead machines are the standard in commercial shearing settings and make far more economic and practical sense than handheld units in settings where continuous use of shears is necessary.

Overhead Shearing Motor

Image credit: Horner Shearing

Handheld Shearing Unit

Image credit: BEIYUAN

CUTTING EQUIPMENT

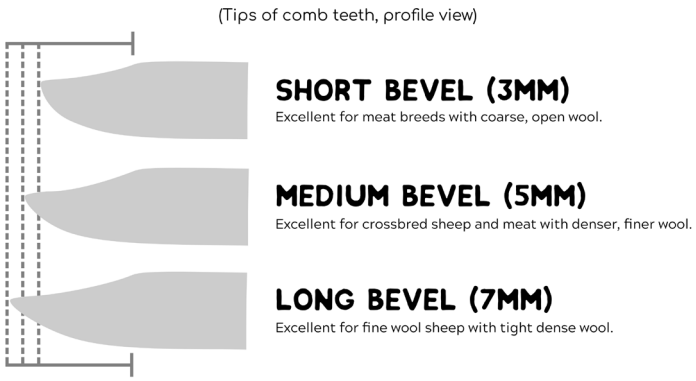
The part of the machine that does the actual cutting of wool is comprised of two parts: (1) a fixed comb and (2) an oscillating cutter that passes over it. Combs and cutters used for sheep shearing are standardized and can be used on either handheld machines or mechanical handpieces (overhead motors).

Combs

There are a bewildering variety of combs on the market. Most, however, will be advertised with common characteristics that can help you decide if a comb is appropriate for your application. These characteristics are ***bevel length***, comb type, comb width, and comb thickness.

BEVEL LENGTH

All of the tips on a brand new shearing comb come polished and rounded from the factory. This rounded tip is referred to as the "bevel." The ***bevel length*** essentially refers to how pointy, or how rounded, the tips of these comb teeth are. A longer bevel indicates pointier tips, while a shorter bevel indicates more rounded, blunt tips. As a general rule, the finer and tighter the wool is, the longer the bevel on your comb should be. In cases where the wool is coarser or more open, the shorter the bevel should be.



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COMB TYPE

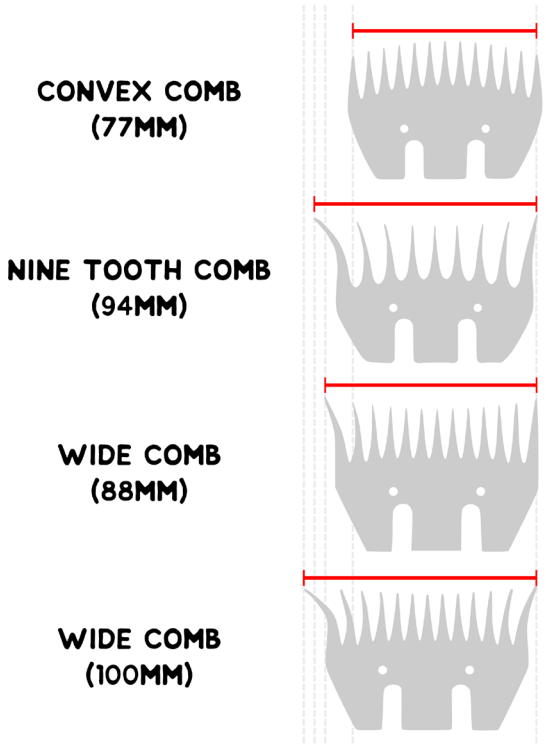
Presently there are four major types of sheep shearing combs being used widely: wide combs, convex combs, nine tooth combs, and cover combs.

- *Wide Combs*

  Wide combs are the standard in sheep shearing today. Models vary by width and bevel length, but all of them have 13 teeth and normally have flared outer teeth, designed to capture more wool during each blow. The overall shape of the front end of the comb is slightly concave, as the outermost teeth are longer than the inner ones. On wide combs the top tooth will be more drastically flared than the bottom tooth.

- *Convex Combs*

  The term "convex" comes from the overall shape of the front end if you were to draw a line connecting the tip of each tooth across the width of the comb. Convex combs are often utilized by farmers for tasks such as tagging, crutching, treating flystrike, and occasional complete shearing of sheep. They have 13 teeth and are relatively forgiving combs when set up properly, as all of the comb teeth are somewhat equally spaced. Convex combs, however, don't have the same feel for the user as a wide comb due to the short ***bottom tooth*** and ***top tooth***, as well as the lack of significant flare to the outermost teeth. For this reason, the overwhelming majority of sheep shearers use wide combs.



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- *Nine Tooth Combs*

  Nine tooth combs are produced in the same widths as common thirteen tooth wide combs, but, as the name implies, without 4 of the teeth. These are generally reserved for use in tough shearing conditions where entry into wool is difficult. The absence of 4 of the teeth results in decreased resistance when pushing the handpiece through the wool, *but also adds a significant increase in risk.* The wide gaps between the teeth are not only hazardous to the shearer's free hand, but also make it much easier to catch parts of the sheep that we don't intend to cut. ***Extra caution should be used when shearing with nine tooth combs, and beginners should not use them on animals until properly trained in their use.***

- *Cover Combs*

  Also known as "winter combs," cover combs are the same as nine tooth combs, but have risers added to the backs of the teeth in order to keep the comb further from the skin of the animal as it cuts the wool. This leaves even more of a protective layer of wool on the sheep than a flat nine tooth comb will. The same warnings about safety that apply to nine tooth combs apply to cover combs.

COMB WIDTH

Comb width is simply the distance between the tips of the outermost teeth on a shearing comb. Comb width primarily affects two things: (1) ease of entry into wool and (2) the amount of wool the shearer is able to take off with each blow. Narrower combs will enter wool with more ease than wider ones.

It is important to note that comb width does not influence the number of teeth that a comb has. That is, wider combs do not have more teeth than narrower ones. Because of this, the gaps between the teeth and the degree of flare in the outer teeth increase as combs get wider.

COMB THICKNESS

Some combs are sold as "run-in," or "thinned down." This simply means that the comb is thinner out of the box than a standard thickness comb. Thinner combs run better in sticky sheep and on lambs, so they can be a valuable thing to have in your toolbox. Most shearers will simply purchase full thickness combs to start; as the combs wear down after each sharpening shearers will reserve the combs for use on lambs and tough-shearing sheep.

Cutters

All modern cutters have four points. They can be purchased in two widths: standard and wide. Standard width cutters will run just fine on practically all combs: from the narrowest convex combs up to the widest wide combs. However, in order to easily get adequate throw across combs 98mm and wider, "wide" cutters are available. They are not entirely necessary, but can be helpful to have if using very wide combs on a regular basis. Cutters can also be purchased in two thicknesses: full thickness and just as with combs, "run-in" or "thinned down," cutters are available. Just as with combs, these thinner cutters can provide an advantage on lambs and tough-shearing sheep (difficult entry into the wool, sticky, cold, etc.)

A SHEEP SHEARER'S TOOLBOX

Necessary items

In addition to a motor, driveshaft, handpiece, combs, and cutters; a shearer absolutely needs the following items in order to set up the equipment and keep it running smoothly:

SCREWDRIVER

Technically any large flathead screwdriver will do the job, but the author prefers to use a "knuckle saver" screwdriver in conjunction with comb screws that have dual slots. The key on the screwdriver locks down into the outer notches of the combs screw and create a slip-free connection. These are much easier to use when tired, or when hands are covered in sweat and lanonlin.

OILER BOTTLE

Any oiler bottle with a narrow tip or spout will work fine. Just be sure the tip is long enough to reach the center post and center post cup. This will be covered in detail in the section entitled, "Where to lubricate equipment".

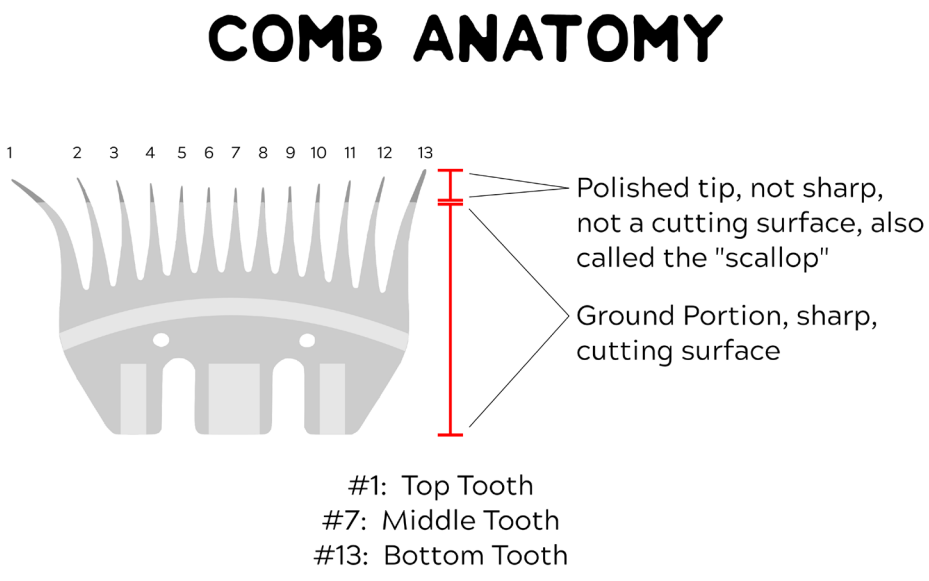
OIL

Conventional motor oil in SAE 30 or 10W-30 weight will work just fine.

Items you should have in your shearing toolbox all times:

- Gear brush outfitted with a metal scraping tool, used to remove lanolin buildup on the back of the comb
- Flesh needle and cotton thread, in the event that a skin cut to the sheep requires stitching
- Antiseptic solution for treating wounds to the sheep
- Fly spray to apply to wounds on sheep
- Sanitizing solution for equipment (See, "Biosecurity: The Sheep Shearer's Role")
- Tally Counter, for keeping track of how many sheep you shear throughout the day
- First aid kit for treating wounds to the shearer (provisions for cleaning and dressing cuts to the hand are most often used. Keep with you very tacky tape to cover bandaged fingers; if you don't, a regular adhesive bandage will fall off after shearing just one or two sheep)
- Hearing Protection

Pictured: Lister "Skorpion" Triple Bearing Handpiece

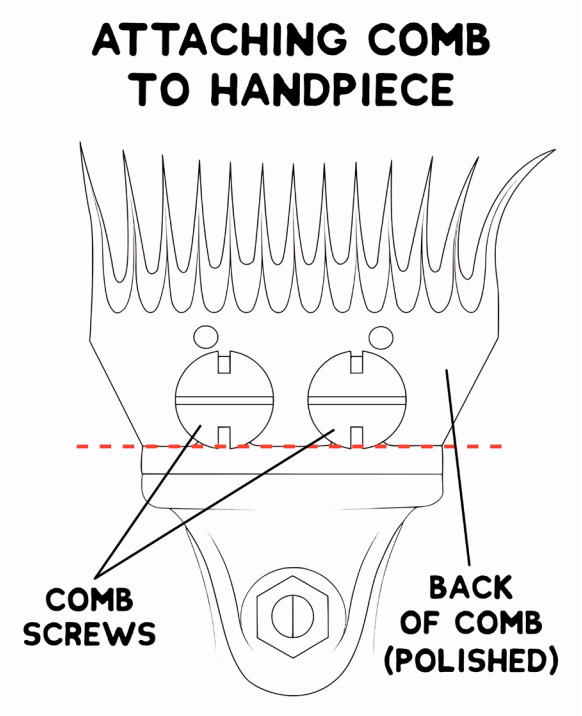


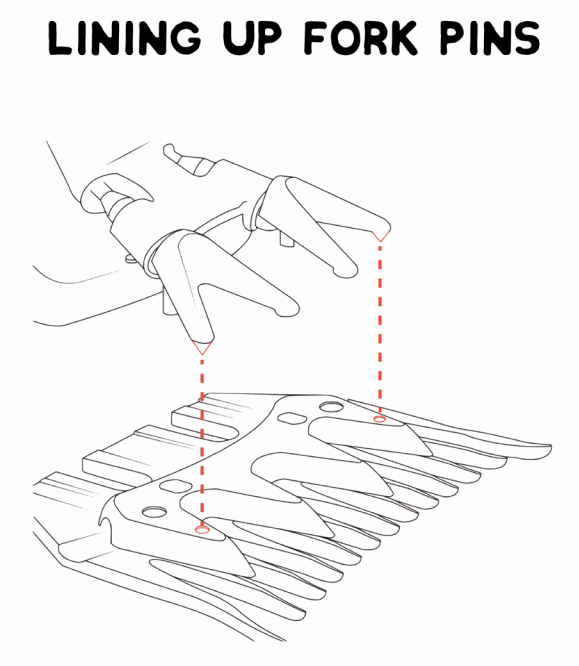
SETTING UP COMB AND CUTTER FOR SHEARING

Proper setup of comb and cutter on the handpiece is critical in limiting skin cuts to the animal during shearing.

Affixing the Comb and Cutter onto the Handpiece

First, ensure that the area between the comb screws and comb bed is clean (sometimes this requires that you remove the screws entirely and clean off both the comb bed and the underside of the screw heads). Also ensure that the comb screws and tension nut are loose. Second, slide the comb on so that the base of the comb is about at the level of the bottom edge of the comb screws and is parallel with the base of the comb bed (dotted red line in diagram below) and tighten the comb screws tight with your fingers. Next, flip the entire handpiece over, loosen the tension nut so that there is plenty of vertical play in the fork, and slide the cutter under the forks, or "chicken feet." Ensure that the prongs under the forks are lined up with the holes on the top of the cutter (diagram below) and press down on the fork body with your thumb so that the cutter is held in place. Then tighten the tension nut until resistance is felt. You are now ready to adjust the lead and throw.





Diagrams by Horner Shearing
Annotations ©2020 Hollenback Shearing

Oscillating the cutter manually

When powered on, the machine will oscillate the cutter across the face of the comb a few thousand times per minute. When setting up our equipment as outlined in the next section, however, we want to see this movement very slowly—even pausing momentarily at each side of the comb—so that we can be sure the comb has been positioned properly in relation to the cutter. To move the cutter across the comb slowly, simply use your thumb to spin the cogs at the heel of the handpiece. If you have affixed your comb and cutter as outlined above, there should be little resistance in doing this. If however, you attempt to move them in this manner and are unable to, back off the tension nut in eighth turn intervals until it is sufficiently loose for you to turn the cogs with the pad of your thumb.

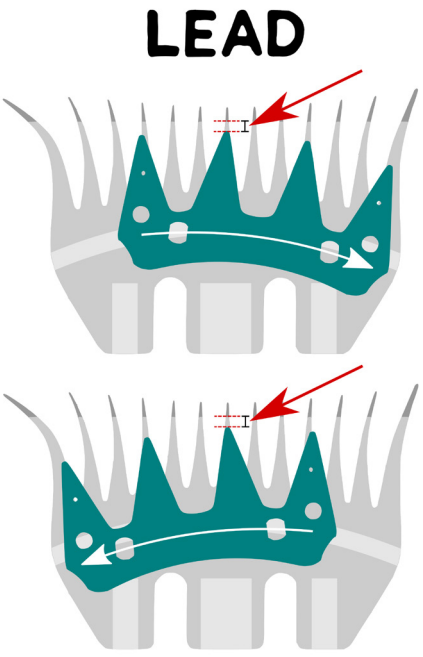
If you are using a handheld shearing unit, you will discover that there are no cogs present on the back end of the machine for you to turn with your thumb. In this case you will simply use your thumb to push the fork and cutter across the comb. If you experience trouble getting the fork and cutter to pass to the other side of the comb once you have reached the side of the comb, you will need to *very briefly* turn the machine on to break it loose from that side of the throw. Once the cutter stops moving completely, attempt again to move it to the side that you wish to check.

LEAD

No, not the heavy metal. The ***lead*** (pronounced *leed*), is the amount of distance from the tip of the cutter to the end of the cutting surface on the comb as the cutter passes the middle tooth. Unless the comb has been ground down many times, this will be located at the base of the scallop.

Here is what you need to know about lead:

- Lead allows the comb to do its job of spreading the skin flat before the wool being combed encounters the cutting area.
- To determine the amount of lead when first setting up your comb and cutter,
- Lead is adjusted by moving the comb, not the cutter. The comb moves forward on the comb bed to *increase* lead, and moves rearwards (towards the handpiece) to *decrease* lead.
- Lead should not be set shorter than 1.5-2mm, and when possible, should be set longer than this. Leads shorter than this increase greatly the chances of cutting the sheep's skin during shearing.
- Generally speaking, using more lead is appropriate for use on good shearing sheep with open wool and good body condition.
- Generally speaking, using less lead is appropriate when shearing sticky sheep, or sheep where it is difficult to enter the wool, especially when using otherwise optimal equipment for these situations.
- More lead is required as combs become thinner over the course of multiple sharpenings.
- Lead will vary slightly with every cutter change if your cutters have not all been ground down at the same rate (thicker cutters decrease lead, thinner cutters increase lead).



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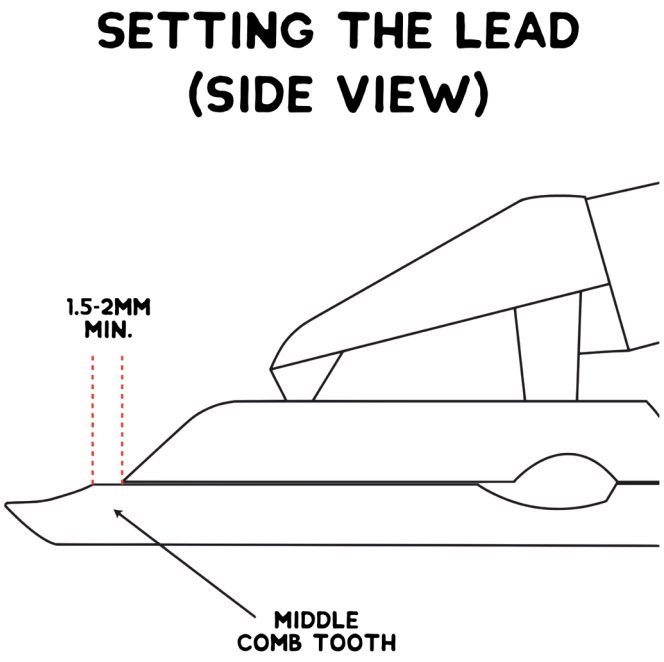


Diagram by Horner Shearing
Annotations ©2020 Hollenback Shearing

THROW

Throw refers to how far (and how evenly) the cutter travels to each side of the comb. Here is what you need to know about throw:

- The comb's throw and lead are adjusted by the very same action: moving the comb in relation to the comb bed. This being the case, when moving the comb laterally to adjust your throw, be sure not to disturb the lead that you so carefully set in the previous step.
- For correct throw, the position of the comb should be such that the outside cutter teeth pass over each inside edge of both the first and last tooth of the comb (see locations indicated in figures).
- If the throw is uneven (passing over one outside tooth more/less than the other), you can fix this by moving the comb laterally in the direction of the tooth that has *more* overlap.
- If you cannot seem to get the cutter to pass over each outside tooth evenly, this is often due to a comb that is no longer parallel to the base of the comb bed. Verify that he comb is parallel to the comb bed before continuing with any adjustments.

SETTING THE THROW

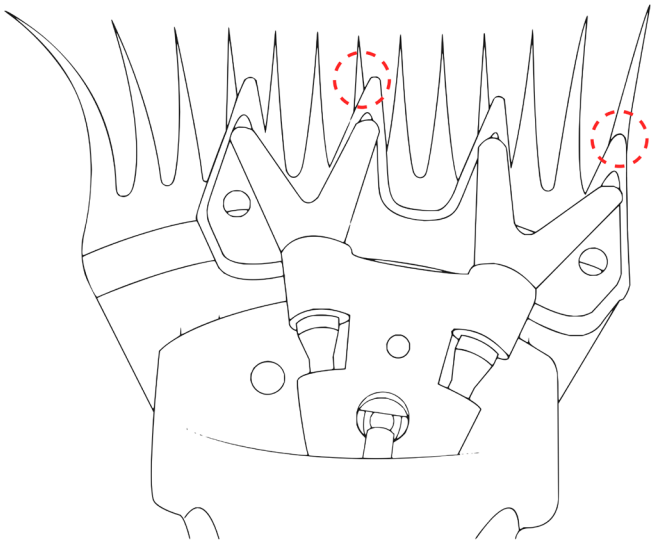
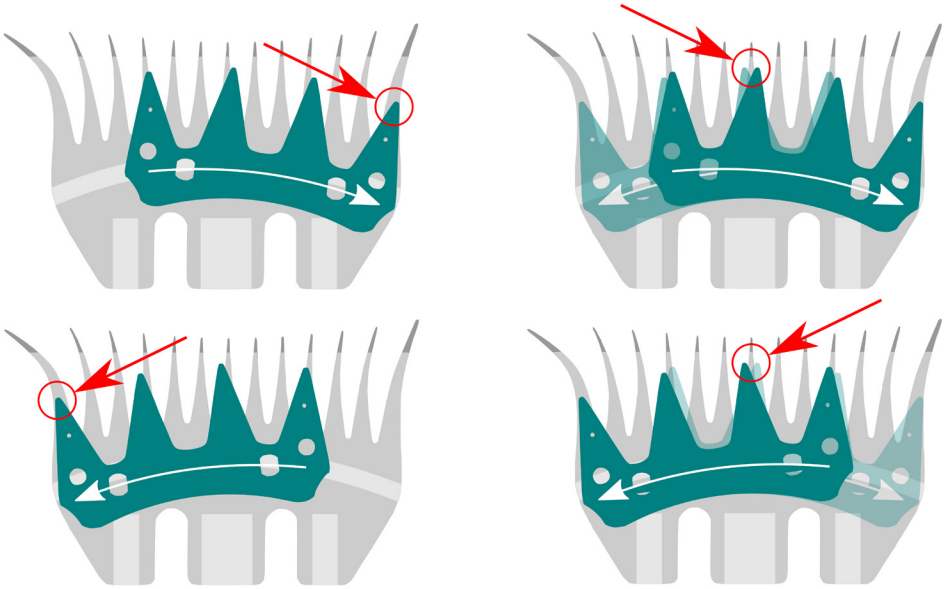


Diagram by Horner Shearing
Annotations ©2020 Hollenback Shearing

- Another place to look when trying to determine if your throw is even, is the middle comb tooth. With the position of the cutter all the way to the right side of the comb, the second tooth in from the left side of the cutter should completely pass over the middle comb tooth (see locations indicated in figures). With the position of the cutter all the way to the left side of the comb, the third tooth from the left side of the cutter should be just barely passing over the middle comb tooth the same amount, but on the other side.

THROW



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TIGHTEN COMB

Once your lead and throw are where you want them, you can now tighten down the comb screws to affix the comb for use. First, be certain that the tension nut is loose. If tension is set too tightly at this point, you will be tightening the comb against the cutter, and not against the comb bed. Then, using very firm pressure, tighten down each of the two comb screws to affix the comb to the handpiece. Once this is complete, double-check your lead and throw. You are now ready to lubricate your equipment.

WHERE TO LUBRICATE EQUIPMENT

Lubrication of the mechanical handpiece and driveshaft are of the utmost importance both for longevity and preventing the equipment from building up heat while using it. Lubricate the points indicated on the diagrams below with a few drops of SAE 30 or 10W-30 weight motor oil (virtually any thin motor oil will work in a pinch).

It is virtually impossible to oil these locations *too much or too often*, but it would certainly be possible to oil them too little and not often enough, so don't be shy with the oil bottle. As a general rule, you should oil all the parts of the handpiece indicated in the diagrams once before every hour of continuous use. The only exception to this is oiling the comb and cutter with a few drops of oil each time you change a cutter, which will occur more often than once per hour. The driveshaft should be oiled in the locations indicated once every two hours of continuous use.

For electrical handheld shearing units, lubrication points will vary from machine to machine. Typically, though, oil holes are indicated on the head of the unit, and oil always goes on the comb and cutter after each new cutter is installed. Consult your manual to be certain you are lubricating the machine to the manufacturer's specifications.

MECHANICAL HANDPIECE LUBRICATION POINTS

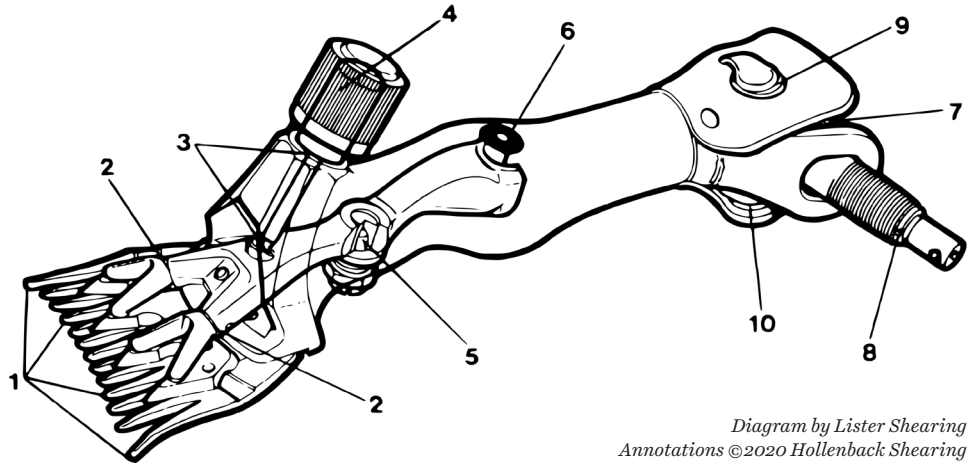


Diagram by Lister Shearing
Annotations ©2020 Hollenback Shearing

Note: the tension on your cutter should be loose when oiling the parts of the handpiece listed in the diagram. If the tension is tight, oil will be unable to penetrate to the center post and cup, or the tension pin and cup.

DRIVESHAFT LUBRICATION POINTS

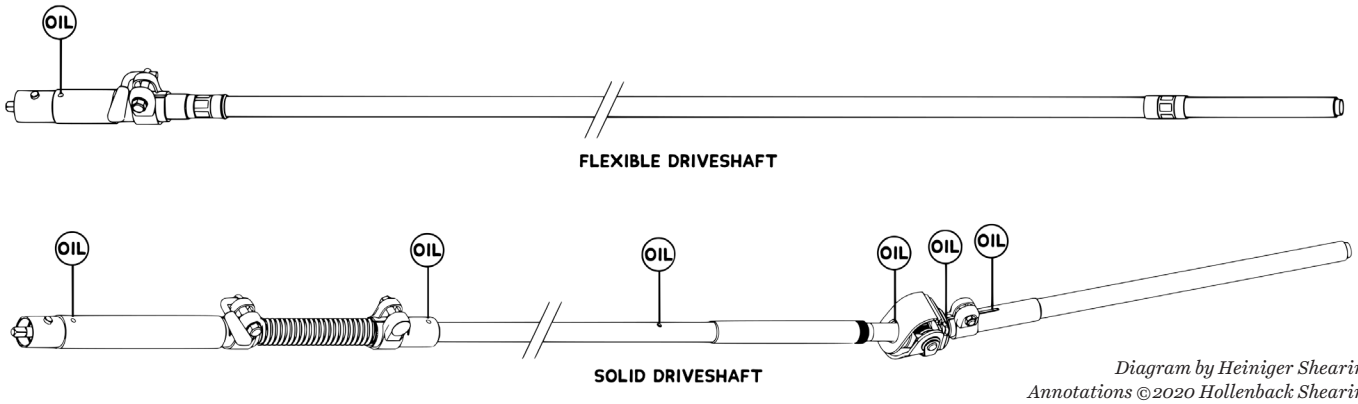


Diagram by Heiniger Shearing
Annotations ©2020 Hollenback Shearing

TENSIONING THE HANDPIECE

Now that your machine and handpiece are oiled, there is one last step before turning on the machine to begin shearing: tensioning the cutter against the comb. Unfortunately there is no repeatable formula for setting the proper amount of tension. Correct tension is something that is set by feel. The more often you shear, the more this will become muscle memory. For the beginner shearer, this should be enough to get you started:

- Before setting the tension, be sure the comb is securely fixed to the comb bed of the handpiece or handheld shearing unit. Also be sure that the pins under the forks are lined up correctly with the corresponding holes on the top of the cutter.
- Screw down the tension nut on top of the handpiece until notable resistance is felt. Then twist the tension nut tighter by about ½ – ¾ of a turn. Start there and run the machine.
- If right away you notice that your gear is not cutting, tighten down the tension in ¼ turn intervals until it does make a clean cut, then leave it there.
- If within the first 5-10 minutes of shearing you notice significant heat radiating from the comb and cutter (the front of the handpiece), back off your tension in ¼ turn intervals until this excess tension is relieved enough to keep this excess heat from being produced.
- If the tension was set too tightly and the comb is too hot for you to touch with your hand for longer than a few seconds, the gear should be cooled before continuing use on a sheep.

SETTING THE TENSION

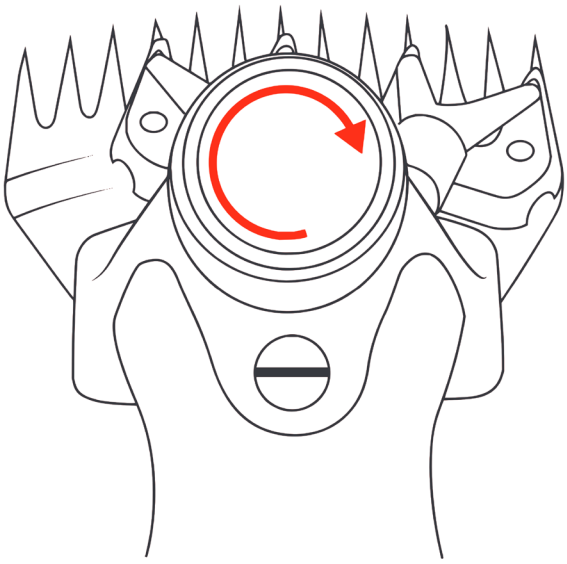


Diagram by Horner Shearing
Annotations ©2020 Hollenback Shearing

COMBS AND CUTTERS: CONSIDERATIONS WHILE SHEARING

Combs and cutters cannot be used indefinitely. They must be changed when their cutting edges wear down. Unfortunately, as with setting tension, there are no set rules for how often gear needs to be changed. Here is what you need to know about keeping combs and cutters running properly while shearing:

- Cutters need to be changed out for new ones relatively often. When you are first starting out, don't shear for longer than 15 minutes without changing a cutter.
- Combs need to be changed out for new ones less often than cutters. When you are first starting out, don't shear for longer than one 45 minutes before changing to a new comb.
- Cutting gear will last the longest on clean sheep with ample, liquid lanolin flowing next to their skin.
- On sheep with a lot of dirt/grit in their wool, you will need to change your cutting gear much more often.
- Changing cutting equipment when your current set is getting dull saves time and energy. Never hesitate to change over to a new cutter, or put a new comb on if your current ones are not making a clean cut!
- Over time you will start to develop a keen sense for when cutters and combs need to be changed and will begin to do so as-needed.
- The back of your combs will often collect large amounts of lanolin. As this lanolin accumulates, it becomes harder to push the handpiece through the wool. Alleviate this by using the metal scraper on the end of your shearing gear brush to scrape the lanolin off of the back of the comb.
- When shearing lambs or in dry/dusty conditions, consider having a sopping wet sponge nearby to set your comb on between sheep. This will act as a heat sink and pull the inevitable buildup of heat off of the comb, helping to keep it cool throughout the shearing day. Hot shears are uncomfortable for the sheep (possibly painful depending on how hot you allow them to become) and sheep will fight and struggle more if you do not take the extra effort to keep them cool.

Biosecurity: The Sheep Shearer's Role

Keeping equipment clean is of utmost importance when shearing sheep, especially if you service more than one farm. Here is what you need to know about cleaning and sanitizing:

- Sanitized and freshly sharpened combs and cutters should be used at every new location/flock you shear. Do not re-use gear at new locations until it has been fully sanitized and re-sharpened.
- Equipment that comes in direct contact with sheep (shearing board, handpiece, hoof trimmers, etc.) should be sprayed with disinfectant after each job.
- A solution of chlorhexidine is widely accepted as excellent choice for disinfecting equipment to be carried from farm to farm. It is not deactivated by organic matter or soaps and kills a wide range of bacteria, viruses, and fungi. Chlorhexidine is sold in two forms: gluconate (generic) and diacetate (Nolvasan®).
- Be sure farmers put any sheep that appear unwell, or have confirmed cases of disease at the END of the line to be sheared. This will prevent transmission of disease within the flock.
- If a sheep shows an active case of disease and your equipment comes in contact with a potentially pathogenic substance (pus, blood, mucous, etc.) take care to change out your comb and cutter and consider spraying disinfectant on anything else that might have come in contact with the substance before shearing the next sheep.

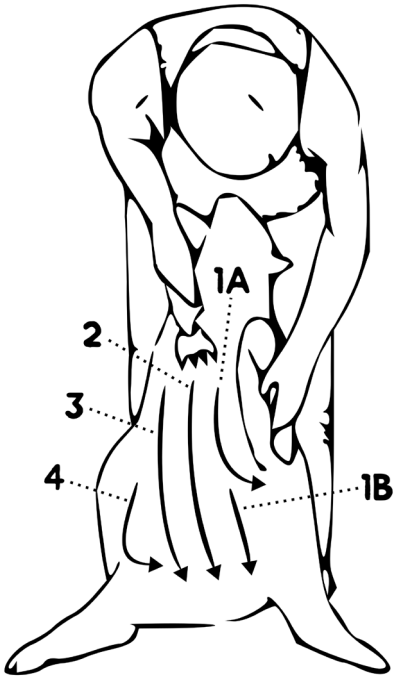
How To Shear Sheep: "The Bowen Method"

This shearing pattern had its birth in New Zealand, where its creators, Ivan and Godfrey Bowen, developed it throughout the 1930s and 1940s. It has changed in small ways throughout the years, but the basis of the method has remained the same and without its development, shearing would still be a long painful process. The aspects that make this method so successful are as follows:

- The sheep's hooves are kept off of the shearing floor for the entire process. This keeps the sheep calmer than they would otherwise be, presumably because they have no means of evading you without their hooves on the ground.
- Each part of the sheep is presented to you and the shears in a way that maximizes the amount of wool you can remove in each position.
- The positions of the sheep are optimal for removal of wool because it allows the shearer to execute blows in a way that minimizes ***second cuts*** and ***skin cuts***.
- When performed properly, this method produces a single fleece that can be thrown onto a table for skirting, greatly improving efficiency of handling and processing the wool that is harvested on shearing day.
- Note that this pattern is for non-fine wool ewes. The pattern will differ slightly for wethers, rams, lambs, and fine wool breeds. The overall pattern is the same, but minor tweaks are implemented for each of the aforementioned groups. The most important difference (outlined later in this handbook) is for wethers and rams. The difference in belly blows are of utmost importance when shearing, as major injury to the sheep can result if the pattern for a ewe is used.

FIRST POSITION:

REMOVING THE BELLY WOOL



To safely get the sheep off of its hooves and onto its rump: (1) hold the sheep against your braced knees with one hand under the chin and one on the rump, (2) turn the sheep's head to the rear (so that its chin is sitting on its shoulder blade) while forcing the rump down against your leg with your other hand, and (3) when the sheep is no longer standing on its feet, lift the front legs and sit the sheep securely on its rump

Sheep's front right leg is positioned upwards and back between shearer's legs, with hoof placed on/under his/her right buttocks.

Sheep should be close to shearer's legs and on top of his/her feet. Shearer's free hand keeps sheep's front left leg out of the way while shearing blow 1A.

Once blow 1A is complete, free hand can come in behind handpiece to pull skin up into handpiece when finishing blows 1B-4.

Blow #4 turns sharply at the end in order to avoid cutting into the flank. DO NOT SHEAR STRAIGHT DOWN when you get to the outside of the belly. You must drop the heel of the handpiece and come from the side.

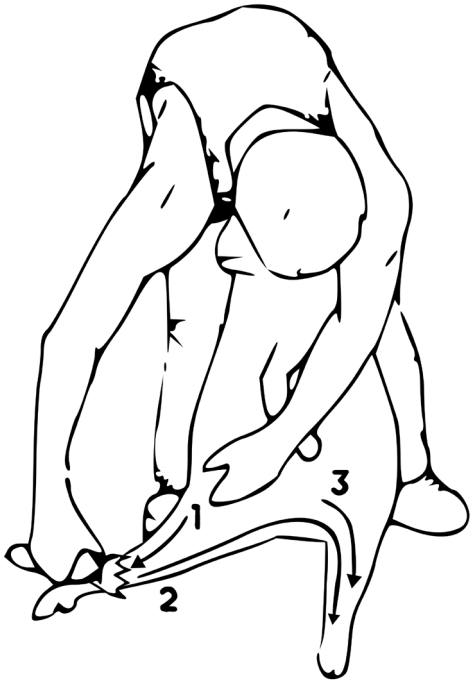
When finishing blows 2-4 take special care to not flick the handpiece up and out, as this will increase the likelihood of cutting the sheep's teats. Extra care at the end of these blows should be taken when shearing ewe lambs and yearling ewes, as they have not lambed yet and will have small teats that are at particular risk of being cut.

Extra care should be taken on blows 2 and 3 when shearing ewes that are still nursing lambs. The large vein that runs up the middle of their belly will be very prominent at this time.

Toss the belly wool aside after removing it from the sheep. Belly wool is almost always shorter and more contaminated than the fleece wool, and making a habit of removing it from the rest of the wool is important.

SECOND POSITION:

SHEARING THE CROTCH



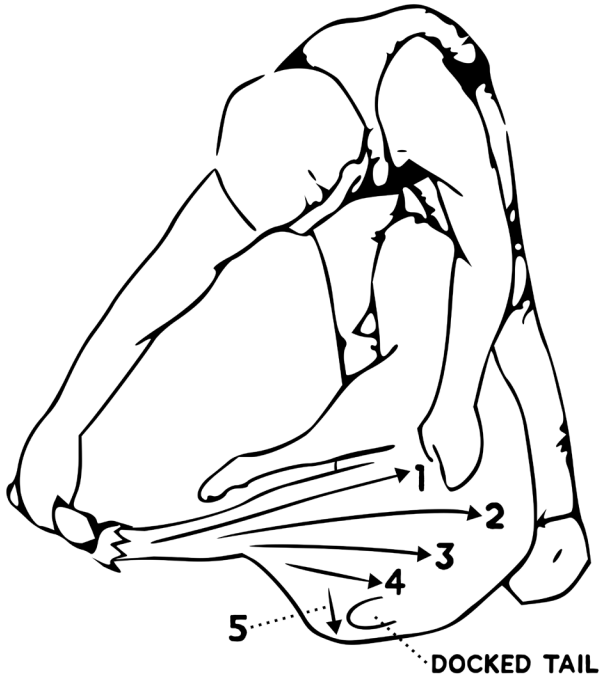
Make sure to step forward with your feet after completing the belly so that your eyes, hands, and body are above the area you are now going to be shearing.

Protect teats with your free hand when completing blow #2 by covering each teat with one of your fingers and pulling them up and out of the way as you complete the blow.

For sheep with very wooly legs, blows in this position start and end all the way out to the hooves, clearing away all wool present on the hocks.

THIRD POSITION:

SHEARING THE FIRST LEG



At this point the shearer must bring his/her body around to the sheep's right side. This facilitates access to the blows in this position and reduces straining. To do this, rotate your right heel outwards and work your foot under the sheep's right flank, then bring your left leg around so that it is on the side of the sheep's spine closest to you. The sheep should now be resting comfortably on your shins.

As in the previous position, blows should begin all the way out on the ends of the legs when shearing sheep with woolly legs.

When completing blow #1, be sure to finish such that the area around the flank is clear. This will make your short blows on that side of the sheep much easier later on. Use your free hand to spread open the wool as you approach the flank.

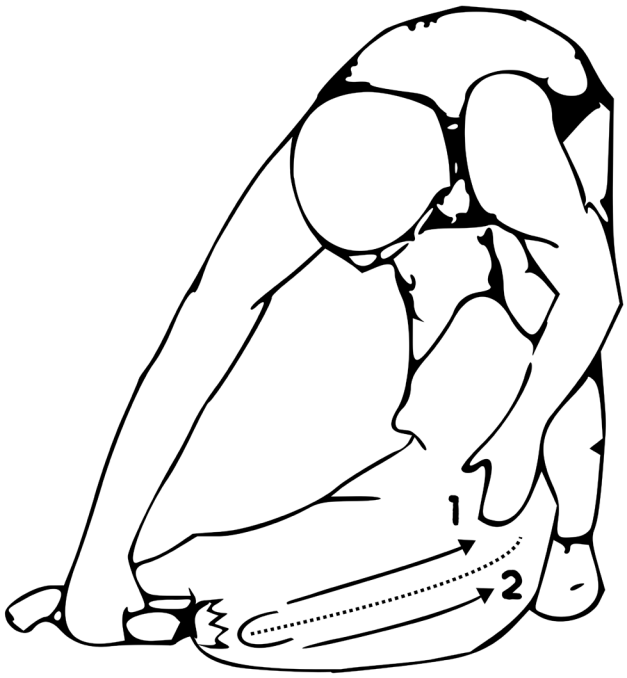
Use your free hand to to spread/stretch the skin where blow #2 and blow #3 are placed. Skin tends to bunch up in these locations and if you do not flatten these wrinkles, skin cuts can occur.

When completing blows 2-4, make sure to finish your blows with the comb teeth on the skin. This requires raising the heel of the handpiece up when finishing each of these blows.

During blows 3-5, you must begin to rotate the rear end of the sheep upwards in order to gain access to those parts of the sheep. To do this, sink your free hand down into left flank of sheep and begin to rotate sheep's rear end upward and also inwards toward machine. This entails stepping forward with your left foot and backwards with your right foot. You are rotating, but not necessarily moving your position on the board.

THIRD POSITION PART 2:

UNDERMINE



You should have plenty of access to complete blow #1 if you did everything right in the third position. If not, go ahead and rotate the sheep's rear end inwards toward the machine and use your free hand to roll the sheep's rear end upwards towards you.

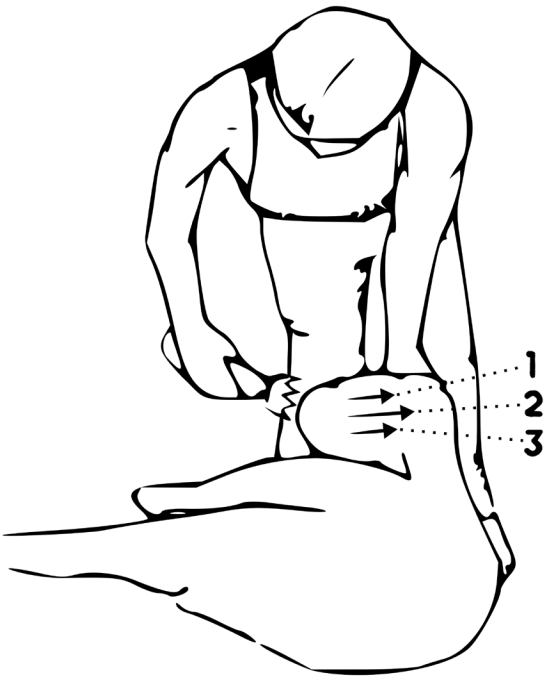
For both blows #1 and #2, be sure you are dropping the heel of the handpiece to the ground so that the handpiece is parallel with the ground and path of travel up the back of the sheep.

If the sheep has an undocked tail, shear the wool off of it during this position.

If the sheep's tail is docked, simply use your free hand to brush back the wool to expose the seam between the skin under the tail and wool on top of it. This is where you will enter with the teeth of the comb at the start of blows #3 and #4.

THIRD POSITION PART 3:

TOP KNOT



Do not move your feet from the position they were in at the completion of the undermine.

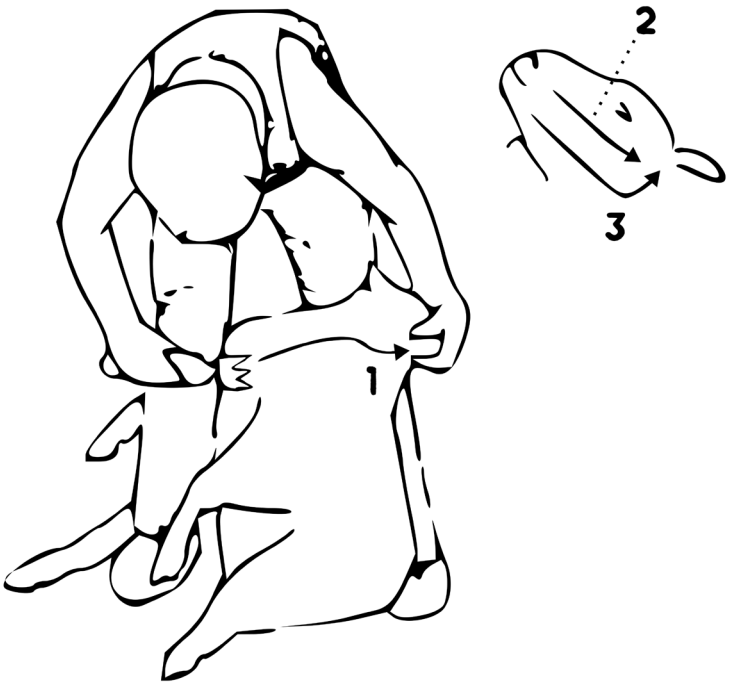
Hold the sheep's head firmly with your free hand and keep it low, against the sheep's torso.

Clear the wool away from the top of the sheep's head, finishing blows #1 and #3 over the orbit of the eye and into the base of the ear, using a scooping motion.

DO NOT flick the handpiece out over the ear in this section. The outer portions of the ear are thin and can easily slip between the comb teeth if care is not taken to avoid this.

FOURTH POSITION PART 1:

NECK



To get the sheep in this position after finishing the top knot, do the following in this order:

1. Reach down between your legs with your free hand and grab the sheep by the shoulder
2. Step up the board with your left foot and place it next to the sheep's thigh
3. Now, simultaneously step up with your right foot (placing it between the sheep's rear legs) and roll the sheep forward so that it is sitting upright.
4. Your left leg should be in front of the sheep's spine (this is how you "catch" the sheep as it rolls upwards) and your right knee should be just behind the brisket. You should feel as though your legs have the sheep securely restrained when squeezing your knees together with moderate pressure.

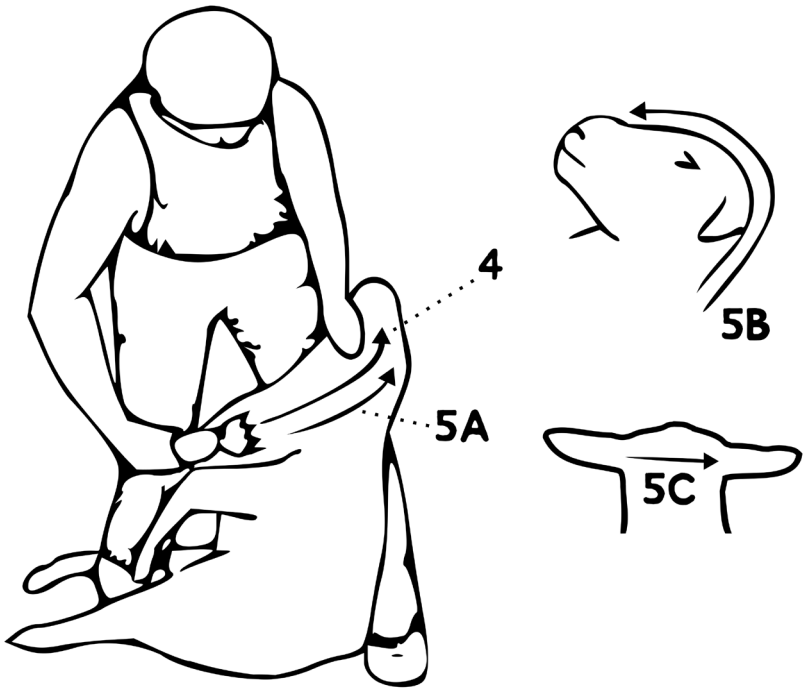
The sheep's weight should be on its left rump. Having the sheep's weight centered on its spine can cause the sheep to struggle.

Blow #1 should begin at the top of the brisket with the top tooth of the comb down and entering first.

Finishing blow #3 into the base of the sheep's ear sets your handpiece up to be in the right position/pointing in the right direction for blow #4 on the next diagram.

FOURTH POSITION PART 2:

NECK AND BACK OF HEAD



Just as with the first neck blow, start blows #4 and #5A at the brisket. Use free hand to flatten out any wrinkles present on the neck when completing blows #4 and #5A.

Use your free hand to control the sheep's ear when completing blow #5A and #5B. This will keep it clear of the comb and cutter.

Blow #5B only needs to be completed over the top of the snout if the sheep has a woolly face. This part of the blow may be omitted on sheep with open faces.

Fill your comb when completing blow #5C so as to give your hand plenty of clear space to hold onto the sheep when completing your long blows later on.

FIFTH POSITION PART 1:

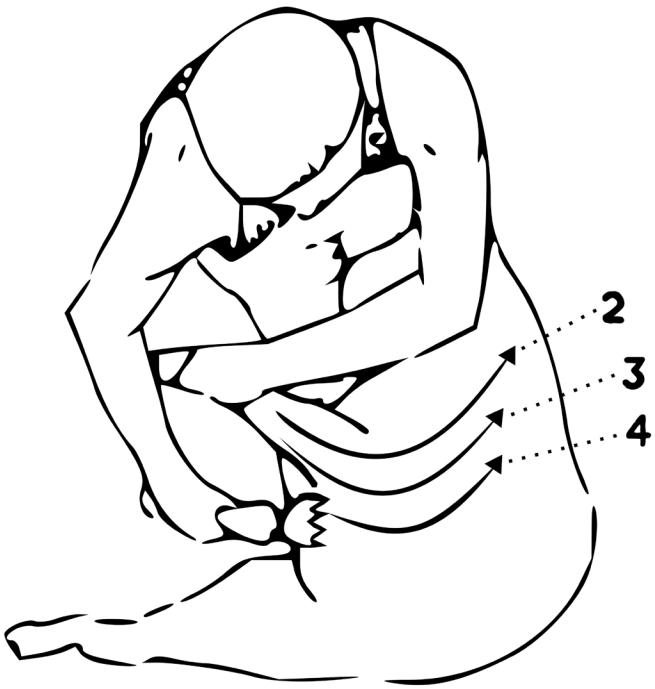
FIRST SHOULDER

The sheep's left shoulder (the one we want to shear here) will likely be tucked down into its body as you move to this section. To present it, rotate your left heel outwards and let the sheep's spine pop out from behind your left leg. To keep the sheep from falling forward here, hold the sheep's head against your left thigh with the forearm/elbow of your free arm and drop your weight back onto your right leg.

Blow #1 begins on the top of the front leg and finishes all the way up to the area you cleared between the ears when completing your neck blows.

FIFTH POSITION PART 2:

COMPLETING THE FIRST SHOULDER



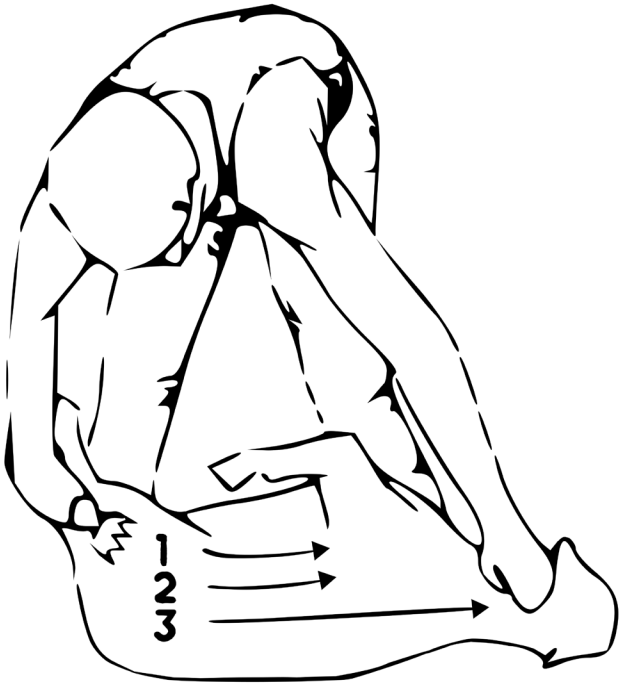
Use your free hand to hold the front leg. The elbow of your free arm is now holding the sheep's neck, rather than its head, as you work your way further down the shoulder.

Blow #2 comes around the point of the sheep's shoulder.

Extra care must be taken on blows #3 and #4 to keep the handpiece flat against the taut flap of skin that is created under the sheep's leg when stretching out the front leg with your

SIXTH POSITION PART 1:

SHORT BLOWS AND FIRST LONG BLOW



Let the sheep slide downwards so that the sheep's right shoulder is against your left shin.

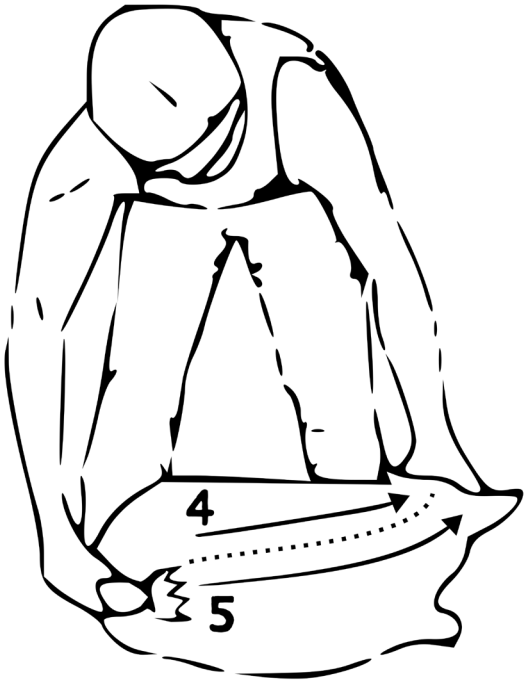
If the sheep picks its head up and begins to struggle, gently set its head back down against the floor and hold it there while you shear blows 1-3.

On larger sheep, you may need to implement more short blows (like #1 and #2) before moving on to #3.

After your first long blow (#3), step over with your right foot so that it is away from the sheep's pelvis by about 8 inches.

SIXTH POSITION PART 2:

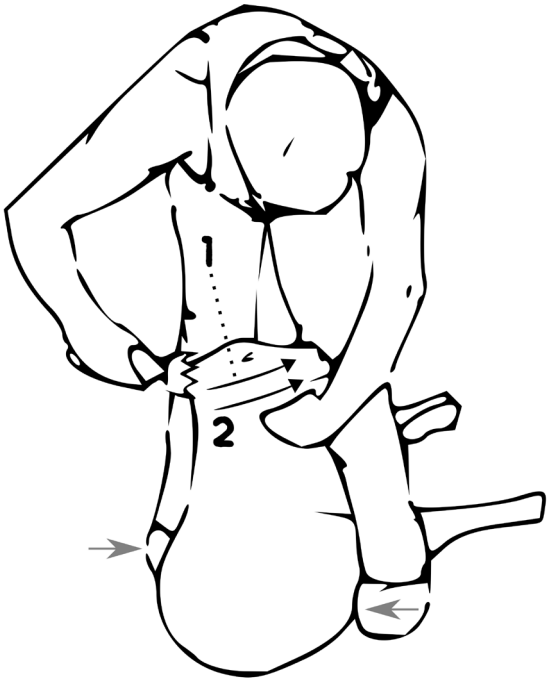
LONG BLOWS



Use your free hand to curl the sheep's head and neck around your left leg, being sure to keep the sheep's front legs on the inside of your left leg, and its shoulder on top of your left foot.

SEVENTH POSITION:

RIGHT CHEEK



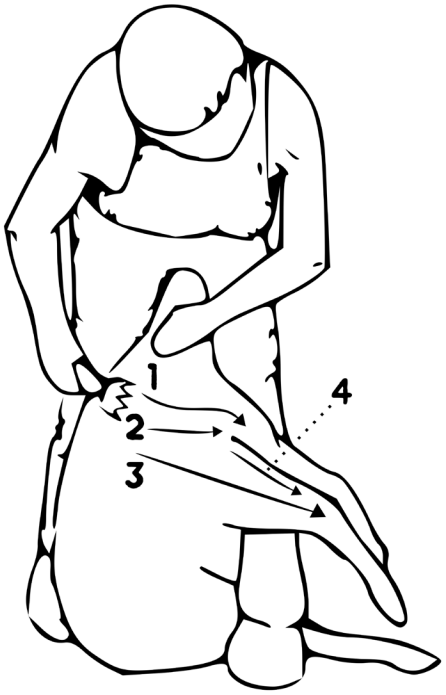
Bring your right foot up so that it is in line with your left foot, and shove your right toe in and under the sheep so that your toes are pointing inwards towards each other. This will keep the sheep up off of the ground and prevent her from struggling.

Use your left leg to roll the sheep up onto its back slightly. If done properly, the sheep's head will be positioned exactly where you want it to shear the wool off of the right side of it's face.

If the sheep's head feel heavy, and has a tendency to fall flat onto the ground, then she sheep has not been rolled up and onto it's back far enough, and your toes are likely not close enough together underneath the sheep.

EIGHTH POSITION PART 1:

SECOND SHOULDER



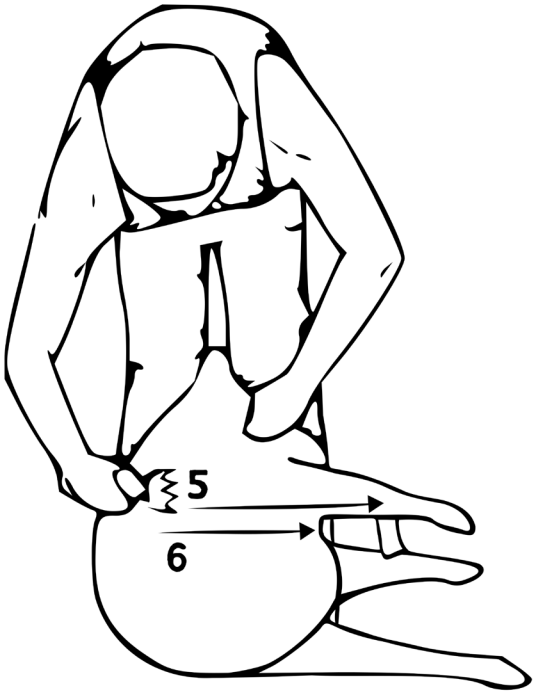
Grabbing ahold of the sheep's jaw, begin to roll the sheep upwards toward you. This will require stepping back with your right foot.

Pass the sheep's head between your legs and hold its neck securely with your knees.

Once you have completed blow #4, step all the way through with your left foot so that your leg is now behind the sheep with your right leg. Your left toe should be under the tail at this point.

EIGHTH POSITION PART 2:

SECOND SHOULDER



Blow #6 does not end where the arrow finishes on the diagram. Complete this blow by rotating the handpiece 90 degrees away from you as you approach the leg, finishing out the blow underneath the leg. Using the fingers of you free hand to pull up on the skin here will help to present the wool for this blow.

NINTH POSITION PART 1:

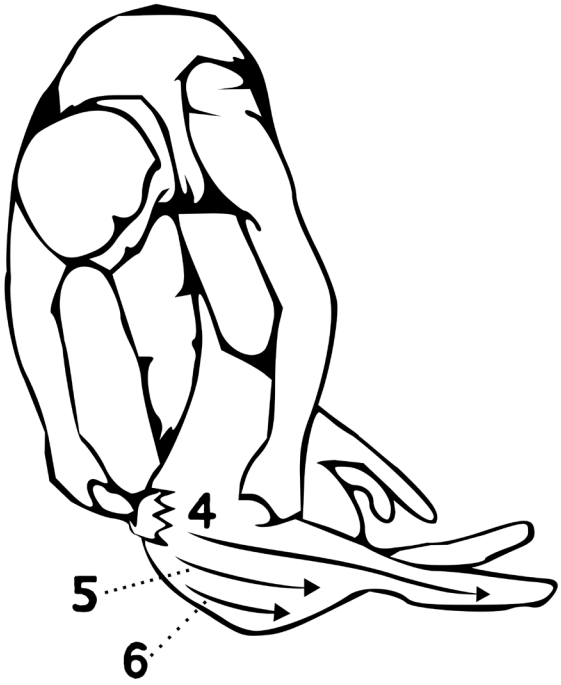
LAST SIDE

Use your free hand to brush the wool on top of the leg downwards so that it is caught by blow #2.

Anything not shorn off by blow #2 should be cleaned up immediately after finishing the blow with a short blow on the top of the leg (#3)

NINTH POSITION PART 2:

LAST SIDE

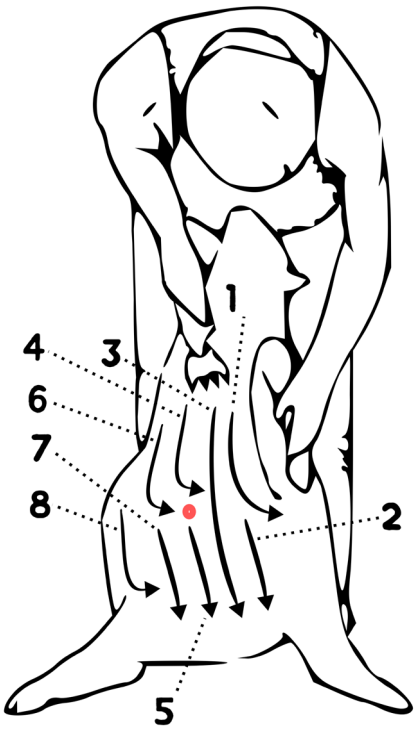


⚠ Blow #5 (much like blow #5 on the second shoulder) does not end where indicated. Finish this blow out and under the hamstring, rolling the handpiece under the hamstring as you finish (not directly into it, which can cause a catastrophic injury to the sheep).

As you transition from blows #4 to #5 to #6, you will need to shuffle back ever-so-slightly to keep revealing the portion of the sheep that you need to shear.

⚠ Upon completion, the sheep will be laying between your legs and will get up on its own. If the sheep is disoriented, be sure to guide it towards its exit.

SHEARING THE BELLY ON A RAM OR WETHER



⚠ ALWAYS PERSONALLY VERIFY THE SEX OF THE SHEEP YOU ARE WORKING ON BEFORE SHEARING THE BELLY! Male sheep (rams and wethers) will require this modified pattern to avoid injuring the animal.

The red dot on the belly of the sheep in the diagram indicates the location of the prepuce.

⚠ Shearing directly downwards into the prepuce will result in a major injury to the animal, so special care needs to be taken. As indicated by blows #4 and #6, the shearer must be sure to shear over the prepuce from the SIDE.

Quality Counts!

The shearing world spends a lot of time focused numbers. How many can you shear in a day? How many can you shear per ***run***? How many have you sheared in your lifetime? These numbers can be a point of pride for many sheep shearers, and rightfully so, as it is an objective measure of one's abilities as a shearer. But it is only one measure, and is unlikely to be the single most important one. Consider the following situation at the end of a shearing day:

1.) "Joe" sheared 80 head of sheep, and left each one cleanly shorn, with a minimum of second cuts, and virtually zero skin cuts to the animal.

2.) "Schmo" sheared 125 head of sheep, but left many with large skin cuts and many second cuts of wool strewn about the shearing board upon completion of each sheep.

Schmo may make more money on the single day described above, but it is Joe that will be asked to return to that farm the following year. Furthermore, if the farmer sees the poor quality of shearing and can tell that he is rushing through his work, Schmo may actually be asked to leave early and never return to that farm again. If Schmo's behavior is habitual, his shearing contractor will likely replace him with a shearer that is more conscientious about his/her work, or simply do without him if there is no one to take his place. Please do not think that the above story is embellished. It is not unheard of for farmers to kick shearers off of their property for egregiously poor shearing and this reaction ought to be expected in cases where shearers are mistreating sheep.

It is your *quality* as a sheep shearer that will define you. Shearing in the beginning is difficult. Much of this is due to the fact that none of the movements are embedded in your muscle memory yet. Take your time. Speed will come. Do it wrong in the beginning and later you'll still be doing it wrong, just a little faster than before. Do it right in the beginning and later, as you build speed naturally, you'll be doing it RIGHT and be just as fast (if not faster) as the person who tried speeding up in the very beginning.

If you try to speed up when you don't know what you're doing, you'll always be a poor shearer. But if you slow down and do it right in the very beginning, you will set yourself up for a life of success. Remember: don't worry, speed will come.

Handling Difficult Sheep

If sheep do anything well on shearing day, it's test the mind of the shearers and other humans that are handling them. Some sheep will seem to fight and struggle more than others. When this occurs, the worst thing you can do is expend energy fighting back. A day of shearing is akin to a boxing match where each round (and there are many rounds) a fresh new fighter comes out to fight you. Each one has rested up and prepared for this fight all day, while you, the masochistic boxer, has been sweating in the ring against other opponents. Do not expend any more energy than is necessary to move onto the next round: believe me, you are going to need every calorie.

LAMBS

With lambs, which tend to be very jumpy, staying low to the ground (they're much lower to the ground than ewes are when you sit them down), and keeping them moving is important. Try not to linger in any one position for longer than is necessary, and consider using a rocking motion with your body while shearing to keep them moving.

STICKY WOOL

Some sheep have very sticky wool. Shearing them feels like you are trying to push the handpiece through nearly-dry Elmer's glue that has become embedded in the wool. In these cases, it pays to not be terribly particular about the way the sheep looks at the end of shearing. You may have to float above the level of the skin by a half inch or so, in order to get out of the sticky lanolin. Yes, this will leave a little wool on the sheep, and it may not look pretty when you are done, but it will save your body and can greatly reduce bad cuts to the sheep's skin.

UNDERWEIGHT SHEEP

Sheep that are severely underweight are difficult to shear quickly because the points on their body (skeletal processes) interfere with running the comb over the body of the sheep. Sheep shearing gear has been designed and manufactured to be used on healthy sheep, so when you encounter unhealthy sheep you must slow down your pattern slightly and take extra care to use a "flat hand" (i.e. run the handpiece so that it is parallel to the body of the sheep). Sections of the sheep to be extra careful around on underweight sheep are: first leg and undermine (hips); and long blows (spine).

RAMS

Rams are typically significantly larger and more muscled than ewes. Their explosive energy can make shearing them quite a task. Do your best to move smoothly and in a very controlled fashion when moving rams through the positions of shearing. On very large or difficult rams, take wool off when he presents it to you instead of obstinately attempting to make him conform to the pattern outlined above. In some cases you may even need to have another individual there to help hold the ram down in certain positions. Do not try to force too much with rams; you will only wear yourself out! Take what you can get. Some rams are big teddy bears and will shear beautifully. Most will be a challenge. A couple of tips specific to rams:

1. Do not step through the rear legs with your right foot when bringing him up to shear the neck. Keeping your foot behind the right rear leg will give you more leverage against his large body that will want to toss you forward in that position.

2. You may need to turn the machine off and put the handpiece down when rolling him up to do the neck, as well as rolling him backwards to access the last side.

3. On large rams, don't pass the head through your legs on the last side. Instead simply keep it in front of you (will likely be at the level of your crotch or chest depending on the size of the ram) while finishing the last side.

AS A BEGINNER

Shearing sheep all day is a difficult task for even the most seasoned shearers. As a beginner many days can seem like some sort of karmic punishment. Don't despair! I promise it will get better with time if you have the right attitude. The worst thing you can do is start thinking negatively or get caught up in being frustrated at the sheep. Remember: the sheep didn't ask for this, we bred them this way. We owe it to the animals to remove that wool efficiently and humanely. If you are unable to do the latter, it's likely you are not cut out to be a sheep shearer. We *all* get frustrated with animals from time to time: it is what we do with this frustration that matters.

Think of the sheep like this: creatures that simply react the way their programming tells them to react. They are not to blame, as they are simply the body that is carrying out the commands of the software baked into their heads. How could you get angry at something that isn't even making the conscious choice to behave a certain way?

If you find yourself getting frustrated with the sheep and start having dark thoughts (it happens to the best of us whether we admit it or not), TAKE A BREAK! Taking five minutes to rest your back and do some deep breathing can help a tremendous amount. Take stock in why you are doing what you are doing and how you can be better at it. Then go back in and try again

Hoof Trimming

Like goats and cattle, sheep have cloven hooves. This means that the hoof is split into two halves, or "claws". Each claw can move somewhat independently of the other, and it is what give sheep such strong dexterity and traction in rough terrain. Each half of the cloven hoof is comprised of a soft sole that is surrounded by a hard wall on the front and sides of the claw. On the back of each claw is a somewhat softer heel.

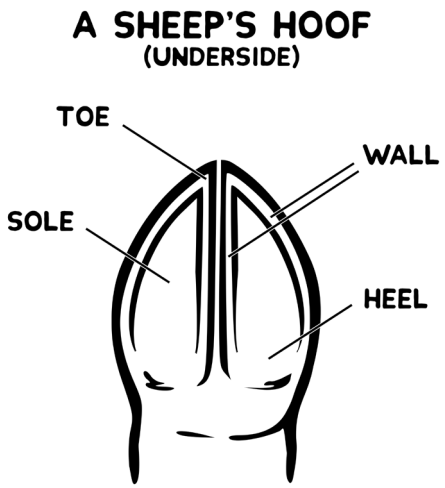
In settings where sheep are grazing in large enclosures or are walking regularly on abrasive ground, hooves will naturally be maintained at a healthy length. In settings like this, frequent hoof trims are generally unnecessary, although it is still advisable for the flock owner to look at the hooves during routine health checks and when handling his/her animals for other procedures such as shearing and lambing.

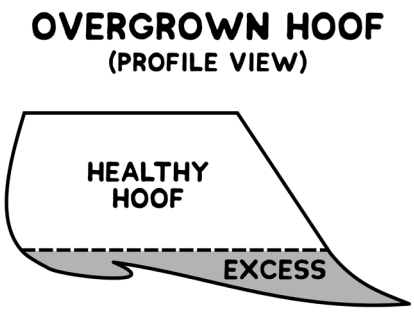
In settings where the sheep are constantly being kept on soft bedding, or are otherwise unable to wear down their hooves during daily activities, hooves must be closely monitored for overgrowth. Conditions will dictate exactly how often hooves must be trimmed, and many factors can influence this (age, genetics, material they are standing in most of the day, what they are being fed, etc.).

As a general rule, however, hooves that are not being naturally worn down via normal interaction with the environment should be checked every 2-4 months. In more extreme individual cases, a maintenance trim might be appropriate as frequently as every 1-2 months.

HOW TO TRIM HOOVES

The part of the hoof that becomes overgrown first is the hard outer wall of each claw. The softer inner sole does not generally continue to grow in healthy animals, and as a result the outer walls will often curl inwards or outwards due to the force created when walking upon them. As the outer wall grows beyond the soft inner sole, it creates a hollow cavity between the walls. These cavities are often packed with mud, manure, rocks, and other organic matter, and must be cleared out of the cavity before trimming the hoof. This can easily be accomplished using the points of a closed pair of hoof trimmers. Most hoof trimmers are essentially a pair of pruners fitted with pointy blades instead of curved ones. You would be hard pressed to harm the animal in digging this dirt out with the points of a pair of hoof trimmers, so do not be shy with hard-packed matter.





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The hoof must be trimmed back so that the hard outer wall of the claw is flush with (at the same level as) the soft inner sole. Sometimes working a hoof trimmer blade under the edge of the wall that needs to be cut can be a major challenge, due to the fact that the walls grow into each other at the point ("toe") of the claw, and close off the cavity. When this happens, trim just the tip off of this overgrown toe to expose the hollow enough so that you can work your blade in there so that it is flush with the sole along the base of the overgrown wall. Once the wall is

flush with the sole, that claw is complete and you may move onto the other half. Heels will less frequently become overgrown, but when they do, are easily trimmed flush with the inner sole due to their soft composition.

A good sharp pair of hoof trimmers is necessary to complete this task with minimum frustration. Old dull trimmers will simply pinch the hoof and the blades will split apart, pinching the hoof instead of cleanly cutting through. Keep hoof trimmers free of dirt and grit for longevity of the blades. Keep the hinge oiled lightly and be sure to have the blades sharpened they become dull.

BIOSECURITY TIP

Hoof trimmers should always be sanitized before being used on animals from a different farm to minimize the possibility of disease transmission from flock to flock. If working on an individual animal that appears to have a hoof infection, trimmers should be sanitized thoroughly before moving on to the next animal to minimize the possibility of disease transmission within the same flock.

APPENDIX A

Glossary of Terms

BY TREVOR HOLLENBACK

blow: (noun) a single pass with the shears that results in wool being removed from the sheep's body.

belly wool: (noun) wool from the belly region with a pronounced crimp. It is often shorter staple length and discolored.

bottom tooth: (noun) the tooth on a shearing comb that is furthest from the shearer during the majority of the shearing process. This tooth is normally the straighter of the two outside teeth on a comb. See ***top tooth***.

catching pen: (noun) a pen or stall near a shearing stand where sheep are held in a tight group during shearing.

conserved forage: (noun) hay or silage.

cover comb: (noun) a shearing comb with only 9 teeth and risers built up along every other tooth on the back of the comb. When used properly, these combs shear further away from the surface of the skin, leaving a protective cover of wool on the sheep if it is to be released into inclement weather conditions following shearing. Extra care must be taken when using this comb, for the combs are generally the same width as standard shearing combs, but with 4 less teeth. This results in very large gaps between the teeth that are more prone to catching body parts of the sheep: especially tendons of the rear legs, ears, neck wrinkles (if present).

crutch: (verb) removal of wool via shearing from around the tail, vulva, udder, and inside rear legs.

disinfect: (verb) using chemicals to kill disease-causing organisms on equipment or facilities.

downtube: (noun) a solid driveshaft which serves as the drive connection from an overhead motor to a mechanical handpiece.

drenching: (verb) the oral administration of medication.

ewe: (noun) a female sheep.

flystrike: (noun) see myiasis.

facing: (verb) correcting wool blindness by shearing wool from the face.

handpiece: (noun) a mechanically driven tool upon which a single comb and cutter are mounted for the purposes of shearing sheep.

handheld machine or ***handheld unit***: (noun) a shearing machine that contains a small motor within (or on the end of) the unit itself. Use of these is particularly popular among farmers and camelid (alpaca and llama) shearers, but are serviceable units for shearing small numbers of sheep daily.

lead: (noun) the distance from the tip of the cutter to the end of the cutting surface of a comb (the base of the scallop).

mustering: (verb) gathering and bringing in groups of sheep, typically for shearing, that are grazing extensive pasture land.

pen stain: (noun) fecal staining on wool caused by sheep coming in contact with feces in holding pens and catching pens prior to shearing.

prepuce: (noun) the sheath surrounding the penis of a male sheep.

ram: (noun) a male sheep that has not been castrated.

run: (noun) a period of time, usually two hours, during a typical commercial production shearing day in nations like Australia and New Zealand. Most days consist of four or five shearing runs, broken up by 30-minute breaks and a 1-hour lunch at midday.

second cut: (noun) a small cut of wool that is either left on the sheep or sheared off after an initial pass with the shears. These result from failing to keep the comb against the skin of the sheep when shearing, or from using too much of the comb's width when use of only half the comb is indicated. Second cuts present in otherwise high quality wool can cause it to be devalued.

shearing contractor: (noun) an individual who runs a mobile sheep shearing business by managing crews of shearers to go out and shear at different farms, sometimes even shearing alongside his contracted workers.

shearing stand: (noun) the small area outside of a catching pen or near the chute on a shearing trailer where sheep are shorn, upon which an overhead motor and driveshaft are installed.

skin cut: (noun) a cut to the skin of the sheep when shearing. Skin cuts cause pain to the animal and possible health complications. If not removed from the fleece, sheep hide that ends up in the wool clip can both devalue wool and cause breakage of equipment in wool mills.

tags: (noun) clumps of dung-laden wool found around the rear end of sheep.

tagging: (verb) the removal of tags using sheep shears.

teat: (noun) one of two nipples located on the udder of a female sheep.

throw: (noun) the lateral area on a comb that a cutter covers when oscillating across the comb's surface.

top tooth: (noun) the outermost tooth on a shearing comb that is closest to the shearer during most of the shearing process. This tooth is usually flared outward in order to capture more wool during each blow. See ***bottom tooth***.

vulva: (noun) the region containing external genital organs on female sheep.

wether: (noun) a male sheep that has been castrated.

winter comb: (noun) See ***cover comb***

wool clip: (noun) the wool produced by a specific sheep operation or nation

APPENDIX B

Sample Flock Management Year Calendars

BY ALISON SMITH

November/December Lambing

January	• 2nd week: deworm replacement ewes and rams if necessary • 4th week: deworm all ewes and lambs
February	• Vaccinate all lambs at 10-12 weeks old for Enterotoxemia and tetanus.
March	• Wean 2 weeks before shearing.
April	• Shearing • Booster vaccine for all lambs
May	• Sell market lambs late May-August • Vaccinate breeding ewes 2-4 weeks before breeding for abortion-causing diseases • Flush breeding ewes for 2 weeks before rams are introduced.
June	• Deworm rams if necessary and give annual booster vaccine. • Introduce to ewes. • Start of breeding
July	• Watch signs of malnutrition or parasites • Pull rams 5 months before you want lambing to stop at least 38 days after introduction
August	• Watch signs of malnutrition or parasites • Pregnancy check if desired last half of August/early September (45-70 days gestation)
September	• Watch signs of malnutrition or parasites • Rotational grazing
October	• Tag/Crutch all sheep 4-6 weeks before lambing • Vaccinate all breeding ewes 4 weeks before lambing starts • Purchase all supplies for lambing
November	• Supplement feed last 2 weeks of pregnancy • Start lambing end of November • Prepare lambing barn unless pasture lambing, then just supplemental care barn areas
December	• Continue lambing

February/March Lambing

January	• Vaccinate all breeding ewes 4 weeks before lambing starts • Deworm replacement ewes and rams (anytime Jan-March) • Supplement feed last 2 weeks of pregnancy • Prepare lambing barn unless pasture lambing, then just supplemental care barn areas
February	• Start lambing • Deworm all ewes immediately after lambing
March	• Continue lambing
April	• Shearing April or May depending on weather • Vaccinate all lambs at 10-12 weeks old for Enterotoxemia and tetanus.
May	• Watch for signs of parasitism in lambs and ewes particularly
June	• Wean lambs • Booster vaccine for all lambs
July	• Watch flock for signs of malnutrition or parasites
August	• Vaccinate breeding ewes 2-4 weeks before breeding for abortion-causing diseases • Flush breeding ewes for 2 weeks before rams are introduced.
September	• Deworm rams if necessary and give annual booster vaccine. • Introduce to ewes • Start of breeding
October	• Watch signs of malnutrition or parasites • Pull rams 5 months before you want lambing to stop at least 38 days after introduction
November	• Watch signs of malnutrition or parasites • Pregnancy check if desired last half of November/early December (45-70 days gestation)
December	• Tag/Crutch all sheep • Purchase all supplies for lambing