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LLAMA PACKING: A GUIDE FOR THE LOW IMPACT USE OF LLAMAS IN THE BACKCOUNTRY

By

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INTRODUCTION

Imagine a warm sunny afternoon in a remote section of the back-country; you've decided to get off the trail and take a break. As the afternoon wears on you notice a hiker tramping up the trail below. You admire, yet pity the person hidden under the over-stuffed bundle of goods known as a backpack. Smiling contentedly to your companion, you realize there is an easier way.

Later in the afternoon you hear another commotion coming up the trail, louder than before. You recognize the sound as a horse and mule string. The train of animals quickly pass beneath you and vanish in a cloud of dust. The dust soon settles but a multitude of tracks remain. Smiling contentedly to your companion, you realize there is a way that is gentler on the land.

With only a few hours of daylight left, you start hiking yourself. Behind you, on a short lead line carrying ample supplies, is your companion--a llama. Smiling contentedly, you hike deeper into the backcountry.

Llamas have been used as beasts of burden for many hundreds of years in South America. Only recently have llamas become popular in the United States. What was once a small herd of exotic animals in our country is exploding into a thriving multi-faceted industry. Currently there are
22,000 llamas in the United States. This number is expected to reach 150,000 in just eleven years (Thomas and Johnson, 1988). This explosion is fueled by the ever-spreading knowledge that llamas are good investments, gentle pets, bountiful wool producers, and excellent pack animals.

The increased popularity of llamas overall has led to an increased number of llama packers. Llamas are rapidly gaining popularity among commercial outfitters, U.S. agency personnel (Park Service, Forest Service and Bureau of Land Management), and the general public.

Despite this growing interest in llama use, no single source book on llama packing is available. There are a number of sources regarding llama health and general husbandry, but little written about llama packing. This information void can cause hesitation and speculation on the part of would-be llama packers. Secondly, the people that are currently using llamas for packing have little to guide them about the proper use of llamas in the backcountry. This could be detrimental not only for the environment, but for the llamas as well.

Because of the inadequacies discussed above, some guide for llama use is needed. Therefore, I have written this paper and have divided it into two sections. Section One is addressed toward the person who is thinking of using llamas for packing but needs a little more information before
making the plunge. Section Two is written for those who have already decided to pack with llamas but need advice on how to go about it.

In all fairness, I should tell you before you get started what the paper isn't. Since there is plenty of information about llama health and care, I only deal with aspects of husbandry that are pertinent to llama packing. For example, llama health topics are limited to tick control and conditioning for the trail—important things for the llama packer to know. Other health topics such as the care of new-born llamas and fertility problems will not be addressed.

What you will find in this book, however, is everything you need to know to get you, your equipment, and your llama in and out of the backcountry in a safe, efficient, and environmentally sound manner.
PART ONE: WHY USE LLAMAS

ATTRIBUTES OF THE LLAMA

Llamas were used as beast of burden some four or five thousands years ago (Franklin, 1981). The Inca empire, which flourished from 1200 A.D. until 1532, relied heavily on the llama to transport supplies. Llamas still play a vital role in the lives of the people of Peru, Bolivia, and Chile. Today, in the U.S., more and more people are turning to llamas to pack supplies into remote, backcountry areas. But what is it about the llama that makes it such a terrific pack animal?

The llama has many characteristics which make it superbly suited for packing. Their unique foot, efficient metabolism, and calm personality are just a few of the llama's beneficial traits. In order to understand how these traits developed one must first understand the taxonomy and evolution of the llama.

Llamas are members of the camel family. This taxonomic family is divided into two genera. One genus, Camelus, has two species—the one-humped dromedary or Asian camel and the two-humped Bactrian camel of Mongolia. The other genus, Lama has four species—all found in South America. The four species of the genus Lama include: the guanaco, an
The undomesticated version of the llama; the alpaca, a shorter, very woolly domesticated *Lama*; the vicuna, a small, shy *Lama* with the finest of wool; and the standard domestic llama, which this paper is about.

Both the present day camels and the *Lamas* came from the same ancient camel stock which roamed the plains of central North America forty to forty-five million years ago. It was only in the past three million years that these ancient camels migrated out of North America. One group migrated to Asia via the Beringia Land Bridge and evolved into the dromedary and the Bactrian camels. Another group migrated south across the Panamanian Land Bridge and formed the present day genus *Lama* with its four associated species (Vaughan, 1986). But before migrating, the camel-like ancestors had developed one of the key components which makes the llama such a great pack animal—its foot.

When one starts to talk about the wonders of the llama for packing, the foot is the logical place to start. In the same way a house will crumble without a proper foundation, a pack animal is only as good as its feet. The feet are the connection between the animal and the earth over which it traverses.

The prehistoric camels did not continue along the well-established evolutionary trend of foot development. Other ungulates developed from digitigrade (walking on toes like a
cat or dog) to unguligrade (walking on the tips of the toes like a horse or a deer). The camelids, however, went from digitigrade to nearly unguligrade and then back to digitigrade. This deviation from the standard course of foot development evidently occurred so as to allow the camelids better support on soft substrates. The outcome was a padded, digitigrade foot with a large surface area in contact with the earth (Vaughan, 1986).

The natives of South America probably realized long ago that this large, wide foot provided extreme stability and sure-footedness for the llama. To the novice looking at the llamas foot, however, many of these secrets are hidden. With the foot in its normal position it looks much like the split hooved foot of a deer, goat, or sheep (see Figure 1.).

![Figure 1. Llama Foot](image)

Only when you lift the foot and observe the underside can you see that the foot is not at all cloven but webbed. The soft, nearly round, leather pad which makes up the bottom of the foot extends under two toe-nails. The toe-nails provide traction in the snow and mud while the wide, soft, leather
pad provides stability. And, perhaps most importantly, this structure means that the impact of the llama's foot on fragile soil is minimal.

The unique development of the camelid's foot took place long ago in North America. Once the camel-like ancestors reached South America, other developmental changes took place. Many of the changes that took place during the evolution of the Lama were influenced by the harsh environment of what is now the Andean Mountains.

One such characteristic is the way the llama moves its feet. The common gait for a llama is the pace. The pace is a type of locomotion where the feet on the same side of the body move forward at the same time. This allows the llama to cover more distance with less energy than it would if it utilized the walk common to most ungulates (Franklin, 1981). The sparse vegetation found in the Andean mountains, homeland for the llamas, probably accounted for the development of the pacing gait because the llama needed to cover great distances to find food.

The sparse vegetation had other beneficial effects on the llama. In order to survive with scarce rations, the llama's metabolism became very efficient. Being a ruminant, the llama regurgitates a cud from one of its three stomachs then chews the food a second time. Llamas have a more continuously active fore-stomach and more frequent cycles of rumination than other livestock. This combined with special
secretions allow the llama to do well on low protein foods such as pine needles, sedges, and shrubs they nibble along the trail. Consequently, little if any of the 80 to 100 pounds on the pack llama needs to be llama food.

A high flat plain in Peru and Bolivia, the puna, rests at elevations between 12,000 and 14,000 feet above sea level. Llamas spent many of their developmental years grazing on the high puna. At these elevations oxygen is scarce; consequently, the llama has a unique blood structure to deal with the oxygen deficiency. The hemoglobin of the llama has a much greater affinity for oxygen than does that of other mammals, and the blood contains more red corpuscles (Tillman, 1971). This unique blood structure allows the llama to function efficiently as a pack animal even at high elevations.

And if the physical attributes of the llama are not enough to convince you of their high rank as a pack animal then consider their behavior. Yes, llamas spit. But only in rare instances will you find a llama which regularly spits at humans. Most often spitting is directed at another llama. It is the llama's very sensible way, it seems to me, of settling arguments. Rather than bloodshed or death, the llama's bitter and rank wad quiets most differences.

Spitting instead of physical confrontation is indicative of the disposition of the llama. Intelligent, companionable, gentle, curious and calm all describe llamas.
These are important characteristics for stock used for packing in the backcountry. Calm is important for obvious reasons. There are many hidden surprises just waiting to happen on any pack trip. Packs will slip off backs, grouse will explode under your feet or a foraging bear will notice you only seconds after you noticed him. Whatever the event, you can rest assured that the llama will remain calm.

For example, last spring I convinced three local elementary-school children to help me with my pre-season llama conditioning. Our destination was the foothills behind my house. Little did we know that my neighbor had decided to fire a round from his authentic Civil War cannon to announce the coming of spring. When the blast went off we were at most sixty yards from the muzzle of the cannon. Thank God it was a blank. The three children and their llamas were ahead of me. Two of the llamas took a side-step and stood eyeing the cannon through the trees. The third llama never jumped at all; instead, it watched the youngest of the three children running circles about him and crying hysterically.

Because of their calm disposition and moderate size, llamas are also very safe animals with which to work. Llamas don't bite and rarely kick. The one full-force kick I have received produced only a light bruise. The simple fact that you're on the ground and not riding high on the back is probably the biggest contribution to safety. People
with no previous stock experience can feel safe leading a llama with just a few minutes of training.

As well as feeling safe when leading the llama, there is no need to worry about the llama running away. Llamas have a strong herding instinct, and most will go to great lengths to stay grouped with other llamas. Therefore, it is usually a bad idea to keep a single llama isolated from other llamas. Occasionally, one will find a more independent llama that enjoys staying by itself. What this means for the llama owner is that, unless you own an independent llama, you should own two llamas.

On the trail, however, this strong social drive has positive ramifications. Even the laziest llama will strive to keep up with his more energetic companions. In camp the llama allowed to graze freely will certainly stay near the other confined llamas. Allowing a llama to roam is not only good for the llama, it also is less harmful to the environment.

Exactly how one would measure intelligence in a llama is unclear. But if their ease of training is any indication of intelligence, then they are certainly very smart creatures. Llamas reach maturity at age three, approximately, and often live twenty to twenty-five years. A six-month-old llama can be taught to lead in about three fifteen-minute sessions. A two- or three-year-old llama
that has been taught to lead can also be taught to pack in about three fifteen-minute sessions.

One evening Jack, a four-year-old pack llama with which I was hiking, froze still and was staring at a clump of bushes one-hundred yards uphill. His large brown eyes and banana-shaped ears were sharply focused on the seemingly inanimate bushes. Momentarily, one of his ears rotated to listen for sounds from the trail behind us but then quickly refocused on the bushes. I respectfully gave the bushes due attention but saw nothing. Still Jack would not budge. Finally, after considerable jerking on the lead line, I got Jack to start moving. Four steps later, two white-tailed deer bounded from the bushes. As we continued along the trail Jack let out a I-told-you-so hum. The keen senses of a llama can be equally helpful for the animal-seeking naturalist, photographer, or bow hunter.

Their keen senses coupled with their built-in alarm call make the llama useful for night patrol. When the llama sees, hears, or smells danger they will often sound an alarm call loud enough to wake the most restful sleeper. I know a commercial llama packer who packs in areas with known grizzly-bear populations. Based on his observations of the reaction between bears and llamas he stakes a llama in front of each tent before retiring to serve as night patrol watch-llamas.
As a final note on the attributes of llamas, I want to mention a few words about companionship—the human-llama kind. There are two attitudes one could have about packing with llamas. One approach would be to consider your pack llama just another piece of equipment. As long as you take care of your equipment, it will perform its function of packing supplies in and out of the backcountry. But I would strongly advise against this philosophy. You would be cheating yourself terribly.

I find it more fulfilling to think of your llama as a companion. The two of you are setting out on a journey together. Without your companion you would be carrying the gear yourself. Without you, your llama would be stuck in the barn eating hay. Because of you he's on the trail enjoying a smorgasbord of delightful tastes, sights, and sounds. A llama makes a very good companion indeed.

ENVIRONMENTAL ADVANTAGES OF PACKING WITH A LLAMA

Perhaps after learning some of the unique characteristics of the llama which are specialized for packing, you are still hesitant. After all, a llama is a pack animal and the two of you will do more environmental damage than if you simply packed supplies on your back. You are right. And the decision whether to use pack stock or to pack supplies on your back is one we all have to make. But before making that decision, one really needs to know just
how much impact a llama will cause and how that impact relates to hiker and horse use.

I would like to be able to quote studies which quantitatively measure the impact of llamas on different backcountry environments but, the fact is, no such studies have been performed. There have been, however, two studies about horse and hiker impact. One study, "Impact of Horse Traffic on Trails in Rocky Mountain National Park" (Summer, 1980), documented which landforms are more sensitive to horse traffic. The other study, "Trampling Effects of Hikers, Motorcycles, and Horses in Meadows and Forest" (Weaver and Dale, 1978), compared the three modes of locomotion in two different forest types. In both environments horses and motorcycles caused more trail impacts than hikers. Other less formal reports have been done by the U.S. Park Service and the U.S. Forest Service related to llama use.

The major impact stock could have on the backcountry can be divided into two types: physical and social. Physical impacts can take place both on the trail and at the campsite. The well established trail is usually not affected much under normal conditions. Impact problems can occur, however, in wet areas and in areas prone to erosion. Campsites are often devastated by stock that trample and are allowed to over-graze the vegetation. Also, the method and
location of confining pack stock can have serious consequences if not done properly.

Horses have considerably more impact on the trails than hikers (Weaver and Dale, 1978). But where does the llama fit in? Based on my observations, the impact of the llama is much closer to the hiker than the horse.

I had the opportunity to compare llama tracks to elk tracks while bow-hunting this past fall. A small herd of approximately five elk had recently used the section of trail I was hiking. Curious about the relation of the tracks, I tied-up my llama and walked back the trail for a comparison. The llama's track was difficult to distinguish from the elk track even though the llama's foot is not cloven as is the elk's. The leather pad is continuous across the foot but it creases in the center—making a track that appears cloven. The only difference was a slightly larger gap between the apparent hooves of the llama track. See Figure 2.

![Figure 2. Llama Track and Elk Track](image)

More interesting than the similarity in shape of the tracks was the difference in disturbed soil. The llama's track actually caused less soil disturbance than the walking
elk. Further back the trail, I observed where both the llama and the elk had walked through a muddy section of the trail. In the mud the llama's track looked less like an elk track but more rounded. The leather part of the pad that had formed the crease on the hard surface was now helping support the llama in the mud. The llama's foot sank less into the mud than the elk track.

I have also compared llama to horse tracks. Whereas the elk track is similar to the llama track in shape, size, and impact, the horse track is not. Even on highly compacted dry trails where a llama would not leave a track, the print of a horse hoof will remain. More damage is done on wet or sloped trails. Horses going uphill don't do as much damage but can really tear-up a trail when coming down it. I got off the trail once to let three people on horseback pass as they were coming down the trail toward me. From the side of the trail I could easily witness the digging action of the hooves. The hoof furrowed into the soil in an attempt to battle gravity's pull on the horse and rider. Once passed, I returned to the trail and could easily see every step taken. The downhill end of each hoof-print ended in a small mound of soil. Llamas coming down the same slope would have had only a fraction of the impact.

Horses cause equal or worse destruction in wet and boggy areas of a trail. The horse's hoof can quickly turn a moist section of trail into a large mud-hole. What is
worse, is the horse's tendency to circumvent wet areas, thus creating unwanted multiple-lane trails. Conversely, llamas can easily be made to walk on the trail, even through mud.

Staying on the worn surface of the trail is also important in dry areas. Little damage occurs on the already compacted and trampled tread, but the sides of the trail are very sensitive to any impact. Yet, horses, because of their skittish nature, will consistently side-step to the edge of trail when encountering hikers, animals or anything else which may spook them. Whether you are on a horse's back or leading a mule, they are hard to confine to the center of the trail. However the llama, because of its calmness, is quite contented to walk or stand in the center of the trail.

The llama's minimum impact to trails, relative to horses, is mostly the result of the llamas' unique foot. Both the size and construction of the foot enable the llama to go lightly on the trail. The average pack horse or mule weighs 1000 pounds and has a surface area per foot of approximately 19.63 square inches (based on measurements taken of horse prints in my neighbor's field). This translates to 12.73 pounds per square inch exerted on the earth from the standing horse. The average llama weighs 350 pounds and has a surface area per foot of 9.62 square inches. This is equivalent to 9.10 pounds per square inch.

Less soil compaction will occur with less pressure (or pounds per square inch) applied to the soil from the llama.
Soil compaction directs water to run over the surface instead of being absorbed. This is the first stage of erosion.

Even though the standing horse exerts 25% more weight per square inch than the llama, one should not jump to the conclusion that a horse has 25% more impact. Walking animals exert forces on the soil in a very complex fashion, and the structure of the surface of the foot also needs to be accounted for. Nonetheless, the fact llamas have a greater surface area (for their body weight) in contact with the land would suggest less impact from the llama.

Before leaving the feet, I want to say a few words about foot construction. The bottom of the llama's foot is a soft, round, leather pad. The horse hoof, by comparison, is a hard enamel-like structure. The very rigidity of the horse hoof probably accounts for much of its trail destruction. In contrast, the padded llama foot will mold and conform to small abnormalities in the trail surface such as small rocks and sticks. A hardened hoof does not conform—does not compromise. Sticks are crushed or upended and small rocks are rolled out of their beds. To make matters worse, most horses are shod before going into the backcountry. The steel horse-shoe has the same effect on the soil as a biscuit cutter does on dough.

I am still amazed when watching my neighbor's shod horses walk the fence line. When the soil is at all moist,
I will see divots of turf rhythmically dug and tossed clear by the hoof action. The same happens on dry days except the removed soil quickly turns to dust.

We have one stud male llama with a high libido who, for the last two years, has been constantly pacing the fence next to the females. Although the vegetation has worn off the trail he created, the tread depth is still close to zero. The same actions by a horse, shod or not, would have dug a six-inch tread in a matter of weeks.

As I stated at the onset, based on my observations, the impact of a llama on a trail is closer to that of a hiker than that of a horse. Others have formed similar opinions about the llama's relative impact on trails. Comments such as "a llama has as little impact as a white-tailed deer" and "llamas have significantly less impact on trails than horses" were common in the research conducted by the U.S. Forest Service and the U.S. Park Service.

To determine campsite effects one must not only consider the foot but also the highly efficient metabolism and the size of the llama. Llamas and most large animals, including horses and mules, will consume 2% of their body weight in dry food matter daily. A 1000 pound horse will consume 20 pounds of feed per day. Even the heaviest pack llama will eat less than half that amount--eight pounds per day. After examining the browsing habits of llamas, personnel at Sequoia-Kings Canyon National Park determined
that llamas have approximately one-third the impact of other pack stock.

This one-third impact rating given to llamas causes concern for the skeptic who uses the argument, "But it takes two llamas to carry what one horse would carry." The skeptic is correct, but even so, the combined browsing impact of two llamas would still be one-third less than the horse impact.

One of the worst impacts stock can have on a campsite comes from the trampling that occurs when they are confined. Picketing causes the most damage because the animal repeatedly tramples the same area. Temporary corrals are a better method but the trampling is still confined to a relatively small area. The best method for managing stock in camp is to let them roam freely. Pack-stock that are allowed to roam freely will spread their impacts over a larger area instead of concentrating the impact in a small area.

Llamas are very social creatures and most will do anything not to be separated from their woolly companions. Therefore, all that is usually needed is to confine one of the llamas and the rest can be let free to roam—hence greatly reducing the amount of trampling. Horses and mules can also be turned loose; however, llamas have a greater herd instinct than horses, and can more confidently and in more circumstances be turned loose.
Also, llamas that need to be picketed or corralled will have less of an effect than similarly confined pack-stock. Because of the weight and foot construction of traditional pack stock, areas of confinement are usually characterized by excessive trampling—often down to bare soil. Trees in the area of a confined horse or mule will often have the soil around their base so compacted or scraped away by pawing, that the tree will die of root exposure. The lightweight, soft-footed llama causes no such damage.

So you agree, I would hope, that llamas physically have little impact on the backcountry. But how do they fit socially? That is, how do other users relate to the stock? Will the wilderness experience be diminished because of obtrusive feces in the trail or from the spreading of non-native plant species?

If seeing the feces of pack stock while in the backcountry somehow lessens the wilderness effect for you, then you will be pleased to learn about llama feces. Only an elk scat expert would be aware that the small pile of cylindrical pellets belong to a llama and not an elk. No trail full of flies swarming about the pile either. The llama will most often get off the trail to do its business.

Another way pack stock might influence a person's wilderness experience is from the spreading of non-native plant species. More and more remote backcountry areas are being invaded by non-native plants. The rapid spreading of
immigrants is caused, in part, by seeds in the pack stock's feces and from seeds in the hay carried in for pack stock to eat (Marion, Cole, Bratton 1985). Llamas, however, with their efficient metabolism, visit the backcountry without the need of bulk supplemental feed.

The llamas' charm and uniqueness certainly contribute to their acceptance in the backcountry. Rangers using llamas at Mt. Rainier National Park cited public acceptance of llamas as one of their most attractive features. The llama actually helped facilitate communication between the rangers and the public. Also, people feel comfortable around the moderately sized animal even if they have no experience with pack stock. Based on my experience, hikers are surprisingly amenable toward llama packers. I think they relate well to seeing the llama packer on foot as they are. The backcountry horseman generally tolerates the llama. This was not always the case, however.

When llamas first started being used as pack animals in the United States, there was the misunderstanding that something inherent in a llama would absolutely make a horse or mule go crazy. As most horse owners today understand, this is simply not the case. I remember giving a talk to a local backcountry horsemen's club about the use of llamas as pack animals. As the first person to arrive at the fairgrounds where the talk was to take place I unloaded McGruder, a large pack llama, into the nearest paddock.
Other people started to arrive. I was so busy meeting folks and preparing myself for the talk that I didn't notice the cowboys that had already unloaded their horses and were riding toward McGruder. The horses never blinked an eye. In fact, one horse was so curious, it got close enough to touch McGruder's nose over the fence.

Unfortunately, not all of the horses you meet in the backcountry are as well "seasoned" as the ones I met at the fairgrounds. There is the potential for "green" horses to spook when meeting strange animals on the trail. But the same horse that will spook at a llama will probably spook at a deer, backpacker, or any other animal to which it is unaccustomed. Many llama owners are taking the initiative to overcome this problem by visiting horse owners and introducing the horses to llamas.

As stated earlier, the decision whether to use pack stock and what type of pack stock is a decision for each individual. Certainly there are areas where, because of their fragile nature, no pack stock should be used. In those instances you should carry supplies on your back. It is my belief, however, that even the most environmentally conscious person can feel comfortable using llamas in most backcountry areas. You have the information. The decision is yours.
FINANCIAL SAVINGS

To most folks, the unique characteristics and environmental advantages mentioned above have little significance if the expense of packing with llamas is too high. Although the initial purchase price of a llama is relatively high compared to other pack stock, substantial savings quickly accumulate.

Llamas are an inexpensive pack animal for four reasons: they require only limited feed, are inexpensive to transport, need only simple housing, and require infrequent veterinary services.

I have already mentioned the benefits of the llama's efficient metabolism for backcountry travel. The llama's ability to do well with little food also means big savings when buying food or renting pasture land. A llama will consume approximately 2% of its body weight in dry food matter per day (Tillman, 1971). An average pack llama weighing 350 pounds consumes seven pounds of hay per day. Even if the llama eats hay 365 days a year, it would only consume 2,555 pounds of hay. Some of the hay will be wasted around the feeder so this figure should be rounded-up to one and one-half tons of hay per llama per year. The actual cost of hay depends on locality, availability, and the type of hay. The llama with access to pasture for three or four months will cost even less to feed.
Equipment for transporting llamas to the trail-head is also inexpensive. Whereas other pack stock require substantial stock trucks or trailers, llamas can be transported in a variety of light-weight vehicles and trailers. Vans and pickup-trucks, even the small imports, work well for transporting llamas. Almost any car is capable of safely pulling a small, light-weight utility trailer with one or two llamas aboard. I have a friend who, after removing the back seat from his car, loads Charlie, an average size pack llama, into the back of his Volvo. You should see the looks on people's faces as Charlie passes them on the highway. Charlie's case is a bit extreme. Nonetheless, there are many inexpensive alternatives for transporting llamas.

Substantial savings will also be realized because of the hardiness of the llama. The owner will save money in two ways. First, the ability of the llama to withstand extreme weather conditions translates into minimal housing cost. A three-sided shed to allow the llama to get out of strong winds and intense sun is all that is needed. Secondly, because the llama rarely becomes ill, costly veterinary assistance is seldom needed.

Fine, llamas are inexpensive, but how do they stack up against the cost of using other pack stock? A rough cost comparison between the use of two llamas and two horses from time of purchase through two years was conducted at Mt.
Rainier National Park. Based on purchase price, tack, feed, and transportation, the two llamas were 50% less expensive than the two horses after the first year. The llamas were 90% less expensive through the second year. Feed was the biggest savings. The report also showed a $250 savings because the llamas had no need for farrier services—llamas go bare-foot.

CLOSING

Thus far we have examined the reasons why you, the reader, should seriously consider using llamas as pack animals. The physical and behavioral characteristics of the llama make it well suited for packing. Everything from the llama's foot to its calm personality are attributes fit for packing. Environmentally, llamas have relatively little impact in the backcountry. Even the most environmentally conscious person can feel comfortable packing with llamas. And finally, llamas are affordable—especially when compared with other pack stock.

Llamas fill the niche between back-packers and traditional stock users. For someone who enjoys hiking but does not want to carry a heavy pack, llamas are the perfect trail companion. For someone who is concerned with the detrimental effects of traditional pack-stock, llamas are a low-impact alternative.
Now we can get on with the meat of the paper—how to pack with llamas. As you will soon learn, llama packing is easy. Llama packing is also fun and it's the llamas that make it fun.
PART TWO: THE PROPER USE OF LLAMAS IN THE BACKCOUNTRY

GETTING STARTED

Welcome to the world of llama packing. Because of your new-found companion, you can spend a week or better in the woods and still enjoy a few of the comforts of home. Before hitting the trail, however, there are a few things you need to gather and learn. To help you get started I will cover the following topics: shopping for the perfect pack llama, fencing and housing, transportation, and basic care and health of the llama. Once you've started, you can decide on the equipment you'll need. I will survey the llama packing equipment available on today's market and make recommendations based on my personal experience and noted literature. It would be a mistake indeed to think one can simply combine the llama with the equipment and head up the trail. Training and conditioning the llama are vital steps before the first excursion. Everything from desensitizing to staking-out will be discussed. Finally, after a brief section on the theory of packing and pre-trip planning, you will be ready to make tracks.
Certainly one of the most important and difficult decisions you will make is the selection of a llama. In order to make this decision you have to first do some soul searching. Ask yourself, realistically, how often you will use the llama. Do you need the perfect pack llama or will an average one do? Will you ever want to use your llama as a breeding stud? If so, a gelding won't do you much good. Do you have the time and interest to train the llama yourself? If not, you will need to purchase a llama already trained to pack.

Once you have done the soul searching you can actually start shopping—and it is vital that you really do shop around. Visit at least three farms before making a decision, even if you buy the llama from the first farm you visited. Although llamas are still new to our country, it is amazing how many folks own them. There are two organizations that can help locate potential llama sellers (see Appendix A). One is the International Llama Association (ILA) and the other is the Llama Association of North America (LANA). The ILA has more members and publishes a Membership Directory which lists the name, address, and number of llamas for each llama owner.

When you first arrive at the farm, make an appraisal of the operation. Is the place neat and orderly or is baling-twine scattered among the broken shovel handles and pop
cans? A well-organized farm usually means organized husbandry and health practices. Don't jump to conclusions but make a mental note of the appearance.

Explain to the owner that you are looking for a pack llama. Be prepared to see the entire herd if you don't state up-front your exact objectives. On the first visit, if you want to see the entire herd, females and babies, that is fine. However, because of the excessive price of females, they are not used for packing. The more llamas you see the more difficult it will be to remember the animal that interests you.

Collect as much information about the pack llamas for sale as you can. Minimal information should include: age, gelding or stud, previous health record, and price. Keep in mind that llamas under the age of three are immature and should not be fully loaded with weight. It is acceptable, however, to buy a two-year-old and pack him with a lighter load for the first summer.

When you finally get to the paddock containing the pack llama, observe what the llama is doing. Try to get a feel for the personality of the llama. Ask the owner to halter the llama and to lead him out of the paddock. Watch carefully as the owner approaches the llama. If the llama is skittish about being approached, then you can guess he would be difficult to catch if loose in the woods. Is the llama head-shy when the halter is put on? This is a
difficult trait to correct, and could give you a bruise if the llama throws his head toward you. The perfect pack llama will give little resistance to being cornered, and once cornered will lay its ears back and fully submit to having its halter put on.

If the owner struggles and grunts just to put a halter on, then you are probably looking at either an untrained llama or an un-trainable llama. Be sure to find out from the owner to what extent the llama has been trained and see if the llama's actions correspond with the owner's report.

But how can one tell if an untrained llama is going to be trainable or not? The best way to assess the trainability of a llama is to take it for a test drive. Most people wouldn't think of buying a car without first test-driving it. You should do no less with the llama. If the llama has passed your other criteria, schedule a time to come back for a half-hour walk with him. Before going back to the farm, read the section on llama training in this book. On the walk, attempt to teach the llama a simple command such as walking under a low branch or jumping a fallen log. This half-hour walk should also give you time to assess the llama's willingness to follow, the most important personality trait for a pack llama.

It would be nice if one could just look at a llama and decide if it would make a good pack animal. Currently, there is a consensus among llama packers of a certain body
type that makes the best pack animal. Although I agree with the consensus, I want to stress that unless the animal has a willing personality, the body type means nothing.

A llama-packing acquaintance of mine simply explained the best body type with the phrase "football player versus basketball player." The football player body build is one of big muscles, husky and stout. In general, llamas with this body build can carry heavy loads but become fatigued more easily. The broad chest of the football player type causes more side-to-side sway when walking. In addition, the rugged football player types are shorter and hence have a shorter stride. The basketball player, however, will have long stringy muscles that will endure, a narrower chest with less associated sway, and a longer stride for a faster clip. The basketball player type should make an excellent pack llama, if he has a good personality.

Although there is consensus among llama packers about body type, whether to use geldings or studs is not settled. Normally, studs will fight with each other to determine social rank. On the trail, however, llamas fight much less than in corrals and hence work well together in a pack string. Some say the stud, or intact llamas, are less lethargic and are less apt to lie down on the trail. I pack with both studs and geldings and see little difference in their willingness to work. If you have female llamas at
home, as I do, than you will want to keep the number of female-seeking studs to a minimum.

Wool is another secondary characteristic to be aware of when shopping for the perfect pack llama. One should be aware of both the length and composition. Long wool is nice for weaving and for making the llama look extra cute and cuddly. Long wool has no place on a pack llama, however. Debris embedded in the wool where the pack will ride can cause extreme discomfort. The more wool the more difficult it is to brush out the debris. Longer wool is also more apt to catch in the pack's buckles and cinches. Llamas do not like having their wool pulled.

Llama wool has two components. The guard-hairs are the coarse outer-hairs that cover the finer under-wool. The guard-hairs repel water and are less apt to attract seeds and twigs. Therefore, the perfect pack llama will have a good coat of guard-hairs covering its under-wool. In summary, a short wool llama with many guard-hairs is the ticket.

The type of toenail the llama has should also be considered before purchase. While trimming toenails is no great hardship, it does take time. Two factors influence the frequency of trimming—the rate of wear and the rate of growth of the toenail. The toenail will wear down more quickly if the llama is active on abrasive surfaces. This is not always possible if the soil contains few rocks or if
you live in an area where the land is covered with snow much of the year. The rate of growth of the toenail is also fixed for a certain llama. Some llamas, however, have faster growing toenails than others. Llama owners have noticed that light colored toenails either have a faster rate of growth or are harder and wear down less easily. Whatever the case, light colored toenails require more trimming. Therefore, if you must choose between two otherwise equivalent males, select the dark toenailed llama.

If, at the time of haltering or at any other time while visiting, the llama spits at a human, then I would be very reluctant to purchase the animal. Although there are ways of dealing with a spitting llama, it indicates possible personality problems and should be avoided.

As a final note on shopping for the perfect pack llama, beware of the llama with berserk-male syndrome. Berserk-male syndrome most often results from bottle feeding a baby male llama. The young llama will bond to the person holding the bottle—thinking the person is its mother. It grows up thinking humans are llamas. When it reaches maturity, it attempts to establish dominance over the rest of the llamas—which, in the case of the berserk male, includes humans. The berserk male might ram, bite, or spit at a human and is extremely dangerous. Oddly enough, the early signs of a berserk male are ones of over-friendliness. A llama that runs across the pasture to breath in your face could be
berserk. Normal llamas shun attention from humans. Be cautious of a llama that acts like a tail-wagging dog.

Finding the perfect pack llama is not easy. Fortunately, most llamas will be adequate for most people. The more perfect the animal sought, the more time it will take to find him. Purchasing the llama is certainly a big step. Other items need to be addressed, however, before the llama comes home.

Transportation, housing and fencing for your newly purchased llama should be settled before the llama arrives. As mentioned earlier, llamas can be transported in everything from the back seat of a Volvo to a small pick-up truck and the only housing requirement is a shed for protection from extreme winds and intense sun. Fencing is as simple as llama transportation and housing once you know the secret. The real secret to fencing is to keep your llama happy. Food, water, and a little companionship is all that is needed. An unhappy llama can jump like a deer or scoot like a snake and will be hard to confine. A happy llama might not even need a fence.

There are three commercially available types of fence—wooden, wire and electric. All three will work well for confining the happy llama. If barbed-wire is already in place, then use it. Because of its safety limitation, should a llama try to jump, I would not recommend installing new barbed-wire. Electric fencing is easy to move and is
cost effective. Llamas seem to remember getting shocked and respect even the unplugged electric fence. Wooden fences are, without question, the most attractive and also the most expensive of the three types of fencing.

The general topic of llama health and care is much too broad to cover in this paper. There are many excellent sources of information that need not be duplicated here. The International Llama Association publishes a number of excellent brochures dealing with llama health, care and feeding. Also, there are good chapters in Hart's *Living With Llamas* and Tillman's *Speechless Brothers* dealing with the same subjects (see Reference). There are, however, two topics related to llama health that are of special importance to the llama packer—tick control and toenail trimming.

Ticks can cause sickness, paralysis, and even death in llamas. Ticks are parasites that attach to the llama and derive nutrients from the blood of the llama. The ability of the tick to cause paralysis is probably the worst threat to llamas. Last year Jack, one of my best packers, was staggering about the barn like a drunkard. I consulted the vet who suggested we check for ticks, since it was still early summer—tick season. Before I had removed eight ticks from Jack's body, he had totally lost muscle control and was unable to stand. I feared for Jack's life. Removal of the ticks was all that was needed. Jack recovered within a day.
If you live or will be packing in an area that has ticks, check your animals often in the spring and early summer. If you find one tick you can bet there are more in that bundle of wool--another good reason to buy a short-wool pack llama. There are a host of systemic and spray-on medicines to combat ticks. Consult your veterinarian.

As I mentioned above, unless your pasture is extremely rocky, the llama's toenails will need trimming. The toenails should curve and extend down to a level flush with the bottom of the foot. Once the toenail extends beyond the level of the pad, it should be trimmed. Eventually, if left unattended long enough, the foot will become seriously injured. I can't stress enough the importance of taking care of the llama's feet. Foot care starts with the toenails.

EQUIPMENT

Eight years ago, if you had asked someone where you could buy a llama pack they would have laughed in your face. The only packs available were homemade. The early homemade equipment became the prototypes for what is today an expansive market. But before getting into the nuts and bolts of llama packing equipment, I want to say a few words about the quantity and sophistication of equipment.

Stop and think for a minute why you go camping in the backcountry. For most, camping allows you to live closer to
nature—closer to life. All the technological junk that usually clogs the senses is removed. The sun replaces fluorescent lights. The buzz of a bee replaces the hum of electric motors. Remember this when you are deciding on equipment. Unlike the backpacker who is weight limited, the llama packer can take numerous supplies, depending on how he or she wants to play the game. Don't over equip yourself out of a good time.

The first piece of equipment needed is a good halter. There are a number of llama halters to choose from. See Appendix A in the back of the book for a list of llama equipment dealers. A good halter is made of nylon and is not adjustable. Nylon is more durable than leather and can be thrown in the washer if necessary. Fancy, adjustable halters have too many moving parts and can easily become unadjusted. Buy a halter that fits your llama and keep it for that llama. The only hardware on the halter should be one heavy-duty double-bar buckle attaching the ends of the halter that run behind the ears. Halters with the spring-snap crown buckle should not be used--they break easily. For that matter, any halter can break, so remember to always take along an extra halter.

The lead line that attaches to the halter also needs to be durable. For training, a cotton lead is best because it's less apt to inflict rope burns. The durability of nylon, however, makes it better for the trail than cotton.
Also, tight knots can be more easily tied with the nylon lead. The length should be eight to ten feet. This allows ample grazing when staked out, yet it isn't so much lead that you will be tripping on it when leading the llama. Diameters of five-eighths to three-quarter inch are wide enough to fit the hand well and provide plenty of strength.

Unfortunately, choosing a pack is not as straightforward as choosing halters and leads. Available packs can be divided into three styles: the three piece-soft saddle, the three piece hard saddle, and the one-piece pack.

The three-piece systems consist of two panniers and a saddle. A pannier is simply a large container that into which supplies are stuffed. The panniers are attached to the saddle, which is fastened to the llama's back with cinches which encircle the llama's belly. The saddle also has rigging in the front (breast strap) and the rear (breeching strap or crupper) to keep the saddle from shifting forward or backwards.

The one-piece system has the panniers permanently attached to the saddle. The advantages of a one-piece system are that it is faster to put on the llama, and once on, remains in place even without the belly cinch taken up. The tendency to stay put makes the one-piece pack a good training pack, for often the llama in training will attempt to throw the pack before the handler gets a chance to attach the belly cinch.
The disadvantages of the one-piece pack outweigh the advantages. The biggest problem is the difficulty in lifting a fully loaded one-piece pack high enough to allow the panniers to settle on each side of the llama's back. If you are very tall or strong this isn't such a problem. Strong or not, everyone will have trouble balancing loads in the one-piece pack. With the three-piece pack, each pannier can be weighed before attaching them to the saddle. This is just physically impossible with the one-piece pack.

The hard saddle idea undoubtedly was borrowed from the sawbuck, the original horse and mule pack-saddle. Many llama owners use a sawbuck, or a variation, on their llamas. The biggest advantage of a sawbuck is that about anything can be attached to the easily accessible cross-arms. Panniers can easily be constructed and range from wooden boxes to Coleman coolers. The only requirement is that the pannier needs two straps to loop over the cross-arms.

The standard wooden sawbuck has its problems, however. The sawbuck is heavy, and the smooth curved bars that contact the llama do not conform well to the llama's back. It is possible to shape the bars for a better fit, but with so much wool in the way it is hard to assess a good fit. Also, once shaped to a particular llama, it is only good for that one llama. Variations on the sawbuck are much improved. Combinations of wood and lightweight metal allow
for numerous adjustments and hence a better fit that can easily be readjusted for use on any llama.

The soft saddle is more closely tied to the history of the llama than the hard saddle. For thousands of years the pastoralists of Peru and Bolivia used a frameless pack bag called a costal which was secured to the llama with a long wool rope. The costal, however, placed weight directly on the spine of the llama. To circumvent this problem, a soft frame was developed that would keep the weight off the llama's spine.

The soft saddles on the market today distribute the weight equally along the loins of the llama. The problem of the bars not conforming to the llama's shape is eliminated with the substitution of dense padded foam for the wooden bars found in the sawbuck. As you would guess, the soft saddle system is lighter than most hard saddle systems.

There are problems, however, with the soft saddle system. Without the cross-arms to attach to, the panniers need to be buckled, clipped, or hung onto the saddle. It is difficult to hold a loaded pannier and connect the four or more buckles or clips that attach it to the saddle. I much prefer the setup where the panniers can easily be hung on brackets. Overall, my favorite choice is the three-piece soft saddle with hanging panniers. For more information about availability and price of llama packs, get yourself a
copy of the February 1989 issue of The Backcountry Llama. See Appendix A for this and other llama publications.

The last thing to mention about panniers and packs is color. With more and more people using the backcountry, it becomes increasingly important to blend with the surroundings. There is nothing worse than waking up in what you thought was a secluded area, and seeing a bright orange colored tent across the meadow. The same disturbance can be caused from brightly colored llama panniers. When there is a choice, buy earth-tone colored equipment. Tying orange ribbon to the panniers during hunting season will provide the necessary color for safety.

Before moving on to other needed equipment, I want to share my knowledge about a piece of optional equipment which will help organize your packs. Rather than just throwing all your supplies into the pannier, you should attempt to organize the supplies. There is nothing more frustrating than to find, after emptying out an entire pannier, that the can-opener you were hunting for was in the easily accessible side pouch. The answer to organization--spaghetti sauce.

Many restaurant and dining halls order spaghetti sauce and other bulk foods in plastic, three-gallon, square buckets. Two of these buckets will fit into each of my panniers so I have four distinct areas to pack supplies. Once camp is established, the buckets make convenient seats for tired bodies. Two buckets have been converted into
coolers by enclosing them in high density foam. The rugged handles of the bucket facilitate carrying water to camp and make it easy to hoist food high out of bears' reach. Whether you use plastic buckets or some other device, I strongly recommend that you compartmentalize your pannier.

Packs, lead-lines, and halters are necessary equipment to move your llama and supplies along the trail. In camp there is more equipment needed to contain and feed your llama. Corkscrew-type picket pins work well for tethering llamas. The auger part of the pin should be a foot long to allow ample adherence once screwed into the earth. I would suggest getting the pin with the half-circle shaped top. The pins with the triangle-shaped top provide a place for the lead-line to tangle, and the llama quickly shortens his grazing radius to nothing. Pins carved from material found on the trail will disturb more soil from the ground when pulled up and should not be used.

While in camp you will also need to water the llama and feed him grain. Any container that holds a quart of water and has at least a six-inch opening will work for both tasks. The bottom half of plastic milk containers are light-weight, durable, waterproof, readily available, and inexpensive. Because of their pliable nature, they can also be nested inside one another, hence reducing the volume.

TRAINING AND CONDITIONING
There are probably as many theories of training as there are animals trained. The objective here is not to examine the various training techniques used by different professionals. Instead, I want to point out just a few axioms upon which most training techniques are based.

The very first thing to remember is that all you are really teaching the llama is to trust you. The llama already knows how to jump logs and walk through water. The llama knows how to load into a trailer and how to balance on three legs so you can observe his foot. Initially the llama doesn't want to do these things, however, and for good reasons.

A llama packer must understand the great magnitude of trust it takes for the llama to do the seemingly simple task of allowing its foot to be held. As with most cursorial animals, the llama's only real means of defense is running. To allow someone to hold its foot, and hence remove its only means of defense, takes great courage and trust. Eventually one must be able to lift the llama's foot to trim toenails and to check for cuts on the pad. Imagine what must be going on in the head of a llama asked to submit its foot. "Gee, I don't know about this. How can I be sure this human isn't going to harm me? With my halter tied to this fence-post I couldn't get away if I tried. Oh sure Pal, don't 'easy llama' me. If its so easy, let me tie you up to this
post and tie your hands behind your back while I play with parts of your body."

Obviously the llama packer shouldn’t start out attempting to lift the foot. You need to build up a trusting relationship with the llama. A good way to do this is by teaching him to lead.

There are many methods of teaching a llama to lead. You could entice the llama to follow you almost anywhere with a can of grain, but what happens if you run out of grain in the backcountry? You could tie the lead to the bumper of a car and drag the llama into a walk. This method is even less practical, yet I’ve seen people try it. Some animals are trained with the aid of electrical shocks and pain causing apparatuses. If you want to share your backcountry experiences with a companion, then I suggest you build a bond with your llama based on trust, not food, power, or pain.

The basic technique for teaching the llama to lead is called the pull-and-release method. When the llama first feels the strain on his halter from the lead-line he will resist. Hold the tension until the llama finally takes a step forward and then immediately release the tension. This pause between steps is important. The pause is a reward for stepping in the direction its head is pulled, and it adds an increment of trust. In just a few short lessons the llama will be following you around like a shadow. But remember,
you did not teach the llama to lead. You did teach the llama to trust you a bit—enough to follow you on the lead-line.

To get from leading to picking up the llama's foot, one must continue to build trust. The trick here is to find an obstacle just hard enough to test the llama, but not so hard that you won't be able to get the llama to overcome it. Start by walking the llama on a different surface, such as pavement or cement. As you approach the obstacle, give the llama a few seconds to sum up the situation. Let him smell and observe the pavement. Pull, and when he puts his first foot on the pavement, release. Use this same technique to get the llama over a variety of other obstacles such as low logs, bridges and small creeks. The more different situations you put the llama through, without trauma, the more trust the llama will have in you.

Next you might try leading the llama into a confined area, such as a garage or your house. By taking him into a tight area, you are eliminating possible escape routes, so the llama will be reluctant to enter. Repeat this several times until the llama doesn't hesitate at the entry-way. If you feel the llama trusts you, then he is probably ready to be introduced to the pack.

All the time you were building the llama's trust, you should have also been getting the llama accustomed to your touch. The nape of the neck and mid-back are areas less
sensitive to touch. Stroking and patting the llama in these areas reinforces the idea that being touched is not a prelude to death. While on a leading exercise, tie a coat or sweat-shirt around the llama's neck and continue walking. Tie the clothing so it will not rotate and touch the llama's sensitive front legs. Desensitizing the legs will come later. Once the llama is ignoring the clothing he is ready to start sacking-out.

Sacking-out is simply a more advanced form of the tied-on clothing. In this procedure, the trainer introduces pack-like material, nylon or canvas, and places it in the normal pack position on the llama's back. The introduction of the material is very important. Before throwing anything on the llama's back, you should allow him to see, hear, and smell the object. Slowly walk up to the llama's face with the material and allow him to inspect it. Nylon and other synthetic materials can make a lot of noise. Rub the material so the llama can see from where that strange noise comes. Once he has sufficiently inspected the material, rub it on his neck and gradually work it to the middle of the llama's back.

The material used for sacking-out should be folded or sized in such a way that it won't touch the llama's legs when walking. The material should resemble the pack and should be heavy enough so that a few quick side-steps won't send it flying. Now that you have the llama comfortably
standing with the sack on its back, take him for a walk. Get him used to moving with material on his back.

Once the llama is indifferent to the sack, standing or walking, he can be introduced to the pack. The same procedure used for sacking out is used for putting on the pack. First detach all rigging that might touch the llama's sensitive legs. Allow him to see, hear, and smell the pack. Rub it against his neck and slowly slide the pack into position on his back.

The front belly cinch will need to be attached to ensure that the pack doesn't slip or fall. If your pack has both a front and rear cinch, then remove the rear cinch for now. Until the llama becomes desensitized around the stomach, he probably will not like having the cinch placed under his belly. Therefore, have a friend on one side of the llama pass the cinch under the belly to you on the other side. Tighten the cinch just enough to ensure that the pack won't slide or rotate if the llama should go into a jumping frenzy. Also, when attaching the cinch, be sure not to get any of the llama's wool caught in the buckle or other parts of the cinch. Llamas do not like to have their wool pulled, so be careful not to associate putting on a pack with pain.

The front cinch should be positioned just behind the front armpits of the llama. The cinch shouldn't interfere with the back-and-forth movement of the front legs. If the pack was designed properly, then with the cinch just behind
the front armpits the pack will ride just in front of the center of the llama's back. This distributes most of the weight to the front legs where it should be.

With the pack in place, walk the llama to get him accustomed to the pack while moving. The pack will bounce, make noise, and feel different to the llama. More than likely, the llama will have very little reaction to the pack. The more skittish llama, however, may throw a small fit. To prepare yourself for action, have the llama in an open area where there are no objects for him to get hurt on, and use a cotton lead to reduce rope burn for you and the llama. If the llama should react negatively to the pack, simply hang on until the llama is through jumping. Once the llama has his senses back, start walking again.

The llama walking with a pack on has a fair amount of trust in you. Now, and only now, should you attempt to lift the foot. Start by desensitizing the area where the front leg attaches to the body. Gradually work your hand down the leg. Should he start to dance, simply keep your hand in contact with the same area until he's finished, then proceed. Once he accepts your touch below the knee joint, rock his weight off the foot and lift. Now you can examine the pad or trim the toenails. Now you have a trained pack llama.

Having a llama trained to pack, however, does not mean you are ready to hit the trail. The llama needs to be
conditioned before he can be expected to perform. In the same way a runner needs to condition her body before a marathon, a llama needs to get fit before heading up the trail. Conditioning for the llama can be divided into two categories: conditioning the feet, and conditioning the body of the llama.

For all the advantages of the llama's foot, there is one drawback. The round leather pad on the bottom of the foot must be conditioned before it can withstand heavy use. The principal behind conditioning the foot is the same for humans as for llamas. My first barefoot excursion in the spring usually has me hobbling over the smallest pebbles. This tenderness is due to the many months with my feet in contact only with the soft lining of boots and shoes. Similarly, the llama's feet have only been in contact with soft earth and snow over the winter. Their feet also will be tender in the summer unless your llama is extremely active on very rocky ground.

The reasons for conditioning the body of the llama also parallel the needs of humans. After a period of inactivity, it is unreasonable to expect our bodies to function as they would if we had been active. The same goes for the llama.

Fortunately the feet and body can be conditioned at the same time. Start the conditioning process by walking the llama for increasingly longer distances. Make an effort to walk him on abrasive surfaces such as gravel or pavement.
You can assess the llama's body condition by monitoring the llama's breathing. Watch the llama's nostrils. The nostrils will flare and contract when he becomes fatigued. If you are not getting the nostrils to flair then you're not giving the llama enough of a workout.

The initial condition of the llama determines how much work it will take to get him in shape. Normally, the llama's feet and body will be ready for a weighted pack after one week. Obviously, you don't want to start him out with the maximum weight. Instead, the weight should be low to start, then increased gradually.

For very short distances, the mature llama can carry 50% of his body weight. For trips of long distance or duration, however, 25% of his body weight is maximum. Immature, one- and two-year-olds should never carry more than 20% of their body weight. A safe weight to start with is 10% of their body weight. Once the llama has adjusted to this weight, increase the weight in 5% increments until you reach the maximum weight for that llama. Below is a table that will give you a general idea of the llama's body weight (Tillman, 1981) and its associated maximum pack weight based on his age.

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<tr>
<th>AGE</th>
<th>WEIGHT</th>
<th>MAXIMUM PACK WEIGHT</th>
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<tr>
<td>1 year</td>
<td>180 - 240 pounds</td>
<td>36 - 48 pounds</td>
</tr>
<tr>
<td>2 years</td>
<td>240 - 340 pounds</td>
<td>48 - 68 pounds</td>
</tr>
<tr>
<td>3 years</td>
<td>280 - 390 pounds</td>
<td>70 - 97 pounds</td>
</tr>
<tr>
<td>4 years</td>
<td>280 - 440 pounds</td>
<td>70 - 110 pounds</td>
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<td>over 4</td>
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Remember, how much the llama will carry for you depends on a number of factors—body weight being only one. Personality and willingness-to-work are also major factors and they are hard to assess.

PRE-TRIP PLANNING

You have come a long way toward getting into the backcountry with your llama and supplies. You have selected your llama and the proper equipment and have trained and conditioned the llama. The last step before actually going packing is pre-trip planning. You must first decide where you are going and for how long. Based on this decision, you can determine your needs and the needs of the llama, such as feed and water requirements.

When you start to figure out your itinerary, you will probably ask yourself "where can I expect my llama to travel" and "how far will my fully loaded llama travel in one day?" The general rule for determining the terrain is that the llama can go anywhere its leader can go without the use of hands. If you need to use your hands to scramble up or down an incline, then it's too steep to expect the llama to follow you with a loaded pack.

Boulder fields or rock-slides also need to be approached with caution. The rocks themselves are not so much the problem as the spaces between them. The larger the rocks, the bigger the spaces between them, and the greater
the chance of a llama's foot getting wedged—possibly causing a broken leg. Fortunately, llamas are very agile and sure-footed and will handle most boulder fields. To cross a boulder field safely takes time, so allow extra time when planning a trip that traverses many boulder fields.

Even more caution needs to be applied when considering crossing large rivers with llamas. Even though llamas can swim, you should think twice about crossing a river where the water will be deeper than the llamas mid-line. Slow moving creeks with water up to the llama's belly, however, can be crossed without much trouble.

Another medium you might take your pack llama through is snow. Although the surface area of the llama's foot is large, it does not provide much snowshoe action. Therefore, snow depths greater than two feet can also pose problems for the pack llama. A certain amount of lunging through the snow can be expected, but you should be careful not to ask too much of your llama in these situations. Wading through deep snow is extremely fatiguing and could set the llama up for hypothermia.

The actual distance the llama will be able to go depends on the topography, weather, weight of the load, pace and the llama's condition and experience. An experienced, well-conditioned pack llama will be able to carry 25% of its body weight twenty miles a day through most conditions. In 1979, managers of Sequoia-Kings Canyon National Park went on
a 110 mile llama trek. The fully loaded llamas covered twenty-six miles one day and had two climbs totaling 5000 feet (Hoffman, 1986). As a general rule, for the average hiker, the llamas will cover as much ground as you would expect to be able to cover yourself if you were carrying a loaded pack.

Even though the pace of the llama is compatible with the human stride, you should allow extra time when estimating the time it will take to cover a certain distance. It takes longer to break camp, load the panniers, feed and water the llamas and strap on the packs, than it does to simply load your gear into a backpack. Llamas also take time to defecate and nibble along the trail. Approximately 15% more time is needed when using llamas than when solo backpacking.

Now that you know where you are going and for how long, you can calculate the llama's feed and water needs. As stated earlier, the llama will do quite well with what there is to nibble along the trail. Nonetheless I carry one pound of corn per llama per day on the trail. Any high protein grain will work. Besides helping replenish protein, the grain also acts as a reward for their effort and comes in handy should a llama stray from camp.

The water requirements of the llama are also minimal. However, do not make the mistake of thinking that just because llamas and camels are members of the same family,
llamas can compete with camels in conserving water. Plan on offering water to your llama twice a day, morning and night. It is common for the llama not to drink any water the first day. When the llama gets thirsty enough he will drink. Based on my experience, a llama drinks about a gallon a day. This of course may vary with each individual llama, the amount of energy used that day, the water content of the grasses nibbled, and the weather. As long as you plan your trip to account for the gallon of water per day, you should not have any dehydration problems.

I have included in Appendix B a list of items I take with me when hosting a commercial llama pack trip. Pay close attention to the items listed under Llama Gear. The rest of the items are more a matter of personal preference, but I left them on the list knowing it is always easier to work from something—rather than start a list from scratch.

ON THE TRAIL

The time has finally come to load the gear and llamas and head for the trail. Before departing for the trail-head, however, you need to load and balance the panniers. Doing it at home, before departure, will reduce the time the llama will spend anxiously standing at the trail-head.

Think about what you are doing before you start stuffing gear and supplies into the pannier. Many tools, such as an ax, saw, and shovel should not even go in the
pannier, but should be fastened to the exterior. This will save digging into a pannier every time there is a tree across the trail or someone needs to relieve himself.

Each pannier should have supplies loaded into it in a certain way. Supplies that will be needed first should go into the pannier last, for easy access. Sharp objects should not be placed where they might poke or irritate the working llama. Horse and mule packers have a theory for how the weight of the load in each pannier should be distributed—this same theory applies for llama packers.

According to the theory, the center of gravity of the pannier should be located one-third of the way down from the top of the pannier and in the center third of the pannier coming out from the llama. Top or bottom-heavy loads cause more side-to-side sway and the llama will waste energy keeping his balance (Elser, 1980). You will never get the weight distributed perfectly, but placing the heavier objects near the center of the pannier will eliminate most sway.

The two panniers will also need to balance each other. An inexpensive load scale and a little patience is all that is needed for the job. A difference in pannier weight of more than four pounds might cause the load to shift on the llama. Continually stopping to readjust the pack is frustrating and time consuming.
Load the full panniers and the rest of the equipment into your vehicle first. Then, once you are ready to depart, load the llama. This reduces the time the llama spends in the strange environment of the trailer.

On your way to the trail-head think for a few moments of why you are going in the first place. If you're like most people, you are going for the solitude, beauty, and recreational opportunities that only remote backcountry can offer. Strangely enough, the moment you arrive you negatively impact the very reasons for going in the first place. Everywhere we go we leave clues of our passage. The wildlands in our country are absorbing about ten million visitor-days (a twelve-hour stay by one person) a year. It's truly a dilemma. The more people who grow to respect and love our wildlands, the less wild our lands become.

But it doesn't have to be this way. There are camping techniques that will cause only minimal impact to the environment. A little extra effort is needed, but if you care about our wildlands you will do your best to reduce your impacts. Having an overall ethic of how you will treat the backcountry before you enter will help guide you toward proper decisions once there.

The first action once you have arrived at the trail-head is to unload the llamas. Whether they are in a pickup-truck, van, or stock trailer the llamas will feel more comfortable walking out head-first rather than backing out.
Llamas that don't have room to pivot inside the trailer can be backed out if they have been trained to do so.

After unloading the llama from the trailer you will need to tie the animal to put his pack on him. It is important you tie the llama's head at the correct height and with a quick release knot. Tie the llama up short to a support at the height the llama normally holds its head. There should be less than one foot between the llama's head and the support. Use a knot that can be undone with just the jerk of a hand like the one in Figure 3. below (Elser, 1980).

Figure 3. Quick-release Knot

Now that you have the llama tied correctly, you can prepare to load supplies onto the llama. Since you already packed the panniers before departing for the trail-head it is simply a matter of strapping on the saddle and throwing on the already balanced panniers.

With the animals loaded, car locked, and car lights off, you can pull the end of the quick-release knot and start up the trail. Be careful how you hold the lead in
your hand. If you have the lead-line wrapped around your hand and the llama should bolt, it will probably inflict a severe rope burn and could tighten enough to drag you down the trail. To avoid this disaster, walk with the lead looped in the palm of your hand—not wrapped around your hand.

The same quick-release knot used to tie your llama when putting on the pack is also used to string llamas together. The llama pack-string is formed by attaching the lead of the following llama to the rear of the saddle of the llama in front of it. It is a good idea to have a pigtail, a loop of more easily breakable material, to form the connection between the lead and the rear of the saddle. This way if one of the llamas falls off a cliff, the pigtail will break before pulling the other llamas with him. Although llamas are calm animals and rarely spook, if they do spook, a long string of llamas can end up in a tangled mess in a hurry. For this reason, keep your string small—three animals is enough.

Whether you are leading one or a string of llamas you should attempt to keep them in the middle of an established trail for the edges are sensitive to trampling. If the single llama starts walking to your side, swing the loose end of the lead in a circular fashion to scare him back in line. If one of the llamas in the string is walking on the side of the trail you should move that llama to the front of
the string where you can control him. The llama should be kept in the center of the trail especially in moist areas, even if this means getting your own feet muddy. Walking around wet areas will create an unsightly, multiple-lane trail.

In general llamas are very good at following the leader. On switchbacks, however, you may need to shorten the amount of lead you give the llama to ensure he won't shortcut the switchback.

Also be careful when crossing streams. Something about the rushing water causes the llama to want to defecate. Do not allow this to happen in the water. It is important to keep the llama moving until you are at least 200 feet on the other side of the stream.

After the first hour of walking the llama will be ready for a break. Find an area out of view of the trail. This will provide you and others the solitude you are both seeking. Tie the llama to a tree. During a short lunch break the llama won't have enough time to damage the tree or the surrounding area. For breaks less than an hour it's not necessary to remove the llama's load. They are capable of lying and getting up fully loaded.

Suppose after lunch you come to a point where you could save time by leaving the trail and going cross-country to your destination. Even if your llama could handle the
terrain you should stay on the established trail to reduce impacts.

A washed-out bridge or some other emergency, however, may make it necessary to go cross-country. If this situation should arise you need to reverse your thinking about how to minimize impacts. If you are traveling with a group of people you need to spread out rather than following the same route. This will lessen the chance of a trail being established. When possible you should also travel on durable surfaces such as bare rock, sand and gravel, snow and ice, and other non-vegetated surfaces. Similarly, wet soils or steep slopes should be avoided. Blazing trees will certainly create a new trail and should not be done.

So far I have been talking about the mechanics of packing. There is also the human aspect. Although we visit the backcountry to get away from people, more than likely we will bump into someone. Llama owners, being the new guys on the block, have a special obligation to learn the rules of social conduct in the backcountry. When you and your llama meet another group on the trail, you must decide who is most able to get off the trail to let the other pass. Hikers can more easily get off the trail and should be asked to move to the downhill side of the trail while you pass. Realize, however, the hiker may want to stop and visit with your woolly companion before passing.
Special care needs to be taken when meeting horses or mules on the trail. If the horse or mule is "green" or has never seen a llama before there is the possibility it may spook. This is a serious threat to the horse rider, and could spell disaster for a pack string. I can not stress enough the importance of having smooth, non-confrontational, safe encounters with horses and mules. Many stockmen in the western United States still view the llama as an exotic creature who should not be allowed on trails. In fact, one National Forest in eastern Montana actually closed certain trails to llama use. The ruling was overturned, but the fact remains that llama use is not welcomed by all. The last thing we need to do is cause a disaster and have someone get hurt. Therefore, if not for the safety of the rider, then for the benefit of other llama packers, do whatever it takes to make the encounter hassle-free.

Surprise meetings between horses and llamas have the most potential for problems. Therefore, whenever you approach blind curves or peaks in the trail be especially cautious. If you are hiking with other people who are not leading a llama, have them scout the trail ahead to warn you of oncoming horses. If you are alone, stop and listen before entering the blind curve or peak. Should you hear horses coming, tie your animal and walk ahead to warn the oncomers that there are llamas on the trail. If the
stockman isn't familiar with llamas, explain that horses will sometimes spook if they have never seen a llama.

After verbal contact has been made with the approaching stockman, move your llama to the downhill side of the trail. Should the horse spook, the stockman can more easily control the horse when it's running uphill. Take your llamas a good fifty yards off the trail and remain still. If the trail is too steep, then turn the llamas around and go back until you find a place where the horses can pass safely.

IN CAMP

There are a few hours before dark and your legs tell you it is time to find a camp. In your mind you have an idea of what makes a good backpacker's camp. A durable site with a level place for a tent, nearby water, protection from the elements, and seclusion is desired. There are additional considerations, however, when camping with pack stock. Besides the above criteria, you also need a place with ample grass for grazing.

To reduce impact you should choose a durable site that shows no sign of previous use, or you should camp in a heavily used site where further use will cause little additional damage. The in-between sites, ones that have been used but still have substantial amounts of vegetation, should be avoided. These moderate-impact sites will recover
if left alone, but will quickly deteriorate if used repeatedly (Hampton and Cole, 1988).

Don't wait till the stars are shining in the evening before selecting your site. Allow at least two hours to set up camp and to take care of your woolly companion. Too often people will go just a little further and find themselves having to use a bad site—bad for themselves, the llamas and the environment.

Whenever possible, it's better to use a high-impact site than create a new site. When the situation is unavoidable, however, and you must use a pristine area, always try to find a non-vegetated campsite. If you have to choose between vegetated sites, look first for dense patches of dry grass and avoid vegetated forest floors and sites with low-growing shrubs as much as possible (Hampton and Cole, 1988).

Once you have chosen your camp site, tie the llama next to the site and remove the panniers and saddle. Leave your gear there and take the llama to its grazing site to be watered and fed.

Once you have found a place with suitable grass, at least 200 feet from camp, water and the trail, you will need to decide how to best keep your llama so he will have minimum impact and so he can be caught in the morning. There are three options—corral, picket or roaming free.
The best option is to let the llama loose whenever possible. The free roaming llama will have very little impact on the site. Before doing so, however, be sure you will be able to catch the llama in the morning. That means you really need to know your llama before turning it loose. If you are packing with an insecure llama he probably wouldn't think of leaving camp. Two llamas turned loose however, might take off down the trail together.

There are simply too many factors that determine whether a llama will stick in camp or not. Personality, amount of feed in camp, experience, training, and personal attachment with the llamas in camp are just a few. The best way to find out what your llama will do is to test him. Leave the lead attached to his halter and let the other end drag on the ground. This will give you a handle by which to catch him and it will hinder his forward movement as he attempts not to step on the lead. Let him graze and if he starts to wonder out of site you can approach him with grain and snag his lead.

If you have more than one llama keep the more dominate one confined and turn the others loose (with their lead attached at first). After taking a few trips your llamas will gain more experience and will learn to stay around camp. Work at it. You, the llama, and the environment will all benefit from the free roaming llama.
The second best method of stock management is the corral. Building permanent corrals is not a viable option in many backcountry areas. A temporary corral, such as a battery-operated portable electric fence can be used, however. Although the temporary corral allows easy catching in the morning it does so at the expense of increased trampling. Light-weight fiberglass poles and flexible Australian sheep fencing make a good electric fence that can easily be moved. Make sure your llama has been introduced to electric fencing if you will be using this method of confinement.

The final option for confining the llama in camp is by picket stake. One simply screws the corkscrew-shaped picket stake into the earth and attaches the lead of the llama to the stake. This method is the easiest and yet does the most damage. One way to reduce the impact is to carry a light-weight nylon-webbed lead, 25 to 30 feet long. With a little practice, the llama will learn to negotiate the extra length.

Whether corralled or picketed the llama will frequently need to be moved to a new area. Don't let the grass get eaten to the ground before moving him. He should be moved before the grass is eaten down to three inches in height.

Now that you have decided how to contain the llama, feed and water him before returning to make camp. Llamas drink so little water why chance bank erosion by leading the
llama to the stream or lake? It will take less effort and make less impact if you carry the half gallon or so to the llama. Feeding a high protein grain will also reduce impact by reducing the amount of grass and browse needed. Feed a half pound of grain twice a day in the plastic containers I mentioned earlier or some other high sided container that won't allow the grain to be spilled easily. Grain is seed, and the last thing we need to do is to spread non-native vegetation in our backcountry.

With the llamas taken care of, you can get back to setting up camp. When camping in a high impact site, set up in the center of the used area and avoid the fringes. Don't enlarge the abused area. When using pristine campsites, the idea is to spread-out as much as possible, thereby minimizing trampling and compaction of the soil and vegetation. Never use a pristine campsite for more than one night.

After pitching the tent the urge is to collect wood for the evening fire. Fire is perhaps one of the leading impacts campers have on the backcountry. Having a fire has three negative effects. First, the fire will sterilize the soil beneath it, impeding recovery of vegetation. Secondly, heavy trampling and compaction usually occur in the area around the campfire. And lastly, fire-wood gathering will alter the natural appearance of the campsite and the surrounding area. Whenever possible use a light-weight
stove for warmth and meal preparation. As bad as fires are, many will still insist on having a campfire. If you decide to indulge in the luxury of a campfire, then do it safely and in a manner that will cause minimum impact.

Safety is most always a matter of common sense. Don't build fire near combustible material like dry grass or heavy duff. Be careful of wind especially during the dry season, and try to predict what would happen if a strong wind should come from different directions. Never leave a fire unattended.

If your camp is in a high use area, selection of where to have a fire is easy—always use one of the existing fire rings. If you are camping in a pristine area, the selection of where to have the fire is not so easy. In general it is best to choose a site that is rocky or sandy, has exposed mineral soil, or is below high waterline of a watercourse (Hampton and Cole, 1988). The two choices for building a campfire in a pristine site are either on a mound of mineral soil or in a pit dug into the ground. If you can find an area with sandy soils or sparse vegetation then a pit is acceptable. Carefully remove the soil and build the fire in the pit.

Where fires must be built in dense vegetation, however, a mound fire should be constructed. A mound fire is constructed by collecting mineral soil and using it to form a mound on top of a base of rock. The fire is then built on
top of the mound. Be careful not to disrupt the area when collecting the mineral soil.

When finished with your fire, make sure it is out and then thinly spread the ashes so they won't be noticed. If the fire was built in an established area, then little other clean up is necessary. Campfires built in pristine sites will need to be further dismantled. Pit fires should have their soil replaced. Mound fires should have the mineral soil returned to where it was found and the base rock rinsed off.

Another impact we impart on the backcountry is waste, human and llama. Impacts from human waste can be minimized by urinating on rocks or in non-vegetated areas far from water sources and by using latrines or outhouses if they exist. If a latrine or outhouse is not present then dig and use a small cathole.

Llama feces, although visually much like deer or elk feces, also needs to be managed. Keep it out of camp and spread accumulated llama feces before leaving camp.

CLOSING

Attributes of the llama are many. From the unique foot to the very blood that runs through their body, llamas seem to have been engineered for the task of packing goods in the backcountry. Non-physical traits, such as ease of training
and calm disposition, also add to their effectiveness when packing.

Many of the same traits that make the llama an exceptional pack animal also save the owner money. Their moderate size, efficient metabolism and hardiness save the owner transportation, feed, and housing costs.

The best reason, however, for using llamas is their ability to go light on our few remaining wild areas. With less than 2% of the contiguous United States officially set aside to be kept wild, it is imperative that we use this remnant wisely.

This 2% has to absorb some fifteen million user days per year from individuals like you and me attempting to escape temporarily the frustrations and tensions of a so-called civilized society. What would we do without a place to rejuvenate, revitalize, and reflect? What would our society do without a place to remind us we are simply animals delicately balanced on space-ship Earth.

Llamas are unique companions with the potential to help us visit wildlands with less impact than other pack stock. Their full potential as a minimum impact stock animal is realized, however, only when used correctly. Do something wild--go llama packing--go light.
APPENDIX A

LLAMA ORGANIZATIONS

International Llama Association
P.O. Box 37505
Denver, Colorado 80237
(303) 699-9545

Llama Association of North America
P.O. 1882
Department L
Minden, Nevada 89423
(707) 265-3177

EQUIPMENT SUPPLIERS

Bonny Doon Packs
121 McGivern Pl
Santa Cruz, California 95060

Wildwood Llamas
Wildwood Acres
Allenspark, Colorado 80510

Mt Sopris Llamas Unlimited
0270 County Road 111
Carbondale, Colorado 81623

Llamas and More
6615 S.W. McVey
Redmond, Oregon 97756

Rocky Mountain Llamas
5893 Baseline Road
Boulder, Colorado 80303

PUBLICATIONS

The Backcountry Llama
2857 Rose Valley Loop
Kelso, WA 98626

Llama Life
P.O. Box 120
Mancos, CO 81328

Llamas
P.O. Box 100
Herald, CA 95638
APPENDIX B

GENERAL GEAR
  ___ tents, how many?
  ___ sleeping bags
  ___ sleeping pads
  ___ ground cloths
  ___ rope
  ___ extra medicine
  ___ bug spray - human
  ___ shovel, ax, saw
  ___ fire grill
  ___ shovel

LLAMA GEAR
  ___ picket stakes
  ___ extra halter
  ___ bug spray - llama
  ___ llama grain
  ___ feed & water buckets
  ___ llama first-aid kit
  ___ saddles and rigging
  ___ panniers, how many?
  ___ lead shanks

KITCHEN GEAR
  ___ body soap
  ___ trash bag
  ___ hot pad gloves
  ___ can opener
  ___ bulk matches
  ___ salt and pepper
  ___ coffee & sugar
  ___ frypan
  ___ stove grill
  ___ flatware
  ___ paper towels
  ___ cloth towels
  ___ cups
  ___ water pot
  ___ coffee pot
  ___ cooking pot
  ___ dishpan, drainer
  ___ stove
  ___ stove hose
  ___ propane, full?
  ___ plates, bowls
  ___ dish detergent
  ___ sponge & brillo
  ___ water
  ___ sharp knife
DAY PACK

___ water filter
___ compass, map
___ notebook, pencil
___ toothbrush, paste
___ water-bottle
___ flash-light
___ first-aid kit
___ survival kit
___ toilet paper

OPTIONAL

___ sun-glasses
___ camera, film
___ binoculars
___ field books
___ reading material

PERSONAL GEAR

___ clothes
___ footwear
___ rain gear
___ hats & mittens
___ jack-knife

VEHICLE

___ tire pressure
___ oil
___ water level
___ windshield

FOOD
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