

Arboricultural Safety and Safe Work Practices

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Why the need for safety?

Arboriculture is changing. Years ago, if you had a belt and knew how to tie knots, you figured you were all set. You thought you knew all you needed to know, what is there more to learn? Besides, you were not planning to be doing this for long. Many tree workers did not think of arboriculture as a career. Tree work was what you did until you got a “real job.”

That mentality has, thankfully, changed. Nowadays we look at our field as a professional – one that requires special training and knowledge. Not everyone can do it and those that do can make it a career. It is no longer considered just a job to do until you can find something better.

One aspect of being a professional is the commitment to lifelong learning. You cannot settle back and say, “This is the way we did this last year and the year before that and the year before that.” Imagine if we did the same tree care practices we routinely did thirty years ago. Painting every pruning wound, pouring concrete into cavities, flush cutting are all practices that were commonly accepted and performed years ago but are almost completely discarded now. Our changes in climbing techniques mirror our changes in tree care practices. We do not climb the way we did 20 or 30 years ago.

Yesterday’s safety standards and safety education might not be good enough for today’s arborist. If we do not constantly evaluate and re-evaluate how we work in the field, we will not only lose the professional respect we have earned, but we will continue to lose the lives of valued workers.

Addressing safety-related problems in our industry

This is a high-risk profession. The all-industry mortality rate – that is, the fatality rate of all occupations in the U.S. combined – varies between 4 and 5 per 100,000 workers. Very few industries have a fatality rate above 30 per 100,000. Unfortunately, tree work is among them, though not many people realize this.

If you ask most people what they consider to be a high-risk profession, one that comes to mind is police officer. Statistically, it may be safer to be a police officer than a tree worker. Police work has inherent dangers, and it certainly has its share of high-risk situations. The fatality rate among police officers and detectives is about 13.5 per 100,000. Tree workers annual fatality rate generally does not dip below 30 per 100,000 and may be higher in some years. Most tree workers do not think about that when they get up to go to work in the morning, but this can be an incredibly high-risk profession.

Consider these statistics. What is the chance of you stumbling out of bed and killing yourself? One in 437,212. Most of you have no fear of getting up in the morning and getting out of bed. After you

get up and have a cup of coffee, you have to drive to work. What are the odds of getting killed driving to work on an annual basis? One in 87,079, still pretty good odds. Most of you don't fear driving to work in the morning. On your way to work, you decide to stop and buy a Powerball ticket. What are your chances of winning Powerball? One in 27,489,577. Now you pull into work and you're an arborist. What are your odds of becoming seriously injured or killed while working as an arborist in the United States? We are not sure yet, but the data is indicating it may be less than 1 in a 1,000, perhaps much less.

Results of TREE Fund survey

In the interest of industry safety, I developed a survey funded by the TREE Fund. The goal was to gather hard numbers on the types of arboricultural-related accidents that occur in order to gain a realistic view of the risks and what can be done to reduce the risks. What follows here is some data from the survey along with numbers that were obtained from the United State Bureau of Labor Statistics.

From 1991 to 2000, at least 587 tree workers were killed on the job. We say at least because the data includes only workers employed by tree companies, not those workers employed in allied professions such as landscaping that were killed conducting tree work. How were those tree workers killed?

Types of fatalities

Fatalities are tracked in a number of general categories, transportation, assaults, contact with an object, falls, exposure to a harmful environment and fires. Only a few of these categories account for the majority of tree worker fatalities. The biggest hazard, representing about 40 percent of all fatalities, is contact with an object – that object being the tree or a part of it. The number two hazard, at about 35 percent, is a fall. The third is electricity accounting for 15 percent of the fatalities. While these are the 'big three' there are others. Transportation-related fatalities play a significant role in the number of deaths in the industry. Out of the 587 deaths between 1991 and 2000, 47 were transportation related. While defensive driving is usually not considered a tree worker safety topic, it needs to be. Fortunately no tree worker has suffered a fatal assault during the past ten years nor killed by fire.

Contact fatalities

The majority of contact fatalities are what we refer to as 'stuck-bys', a branch striking a worker. And if the branch does not get you, then the falling tree does. We have case after case of workers getting killed by contact accidents in this profession, and it is not just the tree worker with the saw, because nearby ground workers get killed just as often. A climber cuts a branch, the branch snaps off and hits somebody on the ground. We often focus our safety concerns on the climber believing this is the worker most at risk. While statistics bears this out, climbers are at the greatest risk, we cannot ignore the risks assumed by aerial lift operators and ground workers. Not only must we not

ignore their risks we also must realize all tree workers require training, not just the climbers. Arboriculture is a team sport, we depend upon one another.

You're only as safe as your least trained worker. If that person on the ground knows nothing other than picking up brush, the whole crew may be in danger. If the ground worker does not know how to work a line or help you in an accident, then you are in trouble.

Other contact fatalities involving chippers and chain saws and while these still represent a significant hazard, they account for only a small percentage of fatalities. One of the greatest dangers out there is getting struck by a branch or a falling tree. In most cases, the falling tree that gets you is a hazard tree. It is important to do a thorough evaluation of a tree before you start working it.

There is one particular incident I know of that highlights the importance of evaluating a tree before taking it down. This particular tree worker climbed up to about 45 feet, and at that point thought there was something wrong with the tree. He proceeded to cut down the tree from where he was because he didn't want to go any higher to piece it out. You know what happens when you snap out the top of a tree; it swings. The trunk swung back and snapped 5 feet below him. He rode an almost-10-foot piece of wood to the ground, it landed on top of him and he died. What I hate to see in accident investigation reports is that the other workers reported that the climber felt a little nervous about going up, but went anyway.

Falls

There were at least 211 tree workers killed by falls from 1991 to 2000. The primary reasons for falls are worker error – a climber unclipping for just a second to reposition or an aerial lift operator who is not clipped in overreaching out of the bucket.

How can we be safer and prevent falls? We have many new techniques that allow us to do our job safer, faster, and more efficiently. A couple decades ago we didn't have this vast array of tools and techniques. We do now, and we need to use it. On that same note, do not try a new technique the first time at 80 feet. New techniques should be practiced on the ground and with other people. Make sure you know how to use the gear when you go up the tree.

Exposure fatalities

The single event most likely to kill is electrocution. The majority of electrocution accidents occur to climbers, with ground workers coming in second. A climber might swing into the power line, a ground worker leans against a truck that becomes energized. Not too surprisingly most electrical accidents occur along distribution lines. These are the lines that run long most streets and through many street trees. Indirect contact, where you do not contact the power line but your saw or the branch you are holding does, is the most common accident. But direct contact does happen and often because no one knew the power line was there.

A common contact point is your upper back and shoulders. You violated an important rule in

working around power lines; you turned your back to the line. But you did this because you did not even know the line was there. Many workers believe that the utility line clearance tree trimmers are the only tree workers at risk of electrocution. This is not true. The worker out trimming a residential tree that was not expecting the power line is most at risk. Nobody bothers to check for lines. Most workers are getting into the habit of doing a pre-climb inspection to identify defects, they should be checking for power lines as well. I know it may seem obvious, but forgetting the obvious in this business can kill you.

Transportation-related fatalities

One often forgotten risk in tree work is just driving from job to job. Traffic accidents are a risk in any profession that spends as much time on the road as tree workers. You might figure that since our trucks tend to be bigger than the typical car we are going to win any conflict. Do not count on it. Commercial trucking is also a high-risk profession and they drive even bigger rigs. We all could benefit from defensive driving training, a type of training often forgotten when we think of tree worker training. The other transportation risk we are exposed to is working near heavy traffic. Setting out cones can be a risky task; some drivers seem to aim at them. Other drivers ignore them. We have had workers die because a driver ran into the aerial lift while the arborist was in the bucket doing some trimming.

Accidents

The average company has not experienced a fatality in the past year, but it has had non-fatal accidents, either those that were treated on-site or required emergency care. What about those little accidents that did not require hospitalization? Many of these accidents involve chain saws. Chain saws cut many people, but they don't kill as often as they injure.

Other factors in fatalities and accidents

Equipment failure

Some of us are using equipment that is much too old. Many of us try to keep equipment forever. We have fatalities from workers depending upon climbing equipment that is more than ten years old and 40 years old in at least one instance. If the equipment does not fail because it is too old, it does because it was hand-made.

One of the most bazaar equipment failure accidents that I know about involved a worker who fell 60 feet. He didn't know how to splice. He made a lanyard out of a piece of rope and two snaps that were attached with tape. Inspect your equipment and retire it if it is old. Your life depends on your equipment.

Age

The younger you are, the greater the chance of being injured. The older you are, the greater the chance of being killed. The younger workers are just that, young and inexperienced. Accidents are going to happen during that learning curve of becoming a competent worker. We all understand that and

usually then worker new to the field are not put into very risky situations both to protect them and their fellow workers. They probably are going to sustain the usually cuts and bruises, and more serious accidents always loom as a possibility but fatal accidents are a risk to the seasoned worker. If you have been in this job for a while you might get a little too confident. You have not had a serious accident so you do not think about it much. You have done this stuff for 20 years and you think that you are safe, but any day could be the day your luck runs out. If your odds of being killed in any given year are 1 in 3,000 add that up for every year you work. Every year you are rolling the dice. The more you roll the dice, the more the odds are that something will come up. Every year you need to be a little more careful, not less.

Cost of safety

We are the only profession charging by the hour and not by the risk we take. The 40-foot mark is our death zone. A number of companies are starting to charge a premium for work above this height because of the greater risk. Too often we charge by the hour, regardless of the risk. We need to factor the risk into our bidding as well.

Worker safety is priority No. 1

Our most important job any day is to be able to work tomorrow. Don't ever forget that. Worker safety is the No. 1 concern in our industry.

Climbing Safety

Be careful! If you fall from a tree, here are the speeds you can reach:

Height (feet)	Speed reached (approximate)	Typical injuries sustained
10	17 mph	Cuts and abrasions, dislocated elbows, cracked vertebra, death rarely occurs.
30	30 mph	Concussions, multiple fractures, pelvic injury, death may occur.
40	35 mph	<i>The death zone, the height above most falls are fatal.</i>
50	39 mph	Severed spinal cord, broken backs, head injury, death usually occurs.
70	46 mph	Head injuries, ruptured aorta, ruptured lung, death usually occurs.

(The human body reaches terminal velocity – about 120 to 130 mph – at approximately 480 feet.)

You can fall from a tree due to many errors. The three most common are rope failure, tree failure, and improper climbing technique.

1. **Rope failure**
Rope failures occur when 1) the rope is accidentally cut (usually with a chain saw – the most common reason for rope failure) or rarely, 2) dynamic loading exceeds the rope's tensile rating.

2. **Tree failure**
This is based upon several characteristics, the two most critical being trees' inherent structure and the specific gravity of its wood. The difference in specific gravity among trees is of minor significance when it comes to predicting failure. An oak should be climbed as cautiously as a willow. Remember most tree failures occur from structurally unsound wood (hazard trees).

3. **Improper climbing technique – how to avoid the problem.**
 - a. Always wear a hard hat, long pants and good work boots.
 - b. Always have a ground person. The ground person's duties are to spot for you, help raise equipment, lower branches and if necessary, perform an aerial rescue. The ground person must always wear a hard hat.
 - c. Plan the climb before entering the tree and then work the plan. Use two points of attachment whenever possible.

Aerial lifts Safety

Aerial lifts have become an essential tool for many tree workers. While there are still situations where an aerial lift cannot be used due to confined space, they generally permit pruning or removal operations to be completed faster and safer than by climbing (remember most accidents happen to climbers, the least to aerial lift operators – ground people are in the middle). Aerial lifts come in a wide range of styles. Some are a single boom, most have two booms, a lower and upper and a few (Reach-all Inc.) are two knuckles, three-boom arrangement. The following are some of the common specifications.

Model	lower boom articulation (degrees)	upper boom articulation (degrees)	working height (ft.)	horizontal reach (ft.)
Asplundh LR-III-55	125	270	60	42
Hi-Ranger SK-451	135	210	56	42

Aerial lift maintenance

OSHA 1910.67 Vehicle-Mounted Elevated/Rotating Work Platforms Standards requires that aerial lifts be properly maintained, receive annual inspections by certified mechanics and that operators wear appropriate fall protection.

The proper maintenance of an aerial lift is important for your safety and to minimize breakdowns on the job site. The following are items that should be regularly inspected.

Daily inspection

The following are items to be checked before the vehicle is used for the day.

- ❑ Cables for wear and tension.
- ❑ Cylinder rod assembly for cracks. Also check rams on hydraulic cylinders for leaks, nicks and abrasions.
- ❑ Cylinder lock valve for holding with boom up, both lower and upper booms. To conduct a drift test on the holding valves, put the boom in the following position. Shut off the vehicle then activate valves to the boom and hold for 15 seconds. Any downward movement indicates the holding valves needs maintenance or there is air in the system.
- ❑ Boom knuckles for looseness and cracks. Also check for cuts, gouges or damage to the upper and lower boom inserts. These are fiberglass and are prone to damage.
- ❑ Boom for leaking hydraulic fluid. Look for puddles of hydraulic fluid on or around the truck. Caution: never investigate hydraulic leaks with the system under pressure. Hydraulic fluid from a pinhole in a hose under pressure can pierce the skin. These pinhole leaks are not normally visible. Fluid under the skin is a serious injury/infection which requires medical treatment
- ❑ Holes in the bucket. These can serve as points of entry of electrical current.

Weekly inspection

These are items that should be checked at the end of each week of use.

- ❑ Knuckle hoses for chafing. Check for excessively weathered, blistered, kinked and burned hoses by removing inspection covers.
- ❑ Cables for rust and wear. Wire cables clean of any excessive grease, oil or dirt then locate any

wire breaks. Running a soft cloth over the cable may help locate any breaks, as remnants of the material will catch on the parted ends.

- ❑ Bolts in turret and boom for tightness. Also check for excessive play in the pedestal bearing by elevating the boom using the lower controls. With the outriggers down and booms completely vertical, move the lower boom in a short arc. The base of the mast should not rock noticeably.
- ❑ Hydraulic fluids for proper level. Also check the appearance of the oil. A milky or “foamy” appearance means the oil is saturated with air or water (jerky or erratic movement of a cylinder is also an indicator of air in the system – or a bent cylinder rod).

Biannual or annual inspection

These are items that should be part of the semi-annual or annual inspection. They are performed by the mechanics in addition to other inspection and maintenance tasks.

- ❑ Oil filter.
- ❑ Hydraulic fluid.
- ❑ Re-torque critical bolts.
- ❑ Boom dielectric testing. Dielectric testing is essential to protect aerial lift operators from electrical hazards. In our industry, dielectric testing should be performed every six months to one year.

Lift Operation

The following are some of the items identified in OSHA’s General Industry Safety Order 3648 “Operating Instructions (Aerial Devices)”

- ❑ The aerial lift and controls shall be inspected prior to use to determine that such controls are in safe working condition.
- ❑ Aerial lifts shall not be operated by a person working alone. Another worker shall be within voice communication of the aerial lift operator.
- ❑ An inspection of the tree shall be completed before work begins. Do not operate when wind speeds exceed 15 mph.
- ❑ The brakes shall be set before elevating workers.
- ❑ Wheel chocks shall be installed before using an aerial lift on an incline.

- ❑ Outriggers shall be positioned on pads or a solid surface. All outriggers shall be equipped with hydraulic holding valves.
- ❑ Boom and basket load limits shall not be exceeded. Booms shall not be used as cranes or other uses not approved by the manufacturer.
- ❑ Aerial lift operators shall not sit or climb on the edge of the bucket.
- ❑ Aerial lift operators shall use approved fall protection systems. This being either a full-body harness with a dorsal attachment and a shock absorbing lanyard that is designed to bring a worker to a gradual stop should they fall (fall-arrest system) or a very short lanyard designed to prevent the worker from being able to fall from the bucket (fall-restraint system).
- ❑ The lanyard shall be attached to the boom, not the bucket.
- ❑ Lower boom controls shall not be operated while a worker is in the bucket except in case of emergency. The ground worker shall be trained in the use of the lower controls.
- ❑ Aerial lift operators shall be trained in methods for escaping the bucket while it is aloft.
- ❑ Before moving the aerial lift, the booms shall be inspected to see that they are properly cradled and outriggers are in stowed position.

Cleaning

Aerial lifts should be cleaned regularly, at least monthly. Keep the boom interior clean by washing out with a pressure washer (clean water only) and then dry the boom by leaving it in a vertical position.

Keep the insulated section of the boom and bucket clean and dry. Maintain a waxed surface to repel water.

Use a bucket cover to prevent road salt from contaminating the unit.

Aerial rescue: Do the current procedures save lives?

Climbing equipment and techniques have changed greatly during the past decade; however, our approach to aerial rescue has remained the same. The current procedures may be based upon unrealistic situations and possibly placing rescuers at risk.

One important aspect of tree worker safety is aerial rescue procedures. Since we perform tasks at great heights, we must have procedures that allow us to safely extricate victims from situations where their fellow workers may have the only means of reaching them. This point is probably best

illustrated in an article by Alvarez (1981). He described an incident where a tree worker was left suspended for almost two hours with a severed leg because the crew did not have an extra set of climbing equipment and the police and fire department had great difficulty moving equipment into the backyard.

Aerial rescue skills are considered so critical to our profession that it is included in the International Tree Climbing Championships. In this exercise a climber must reach a dummy installed in a tree. The contestant is judged and scored on several tasks, entry, examination of the victim and descent among others and includes points awarded for time.

Unfortunately, the focus of aerial rescue in the minds of many arborists – almost to the exclusion of all other aspects – has been only one element, speed. The objective of aerial rescue practice, as identified in many guidelines, is to reach and lower safely to the ground a victim from a height of 35 feet in less than four or five minutes. The stated purpose of this need for speed is based upon the fact that if respiratory failure - possibly as a result of electrocution - occurs for more than four to six minutes, permanent brain damage may occur. However, is this the most common type of situation that a rescuer might face?

A preliminary examination of the Bureau of Labor Statistics 2000 statistics on the tree care industry does point out that electrical-related accidents pose a risk. However, the risk of being struck by a falling limb or tree are potentially a greater risk and in 2000 were among the most frequent causes of arboricultural accidents along with electrical. But the data also points out that the vast majority of electrical-related accidents - in excess of 90 percent – are fatalities; there is no one to rescue. This is not a surprising discovery, Felix (1982) pointed out that electrocution is the number one cause of fatalities in our profession and unlike other types of accidents; death rather than injuries is the most common outcome. Being struck by a falling branch, yet remaining in the tree also has a high fatality rate. Are our aerial rescue procedures designed for realistic situations? Is there the overwhelming need for rapid extrication of the victim?

Sadly these same government statistics include a number of incidents where tree workers have been killed *practicing* aerial rescue. A 1996 accident resulted in a fatality when a worker after receiving more than a day of training and demonstration fell more than 45 feet while attempting to “rescue” a training dummy placed in a tree. The examination of the government accident investigation reports did not include a review of all incidents and these are certainly incidents that go unreported – a slightly injured worker who is assisted in coming down by a companion, for example. However, there does appear to be the possibility that at the present time a tree worker is nearly as likely to be injured or killed practicing aerial rescue as being saved by one.

This focus on speed is far different than procedures developed for high angle rescues. It has been said that the requirements for rescuing an injured worker are unique to the tree care industry as the victim is aloft and not accessible to emergency personnel (ACRT, 1994). While being in a tree is unique to our industry, these two characteristics – height and inaccessibility – are not unique and

common with other industries and situations such as high angle climbing. Here the rescue procedure is characterized not by speed but techniques to treat, stabilize, package and lower victims.

Thus the need in other aerial professions is not centered on quickly bringing the victim down but stabilizing the victim until trained EMT/EMS personnel arrive and can help in directing (not performing) the extrication. This same focus is part of the US Forest Service (1996) procedure for aerial rescue of tree climbers. While noting there are situations where rapid lowering is necessary, this guide points out “it is almost always best to obtain assistance before moving a victim.”

Regardless of the type of accident, across all professions, there are two important considerations. One, the safety of the rescuer must come first and two, wherever possible wait until the appropriate medical people arrive before moving the victim. Too often in their haste to reach a victim rescuers have been injured or killed or victims have been furthered injured or killed by untrained personnel moving them without guidance from emergence medical technicians.

Based upon these facts, the question must be asked whether our current aerial rescue procedures are realistic and safe. Many in the tree care industry are certainly discussing this. Ken Palmer (1999) notes that in a real-world situation the likelihood of reaching a victim in four minutes or less is low. Instead we need to focus on realistic procedures.

But if we are going to change our procedures, many issues surrounding aerial rescue need to be examined. It is not enough to state, “Wait until the medical assistance arrives.” Merely allowing the victim to hang from their saddle may result in further injuries. Hanging from a waist saddle for an extended time period can result in changes in blood pressure, loss of consciousness and even death. Developing a harness, similar to those identified in high angle rescue, one that is lightweight and easy to install, is possibly an important need. In addition to procedures to stabilize the victim until help arrives, it is equally important to have proper procedures to safely lower the victim. But none of this can be done until we have a better understanding of what situations aerial rescues have been or should have been performed.

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Aerial rescue techniques

Aerial rescues are commonly performed in the tree care industry. It is an important skill to know and practice as opportunity may arise at any time. Please remember however that arborists have been killed either in their haste to perform an aerial rescue or *merely practicing aerial rescue techniques*. Efficiency – not speed – should be your focus.

Aerial rescue equipment

One first-aid kit

And in addition to your own complete set of climbing equipment – rope, harness, helmet, lanyard, throw bag, throw line, etc) you may want to consider also having:

- Rescue pulleys to use to lower the victim
- Four locking carabiners
- Descending device
- Several 2 to 4 feet loops of webbing to create a chest harness or secure victim
- Heavy-duty shears to cut jammed carabiners or steel-cored lanyards

Rescue procedure

Incident Assessment

1. *Attempt to assess the victim's situation from the ground.*
 - a. Is the victim conscious and responsive?
 - b. Is the victim secured?
 - c. Is there an electrical hazard involved?
 - d. Is the victim bleeding profusely?
 - e. What is the victim's apparent emotional stability?
2. *Assess your immediate rescue capability.*
 - a. Personnel on hand.
 - b. Equipment on hand.
 - c. Rescue proficiency.
3. *Assess your needs for available assistance.*
 - a. Resources on call – you can contact them immediately - (ambulances, EMT's, local electrical utility, etc.)
 - b. Anticipated response time.
 - c. Potential for situation to deteriorate while waiting for assistance.

Requesting Assistance

1. *Do not leave an incapacitated climber alone if at all possible – if this is your only option you are not prepared to conduct aerial rescues.*
2. *Before seeking assistance, think over the whole situation. If time permits – the injuries are not life threatening - write down the information before calling. **Explain this is a high-angle rescue!***
 - a. Extent of injuries.

- b. Exact location.
- c. Additional equipment needed for a rescue – ladder, saws, etc.

Initiating the Rescue

Do not initiate a rescue if an electrical hazard exists – unless you are absolutely certain that either 1) the victim is no longer in contact with the energized conductor and you will not be at risk of contact or 2) that contact can be safely broken without risk to yourself. Note that many utilities are not recommending breaking contact but instead contacting them to de-energize the line – *do not become a second victim!* If an electrical hazard does not exist consider the following:

1. *Secure the victim.*
 - a. Climb to the victim using the most efficient ascending method available – generally this will be an already positioned rope – many companies now require a climber to set a second rope in the tree specifically for this purpose – and climbing with a secured foot-lock.
 - b. Do not ascend the tree directly below the victim if any doubt about how well the victim is secured.
 - c. Have your rope anchored above the victim.
2. *Upon reaching the victim, immediately secure yourself, then secure the victim to the tree if appropriate.*
 - a. Provide any emergency first aid that is needed and can be performed in the tree. Do the ABC's (airway, breathing, circulation) then render other first aid.
 - b. Secure the climber in a safe and comfortable position.

Victim Extrication

1. *It is almost always best to obtain assistance before moving the victim unless one or more of the following is true:*
 - a. The victim's position in the tree is precarious and cannot be rectified by positioning.
 - b. The victim's medical condition requires immediate care that can only be provided on the ground (CPR, etc).
 - c. The victim is physically and mentally able to assist you in the descent.
2. *IF the answers to the above are no, do not move the victim. Instead, protecting the victim from further injury by securing with webbing.*
 - a. Provide emotional support to the injured/anxious victim
 - b. Clear a lowering path.
3. *IF the answers to 1 are yes, perform the rescue.*
 - a. Can the victim descend on own rope? Note: sometime damage to the rope may not be apparent. If the rope can be used, use your lanyard or webbing to secure the victim to you and descend alongside the victim by working the friction hitch on yours and the victim's ropes. If there are numerous obstacles to the ground, rescue pulleys can be rigged to lower a victim to the ground if another person can assist from the ground.
 - b. If the victim's rope cannot be used, install a lowering rope to the tree approximately 10 feet above the victim. A tensionless hitch created with a carabiner and a fisherman's knot is probably the quickest means of securing this rope. Attach a rappelling device to the lowering rope. Secure

the victim to the rappelling device and lock it off. After double-checking the system, transfer the victim to the locked-off rappel device. Next attach yourself to the rappelling device by use webbing and carabiners or your lanyard – the victim should be positioned above your lap. Slowly descend to the ground. Once on the ground, provide any additional first aid and prepare the victim for transportation to a medical facility.

Important notes!!! This information regarding rescue procedures come from the *National Tree Climbing Field Guide* (USDA Forest Service 2400-Timber) with some modification for the arboricultural industry. Do not rely upon this handout as your only source of information on aerial rescue – not ever point is appropriate to all situations. Each situation is unique and you should obtain material from a wide range of resources to prepare yourself for aerial rescue.