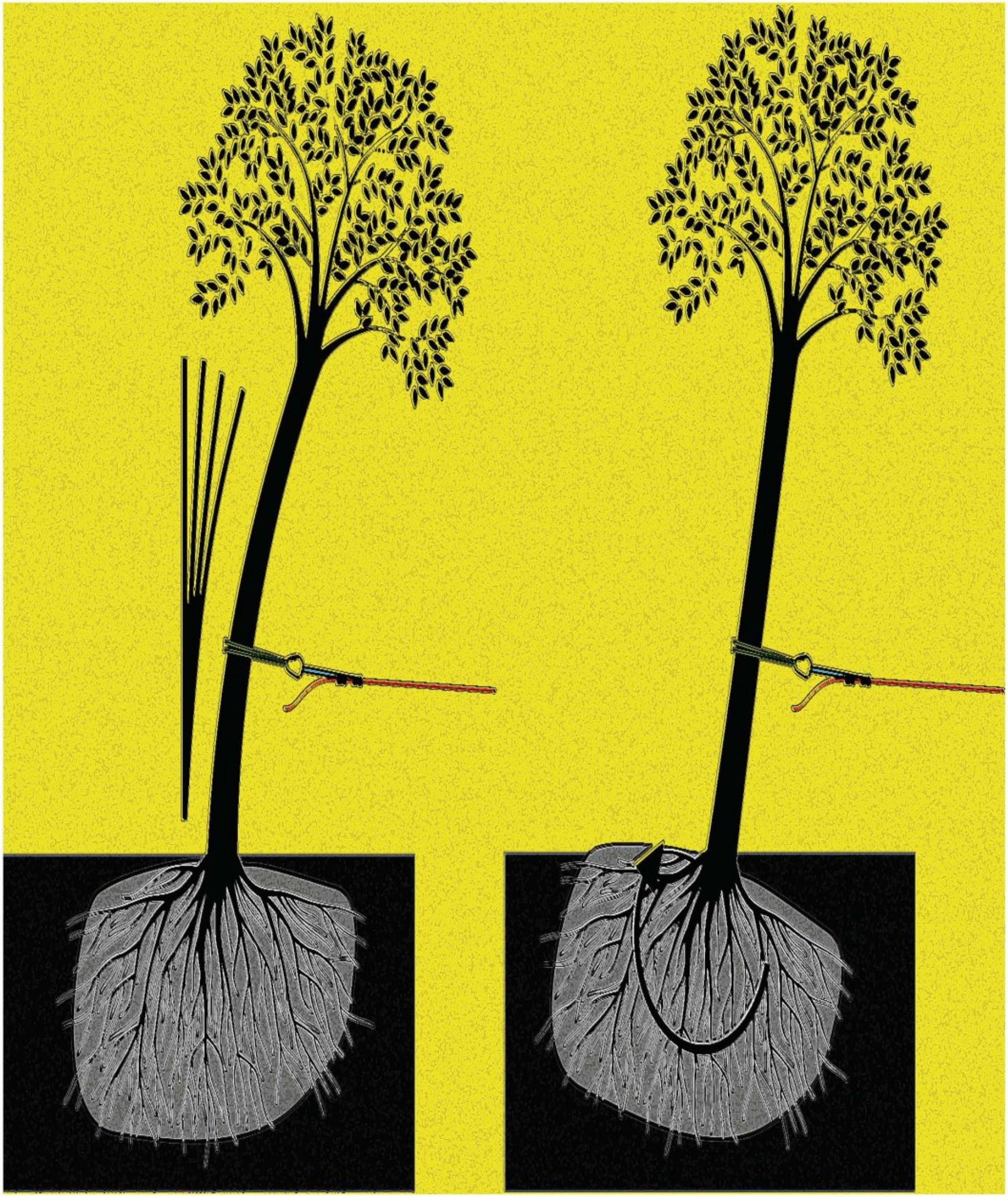
Nylon Highway

Issue #55



... especially for the Vertical Caver

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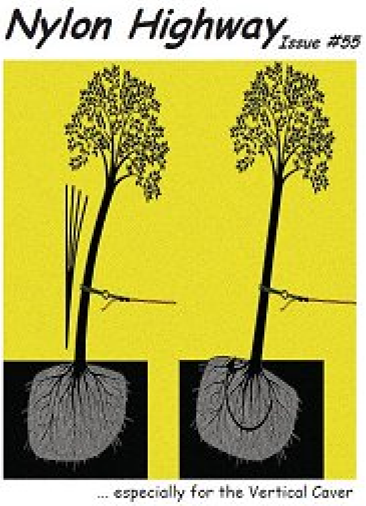

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How to Determine Tree Strength and Build Tree Anchors

Presented by:

Rick Weber

Tree Anchor Strength

Rick Weber

The goals of a tree anchor in a rope rescue system

A tree anchor should provide a stable means of restraining a rope system having a rescue load under a specified severe loading condition. It should prevent the cordage from breaking free of the trunk. And, it should prevent significant movement of the anchor in the direction of the rescue load. Simply stated, we want our tree to stay put and hold onto our rescue system.

Is it strong enough?

Instead of relying on guidelines for selecting trees for our belay and mainline anchors based on anecdotal evidence, a better course is to base our guidelines on actual strength testing of a variety of trees. The results of such tests and conclusions drawn from them appear later in this paper.

Just how meaningful is testing; aren't there really too many variables with trees?

Yes, there are many variables – some of which are not clearly identifiable, especially on night rescues. However, with enough samples from a variety of species and soil conditions, a reasonable set of guidelines for selecting tree anchors can be established. Suggestions for these guidelines appear at the end of this paper.

Trees in Your Jurisdiction

Suffice it to say that a rescue team would be wise to become familiar with the trees commonly found it their areas – especially those in and around areas where a high incidence of accidents occur. In the Red River Gorge in Eastern Kentucky, our squad's pre-plans include identification of anchor trees at popular tourist areas.

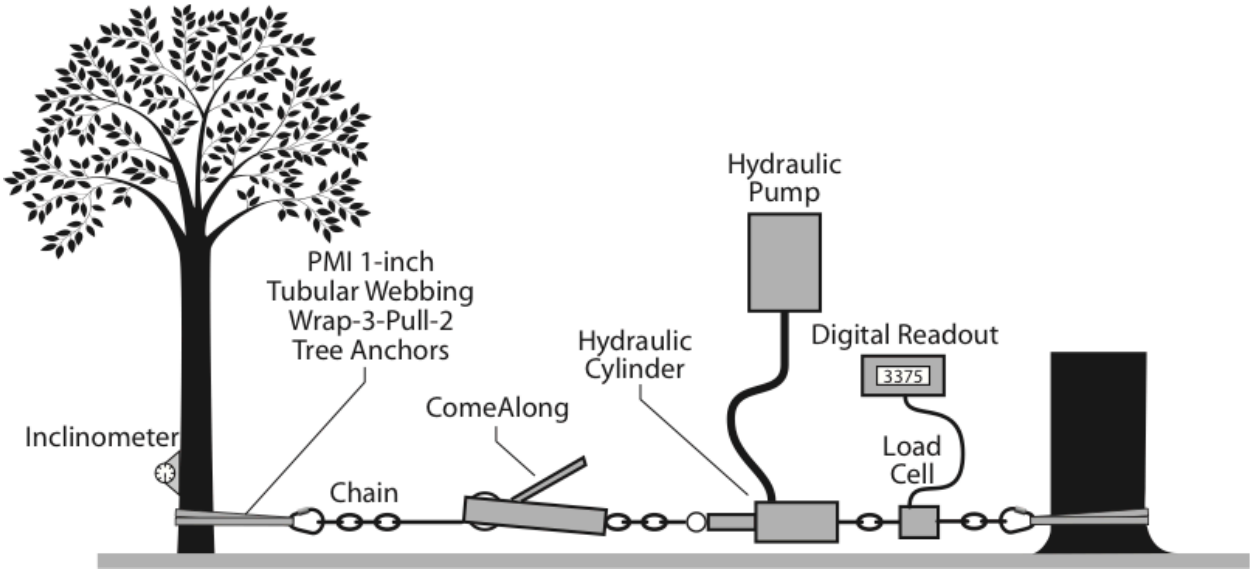

Figure 1 – Testing Rig.

The Test Methodology

Several methods were considered before arriving at the test method used for measuring strengths of trees when used to anchor rescue loads. The method chosen was as follows:

1. A test tree was chosen for testing based on its species, diameter, type of soil in which it was rooted, and location relative to other trees. All this information was recorded.
2. The diameter of each test tree was measured at a point located up the trunk from the ground at a distance equal to the diameter measured at that point. This represents a reasonable place where a rescuer would place an anchor strap or webbing, such as a wrap-3-pull-2, in building his anchor. Other testing was also done with anchors placed higher on the trunks.
3. An inclinometer was strapped to the trunk a distance up from the point that the force was applied equal to two tree diameters. Refer to Figure 1.
4. A test rig, shown in Figure 1, was then attached to the anchor strap or webbing. The other end of the test rig was attached to a larger tree that provided an immovable anchor for the test rig. This rig included, in series, these components:
    a. A webbing anchor affixed to the test tree.
    b. An NFPA G-rated carabiner connected to the webbing.
    c. A length of chain connected to the carabiner.
    d. A heavy-duty come-along connected to the chain.
    e. A means of creating a high tensile load on the system that includes:
        i. A 3-inch hydraulic cylinder.
        ii. A hydraulic hand pump is connected to the hydraulic cylinder to provide it with pressure.
    f. A means of measuring the tensile force created by the hydraulic cylinder that includes:
        i. A strain gage type load cell connected between the chain and large tree.
        ii. A signal processor with digital readout connected to the load cell for measuring and recording the force values created by the hydraulic cylinder.
    g. A large tree to serve as a master anchor for the system.
5. The system was loaded initially by the cable come-along, which was capable of applying about 6 kilo-Newtons (1350 lbf) of tension in the system.
6. Then the hydraulic pumping was started while the digital readout gage was observed.
7. The systems often had to be reset after play was removed during the first stroke of the piston in the cylinder.
8. Pumping continued until one of the following four events occurred;
    a. The digital readout reached 15 kilo-Newtons (3372 lbf). The test force was gradually increased from zero to a maximum of 15 kilo-Newtons (3372 lbf). If, at this point, the inclinometer registered less than 10 degrees of movement, the applied force was left on the rig for 5 minutes to determine if any creep would occur. If the angle remained less than 10 degrees, the test tree was considered to have passed the strength test. Why this particular value of force was chosen for these test is discussed further on in this paper.
    b. The inclinometer, affixed to the trunk, registered an angle equal to or greater than 10 degrees. If this occurred before the 15 kilo-Newtons was reached and held for 5 minutes, the test tree was considered to have failed the strength test. The selection of this particular angle is discussed later in this paper.
    c. The tree uprooted, causing the anchor system to move toward the rescue load.

d. The tree ruptured, allowing the cordage to pull entirely through the trunk. If this occurred before the 15 kilo-Newtons was reached, the test tree was considered to have failed the strength test. This particular event is discussed further on.

Justification of the Maximum Arrest Force (MAF) used for these tests

Some believe that trees should be selected for anchoring a rescue load with the thought in mind that they should be able to hold a load equal to the minimum breaking strength (MBS) of an NFPA G-rated rope. This value – 40 kilo-Newtons (8992 lbf) – is neither realistic nor prudent. If a rescue system were subjected to this magnitude of force, several more significant problems would occur long before the tree anchor became a concern.

For these tests, it was decided to use a well-recognized and widely-used MAF specified in the Belay Competency Drop Test Method (BCDTM) developed by the British Columbia Council of Technical Rescue in 1989 to specify procedures to determine belay competency in rope rescue systems. It is intended to represent the worst case scenario of a main line failure during an edge transition.

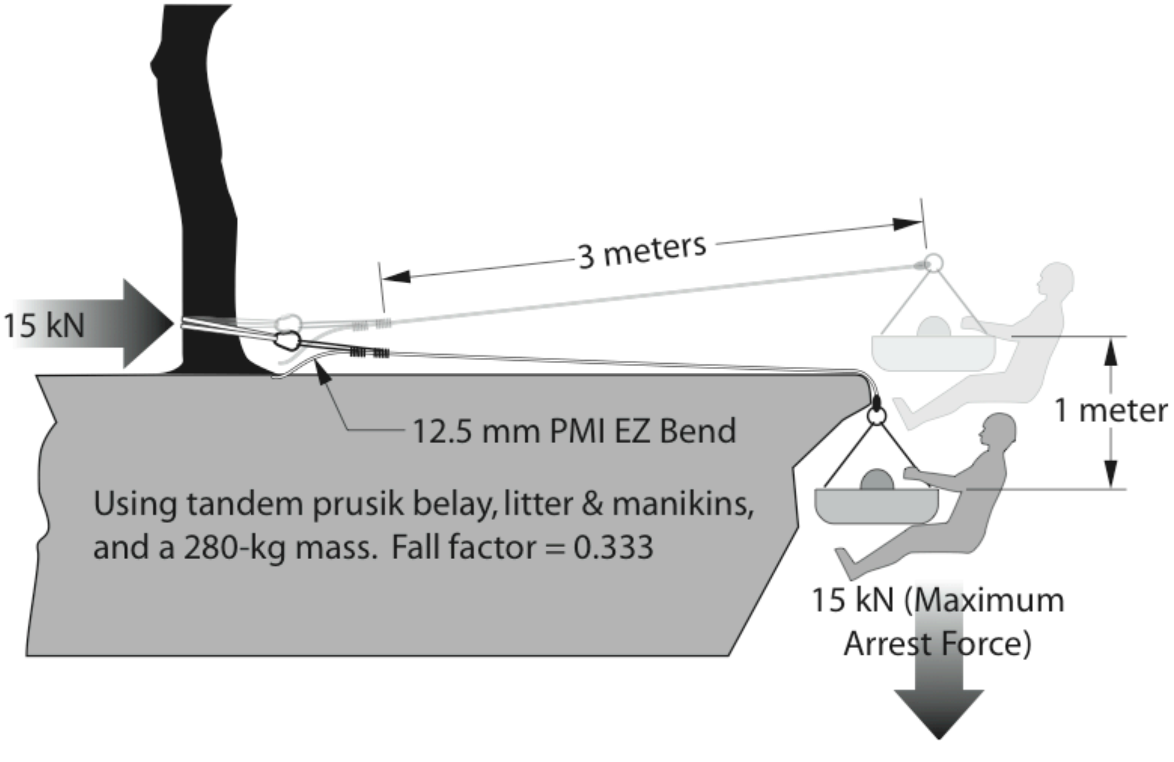

Figure 2 - Belay Competency Drop Test Method

Referring to Figure 2, in the BCDTM a 280 kg rescue load (litter, victim, patient) connected to an anchor via three meters of 12.7 mm kernmantle rescue rope is dropped one meter. With the additional travel limited to one meter, the peak force seen by the rescue load must be less than 15 kilo-Newtons (3372 lbf).

Although hypothetical situations could be envisioned in which forces greater than the one created by the BCDTM could be created, we rescuers need to work within realistic parameters and reasonable probabilities. If a tree anchor in a rope rescue system experiences a force greater that defined by the by the BCDTM there are other things of a far more serious nature going on in the system.

It can also be reasonably argued that a tree which can withstand a sustained force of 15 kiloNewtons will withstand a much higher impulse force exerted over a fraction of a second. This is due to the relatively large inertia of a tree. The energy delivered to a tree by a short impulse force of a particular magnitude is, of course, far less than the energy delivered by a force of the same magnitude sustained over a long period of time.

Therefore, the 15 kiloNewtons (3372 lbf) was chosen as the maximum force that would be applied to the test subject trees. The author is confident that this force sustained for several minutes, presents a more severe load on a tree than the BCDTM shock loading force.

It should be understood that the trees selected for testing were of sizes that were borderline capable of sustaining a 15 kilo-Newton load are not necessarily recommended sizes around which anchors should be built for rescue loads. A prudent rigger will always try to select larger trees and use ones of marginal size only when nothing else is available.

Detailed discussion of the failure modes defined for these tests:
From the previous page, we learned that there were three modes of failure:

a. The tree trunk bent or pivoted to an angle of 10 degrees.
b. The tree uprooted, causing the anchor system to move toward the rescue load.
c. The tree ruptured (loss of structural integrity), allowing the cordage to pull entirely through the trunk.

Taking one at a time:

a. The 10-degree **change in angle** of the tree trunk was arrived at somewhat subjectively, but based on an unanticipated event that frequently occurred with trees less than 15 cm in diameter. It was discovered that when these smaller-diameter tree trunks were bent or pivoted by an application of force to the 1-inch tubular webbing attached thereto, at about 10 degrees, the webbing would shear off a large section of bark on the back of the tree and abruptly shift upward several inches. In some cases on some varieties of trees - conifers in particular – this shift was profound. The webbing – in most cases, a wrap-three-pull-two (W3P2) arrangement – would abruptly rupture the bark and quickly slide upward using the dislodged piece of bark as a sled and facilitated by the slick surface of the cambria on the inside of the bark. This upward movement of the cordage was accompanied by a quick increase in the angle of the trunk by several degrees. The change in angle was, of course, due to an abrupt increase in the moment applied to the tree. Although not observed in any of these tests, it is possible that this event could, once started, continue cascading as the webbing moved up the trunk and the tree bending over more and more until it either catastrophically failed or the webbing was stopped in its upward movement by a branch.

So it became clear that there needed to be a measurable amount of angular movement of a tree trunk, beyond which the integrity of the anchor system was considered unacceptably compromised. And, based on observations, this angle was chosen to be 10 degrees. In a pulling test, once this angle was reached, the force exerted at that point in time was recorded and the test was stopped.

It should be noted that angular movement of the trunk at the point the force is applied can be a result of either bending of the trunk (more common with flexible trees such as conifers), as shown in Figure 3, or pivoting of the entire tree, including its root ball (more common with shallow-rooted trees in unstable soil) as shown in Figure 4.

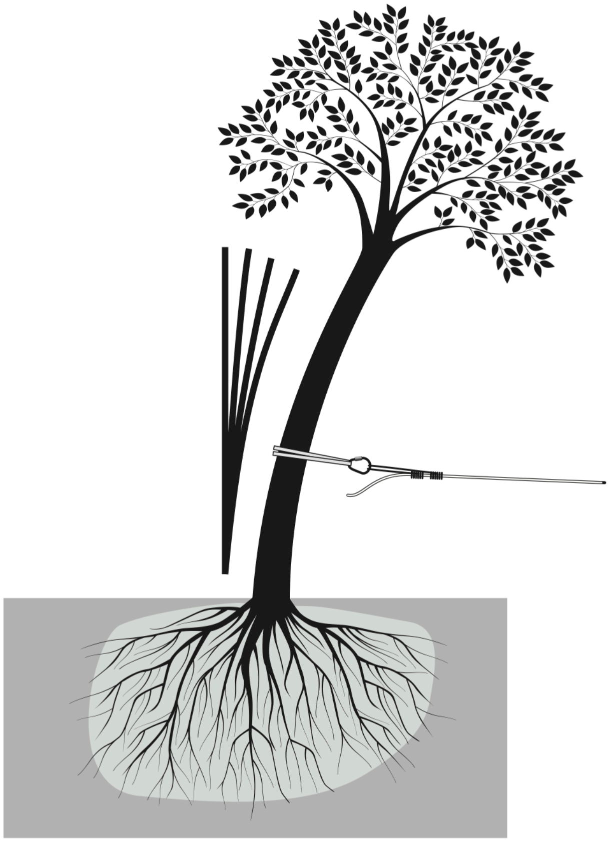

Figure 3

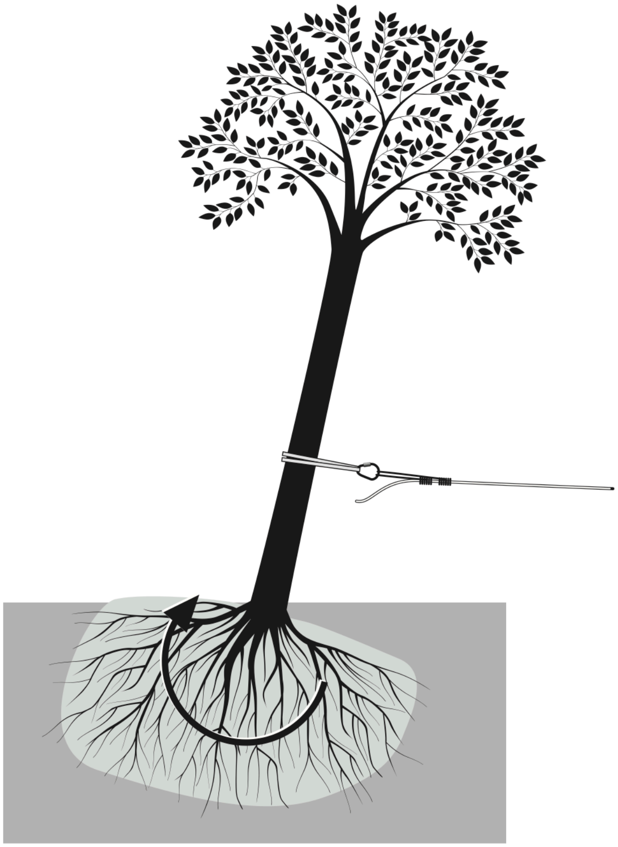

Figure 4 - Pivoting

b. **Uprooting** is a highly unlikely event rescue trainers love to offer up as a possible failure to justify using only large trees. Many anecdotal bone-chilling campfire stories are told to support this myth. In truth, with an anchor affixed near the base of a live tree healthily rooted in stable soil - or even shallowly rooted over the surface of a rock base - it would be a rare event to pull it over applying a force up to the BCDTM load. In these tests, smaller trees rooted in sandy soil tended to rotate – root ball and trunk – to an unacceptable angle long before they showed any signs of uprooting.

Trees of all species above 15 cm in diameter showed no signs of uprooting when the BCDTM load was applied via an anchor to the lower portion of the trunk. Of course a small tree could be uprooted by creating a large enough moment, such as a rope pulling on a 15 cm diameter tree at a point 2 meters (6.5 feet) off the ground. But, we simply avoid affixing the anchor cordage this high without a pre-tensioned tie-back to another tree. Keeping the attachment point of the anchor low on the tree minimizes the moment to irrelevance. The load will tend to pull the entire root ball through the ground in the direction of the load long before the tree would tend to uproot.

When the anchor is very low - say 25 cm (6 inches) off the ground on a 50 cm (12-inch) diameter tree, then another factor becomes significant to the resistance of the tree to failure. At this point, as opposed to several feet up the trunk where the bending moment is the overwhelming component contributing to uprooting, the mass of the root ball and its resistance to moving horizontally contributes hugely to the resistance to failure.

c. Like uprooting, **loss of structural integrity** simply does not occur in live, solid trees above 15 cm in diameter. For example, one of the weakest North American trees, the Cottonwood (Balsam Poplar) has a compressive strength measured perpendicular to the grain of 300 psi. The cross sectional area of a 15 cm (6 inch) diameter tree is 28 square inches. Doing the math, this example will fail when a shearing force of around 8500 pounds is applied – over twice the BCDTM load. So, we will select live, non-hollow trees and not be concerned about this type of failure happening.

The following data was recorded

1. Species
2. Diameter (Measured at the point where the test force is applied. This point is located up from the ground a distance equal to one tree diameter.)
3. Soil type
4. Type of anchor (basket hitch w/webbing, W3P2 with webbing, commercial strap, etc. affixed to the tree so that the applied force is exerted at the location defined in point 2. above)
5. Proximity to other trees
6. Amount of force applied

Tests conducted

32 tests were conducted, the results of which are charted below in Figure 5. Prior to these tests, several preliminary tests were run in an attempt to determine the range of diameters for testing and to also establish techniques for efficiently conducting this type of test.

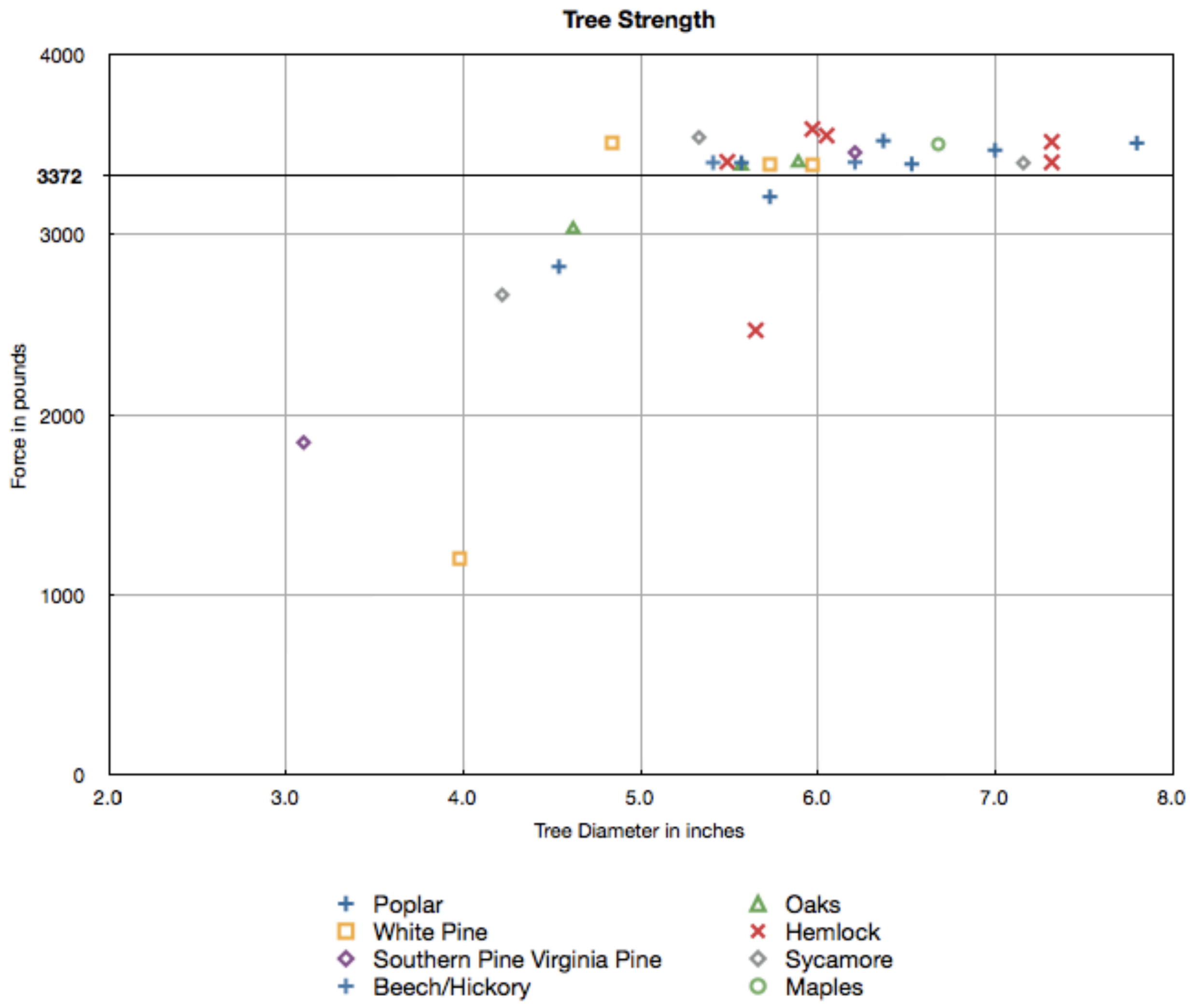

Figure 5 - Tree strength measurements.

Conclusions:

Based on the data collected and processed, suggested guideline in selecting trees to use as an anchor for a raise/lower rescue system:

If an anchor can be affixed to a tree at a point on the trunk no higher off the ground than a distance equal to the tree's diameter, then the trunk diameter at that point should be no less than 6.5 inches (16.5 centimeters). A typical rescue helmet is 8 inches wide and can provide a convenient measuring means.

Other conclusions and observations will be presented at the Symposium.

A comprehensive list of guidelines for selecting tree anchors that includes the above conclusion plus other commonly-applied guidelines:

1. In your pre-plans, get to know the species and characteristics of trees common to your area and the types of soil in which these trees are rooted.
2. Use only live trees or ones that have recently died.
3. Avoid trees with dead snags that could break off and drop onto rescuers.
4. Use the largest diameter trees available in the vicinity.
5. Don't hesitate to extend an anchor to the rigging location from a tree far back from the cliff.
6. Use front-ties when possible to raise the gear out of the ground debris and remove slack from long anchor extensions.
7. Locate webbing and strap anchors as low on the tree trunk as reasonably possible.
8. If an anchor can be affixed to a tree at a point on the trunk no higher off the ground than a distance equal to the tree's diameter, then the trunk diameter at that point should be a minimum of 6.5 inches (16.5 cm).
9. If the tree will be used as a elevator and is under 25 cm (10 inches) in diameter (measured a distance of one diameter up from the ground), a pre-tensioned tie-back should be affixed to the tree at the same height off the ground as the elevated anchor and interlaced with the webbing or straps that form that anchor. Great care must be taken to position the tie-back in reasonable line with the line of force applied by the rescue/patient package so that no sideways bending occurs.
10. Include vectoring systems of ropes to position main lines and belay ropes along their ideal lines of action.

NOTES

Canopy Access:
Beyond Basic Single Rope Technique

By: Joe Maher

Institute for Tropical Ecology and Conservation

Important Note!
It is not the intention of this writer to teach researchers and others how to climb into the forest canopy. This article is intended as a means of acquainting those who may already be exploring the forest canopy with the idea that there are available techniques for climbing of which they may be unaware, or of which they may be aware but not utilizing. Those wishing to climb into the canopy are encouraged to seek professional instruction and discouraged from climbing until such instruction has been received. This writer will not accept responsibility for those choosing to utilize the techniques described herein without having received proper professional instruction beforehand.

Introduction

Over the past twenty to thirty years field biologists have been taking an ever closer look at the forest canopy above our heads (Perry, 1978). The forest canopy has been described as one of the last remaining frontiers for field biologists (Moffett and Lowman, 1995).

The first scientists to explore upwards into this world at the top of the forest employed relatively primitive methods, climbing spurs, or access techniques borrowed from the disciplines of alpine mountaineering, rock climbing, speleology, and from professional arborists. Access at the simplest and most basic level involved only the solitary climber and the tree (Moffett and Lowman, 1995). High tech meant using a length of rope and hardware for ascending the rope.

A typical climb in the canopy usually involved shooting a light line over a limb, using either a slingshot or a bow, and using the light line to haul a heavier line that could then be used to haul a climbing rope up and over the limb. One end of the rope would be tied off to a nearby tree trunk and the climber would ascend into the canopy on the other end of the rope by methods described as single rope technique (SRT) (Smith and Padgett, 1996).

This method had shortcomings in that once the climber reached the limb over which the rope had been placed there were few options for moving about through the canopy (Moffett and Lowman, 1995). The climber could (1) detach from the rope and move about in an untethered state, (2) use lanyards or other short pieces of rope to tie in while climbing about, or (3) simply return to earth and relocate the climbing rope over another limb before making another ascent.

It is surprising to this writer that among the research community there has been little evolution in the methodology used to access the canopy even though the technical/recreational tree climbing community has adopted a variety of techniques that could allow canopy researchers much greater versatility in their movements above the forest floor.

The purpose of this article is to suggest the employment of several techniques that can expand the abilities of researchers to access and move about within the canopy. It must be assumed that those reading this article are already climbers themselves and in possession of a basic understanding of single rope technique and are familiar with climbing terminology. The article is directed toward the individual researcher who is most likely operating alone or with a small group, and with a limited budget. On the assumption that most researchers will be working in remote locations, the article will also attempt to provide access methodology that calls for minimal equipment that can be easily carried in and out of research areas. This article will attempt to acquaint canopy researchers with techniques that will increase margins of safety for climbers. Some of the techniques suggested will suffice to make the canopy more accessible for researchers with limited physical abilities. This article will not address climbing techniques that violate basic safety protocols. All methods presented herein stress the belief that all canopy access should be accomplished "on rope", and that climbers always work from a position below their anchor point in the tree (Maher, 2004).

The most important purpose of this article is to suggest to the canopy research community that it is time to move beyond the idea that basic single rope technique is the only rope climbing skill that is needed to access the canopy. The time has come that those who venture into the canopy on rope be willing to add to their repertoire of skills and take advantage of the many different methods for climbing that have evolved along with the growth of tree climbing as a recreational activity. Canopy climbers need to accept the idea that there is now a sizeable body of knowledge and technique developed specifically for climbing trees and that it is no longer necessary to confine oneself exclusively to methodology conceived for use by rock climbers, alpine mountaineers, and cave explorers.

Conventional Single Rope Technique

It is not the intent of this article to discourage the use of basic single rope technique. SRT has been, and still is, the method of choice for ascending ropes quickly and efficiently. It is herein proposed, however, that other techniques, when used in concert with, or in place of, basic SRT will enhance the ability of the climber to function more effectively in the vertical environment (Moffett and Lowman, 1995).

Single rope technique exists in many forms. The definitive characteristic of SRT climbing is that it involves ascending a single length of rope through the use of mechanical ascenders or friction hitches. Variations in types of ascenders and friction hitches, and their deployment and configuration on the rope, allow for an almost infinite number of ascent options (Smith and Padgett, 1996).

At the simplest level the researcher may use short lengths of small diameter rope (accessory cord) to attach to the main rope with friction hitches, then ascend by alternately advancing these ropes upward. One of the shorter ropes is attached to the climber's harness, the other serves as a footloop. First the climber stands in the footloop while advancing the rope attached to the harness, and then sits in the harness while advancing the footloop. This method is described as "prusiking" (Smith and Padgett, 1996)

At the other end of the complexity spectrum are methods that employ mechanical ascenders and a variety of other equipment such as chest harnesses with roller boxes, bungie cords, and stainless steel links configured in a manner making ascent an almost effortless activity (Vines and Hudson, 1999).

Most SRT climbing, as applied to canopy research, will use a system somewhere between these two extremes.

The term “Texas System” is used to describe that technique of ascension most commonly in use among canopy researchers. The “Texas System” involves the use of two mechanical ascenders. One ascender is placed on the rope above the climber and is attached by webbing or small diameter rope to the climber's harness. A second ascender is placed on the rope, usually about waist level, and has a loop of webbing or small diameter rope into which the climber inserts a foot. The climber ascends by standing in the footloop while advancing the upper ascender, then sitting in the harness while advancing the lower ascender. This action is repeated until the desired height in the canopy is achieved.

Descent from the canopy, while climbing SRT, is usually achieved by one of two methods. The climber may downclimb by simply reversing the action of the ascent, or the climber may switch to a descending device and rappel to the ground. The downclimb is slower and safer, the rappel faster and more dangerous. There are a variety of devices for descent and, as with the equipment for ascent these devices span a scale that stretches from very simple to extremely complex.

The simplest recommended device for descent is the carabiner and is utilized by wrapping the rope in a loop, or Munter hitch, through the carabiner. The carabiner is attached to the climber's harness. Downward pressure on the rope beneath the carabiner creates friction on the rope and allows for a controlled descent. At the opposite end of the complexity spectrum are devices with control handles and safety features designed to make the rappel safer and more controlled. Note that all methods of descent employ friction between rope and descent device as the means for maintaining control as the climber travels down (Smith and Padgett, 1996).

In most situations involving canopy access by way of SRT the rope has been placed over a limb with one end tied off to a suitable point at ground level. The other end of the rope is that part of the rope used for the climb.

It should come as no surprise that SRT is the technique most often used for canopy access. It is the method that is most often employed by mountaineers, cave explorers, rock climbers, and professional arborists when it is necessary to ascend on a rope. In most cases it is the only method that canopy researchers have been exposed to prior to their forays into the treetops (Houle *et al.,* 2004). Conventional single roping does have its downside, however, and that is where other methods may be employed to overcome the shortcomings inherent in its use.

The most obvious issue is that of advancing the climb beyond the entry pitch. If the climber is to follow all safety protocols, then it is impossible to advance beyond the initial entry pitch by SRT unless a second rope or lanyard has been brought along. Bringing along such extra gear violates the idea of equipment minimalism and is unnecessary if the climber has alternative methodology at hand. This is the point at which the climber should be willing to abandon one technique in favor of another.

Another issue is that conventional SRT requires one system and one set of equipment for ascent and another system and set of equipment for descent. Not only is this equipment-intensive, it requires an off-the-ground exchange of systems and paraphernalia, creating a situation in which climber safety can be greatly compromised. There have been methods introduced within the past few years that allow the climber to descend without a major exchange of systems or equipment but these methods have been slow to gain acceptance as they represent a departure from the conventional (Maher, 2004).

The most important negative issue associated with SRT is that it usually involves a rappel as the means of descent. While it is possible to downclimb with ascenders, it is slow and considered impractical when compared to a rappel descent. It is a documented fact, however, that most climbing accidents occur "on rappel" (Maher, 2004). The mature, responsible, and safe climber will treat the act of rappelling as dangerous and will approach any descent with caution.

Finally, conventional SRT requires a degree of training and experience that precludes its use by untrained and inexperienced beginners. It requires a degree of strength, physical condition, and skill usually attainable only by those who climb on an almost daily basis. It also requires an amount of equipment beyond that possessed by the beginning or casual climber.

Most of these negative issues associated with conventional SRT can be avoided if the climber has access to other techniques. Before leaving SRT it is suggested that climbers examine the RAD System as an alternative to the conventional “Texas” style of climbing.

Unconventional SRT: The RAD System

The RAD (Rapid Ascent/Descent) System is an alternative to the “Texas” system that will allow climbers to access the canopy in a manner that will allow both ascent and descent to be accomplished without having to make major changes in equipment. The same equipment that takes the climber upwards can bring the climber downwards, thus eliminating that critical point wherein equipment changeover is taking place. The RAD System also provides the climber with a 2:1 mechanical advantage, decreasing short-term energy expenditure.

To rig the RAD System, begin by placing an ascending device at eye level. This device should have two loops of 9mm accessory cord hanging from its lower end. One loop should be long enough to reach the climber's harness when the ascender is raised as high as the climber can reach. The other loop should reach to the climber's knee when the ascender is raised as high as the climber can reach. Place a large pear-shaped carabiner into the upper port on the ascender with the large end of the carabiner around the rope and through the port. Take a bight of rope from beneath the ascender and thread the rope into a pulley that is inserted into the carabiner. Place a grigri-type-device on the loop of rope that is hanging from between the ascender and the pulley. Attach the grigri-type-device to the climber's harness with a carabiner. Take the shorter accessory cord loop coming off the ascender and attach it to the climber's harness, as the safety back-up, with still another carabiner. The longer accessory loop becomes the footloop. This is the RAD System.

To ascend, one hand should be placed on the handle of the ascender, the other hand on the downrope coming off the pulley. Raise the foot that is in the footloop, allowing slack in the footloop. Raise the ascender as high as the climber can reach. It will also be necessary to allow a bit of slack in the downrope as the handled ascender is raised. The climber will now stand in the footloop while pulling down on the downrope. Rope will be pulled through the grigri and vertical progress captured in the process.

Descent is accomplished by simply removing the rope from the pulley above the climber, then removing the ascender from the rope. The climber is now free to operate the control handle on the grigri device and commence descent. One hand should remain on the downrope below the grigri device to maintain controlled flow of the rope through the device.

Double Rope Technique

The simplest and safest yet least utilized by canopy researchers is double rope technique (DRT). Although double rope technique is slow and energy intensive, it will resolve every one of the shortcomings cited in reference to SRT. In order:

> (1) DRT will allow the climber to advance with relative ease beyond the entry pitch and can facilitate both vertical and horizontal movement through the canopy.
> (2) DRT utilizes the same system and equipment for ascent as for descent and DRT is suitable for remaining at one spot within the canopy.
> (3) DRT descents preclude the necessity of a rappel, avoiding the most dangerous element of climbing.
> (4) The climbing rope does not need to be tied off, thus leaving both ends of the rope free to be used alternately while advancing the climb or securing a position within the tree.
> (5) DRT is not equipment intensive when compared with SRT and a DRT climb can be accomplished with nothing more than the climbing rope, a harness, and a carabiner.

> (6) DRT climbing does not require the same degree of training and experience as does SRT. Beginners can accomplish major ascents under the guidance of a facilitator with no prior training whatsoever.
> (7) While DRT does require strength and good physical condition, it does not require such to the degree as required for SRT climbing.
> (8) DRT allows the use of both ends of the climbing rope thus making it possible for the climber to have more options at his/her disposal while moving through the canopy. This also precludes the necessity of having to carry an extra rope, since, in effect, DRT climbing gives you the use of two rope ends. (Maher, 2004)

While DRT is capable of resolving many of the issues associated with SRT climbing, it does have shortcomings of its own:

> (1) DRT requires the use of arborist rope; static and dynamic ropes, commonly used for SRT, are neither flexible enough, nor abrasion-resistant enough, to function as DRT climbing ropes. Arborist rope is OK for both DRT and SRT climbing, while static and dynamic ropes are good only for SRT climbing.
> (2) DRT requires a greater length of rope. DRT requires a length of rope that is at least twice the length of the pitch being climbed. The rope must be long enough to reach the anchor limb and return to the climber on the other side.
> (3) A DRT climb requires a clear and isolated route up the tree. The rope must go up and over the anchor limb and return to the climber with no other limbs intervening. Such a route is sometimes unattainable, thus making it necessary to climb with SRT.
> (4) DRT is less efficient ergonomically. Advancing the friction hitch one foot results in an actual net vertical gain of only half a foot. A one hundred foot ascent requires moving along two hundred feet of rope. (Maher, J. 2003, 2004)

While it has been named double rope technique, DRT utilizes a single rope. After placement over a suitable limb in the tree, both sides of the rope are used. The rope end on one side is attached to the rope on the opposite side with a friction hitch. Other knots are added for harness attachment and safety backup. Ascent is accomplished by advancing the friction hitch upwards, thus decreasing the size of the loop in the rope created by the joining of the two sides of the rope. Descent is accomplished by pulling the friction hitch downwards, enlarging the loop in the rope. If the hitch is left alone the climber will hang in a stationery state. A footloop placed on the climbing rope beneath the friction hitch, utilizing still another friction hitch, will help as the original friction hitch is advanced upwards. The climber stands in the footloop to advance the upper friction hitch then sits in the harness to advance the footloop. This sequence is repeated as necessary to advance upward. (Flowers, 2000)

Descent is accomplished by removing the foot from the footloop, grasping the climbing rope between the two hitches, then pulling downward on the upper friction hitch. Control of the descent is maintained through use of the grasping hand.

Most ascents into the canopy begin and end with SRT. The climber in possession of DRT capability will advance beyond the SRT pitch, moving at will through the treetop.

It is possible to make an entire climb using DRT and this methodology is suggested for beginning or inexperienced climbers. At the Institute for Tropical Ecology and Conservation (ITEC), DRT is the first technique taught and climbers who have never been on a rope before routinely make climbs to eighty five feet or higher (Maher, J., 2004). A climber on DRT needs no belay, and once the climb is begun, the instructor can walk away to give instruction to others. The only serious mistake a climber can make is to apply pressure to the top of the upper friction hitch without having a controlling grasp on the rope beneath the hitch. This can result in an uncontrolled descent. Safety knots placed in the rope beneath the climber as the climber ascends can prevent such uncontrolled descents. Safety can be increased by replacing the friction hitch on the footloop with a mechanical ascender. The ascender will act as a safety stop. Using the ascender makes the system more equipment intensive, but a climber prepared for both SRT and DRT will have ascending devices on hand.

In order for the canopy researcher to advance a climb beyond the entry pitch the following use of DRT is suggested. When the top of the entry pitch has been achieved, whether by SRT or DRT, the climb is extended by taking the free end of the rope and placing it over another limb along the intended route of travel, then using DRT to advance to that setting. The climber who intends to do this will have brought along a length of light line and a weight. The climber will also have climbed the entry pitch with the free end of the climbing rope attached to the side of the harness so that it will be easily available when needed. The light throwline, with weight attached, is thrown over a limb along the intended route of travel, usually above the climber, retrieved, then used to haul up the free end of the climbing rope that the climber has thoughtfully brought up into the tree. It is also possible to gain a new setting by tying a monkey fist in the rope itself and using this to toss over an intended setting; monkey fists work very nicely for shorter throws. Once this rope is in place a DRT system is tied in the rope, the system attached to the climber's harness, and the climb continues. Once full weight has been placed on the new system, the original system can be untied, and the climber now has another free end that can be used once the top of the second pitch has been achieved. This is the essence of multi-pitch climbing; the climb can be extended throughout the canopy by alternately using the free ends of the rope to tie new DRT settings. It is possible to advance to any spot in the tree where a safe rope placement has been achieved.

Combining Double Rope Technique with Single Rope Technique

Most experienced canopy climbers will make their entry pitch by way of SRT. If they have done this, and wish to advance their climb beyond the entry pitch by way of DRT, then it is necessary to free the end of the rope that has been tied off to a convenient tree trunk or other anchor point at ground level. In order to observe the safety protocol of always climbing "on rope" the climber must first tie off in the tree before allowing anyone below to untie from the ground level anchor point. This can be accomplished by taking the free end of the rope, which hopefully the climber has carried along as the climb is made, tossing it over the same limb over which the SRT setting already exists, or over any another convenient and safe limb, tying a DRT system, attaching to it, placing full weight on it, detaching from the SRT setting, then instructing ground personnel to untie the SRT ground level anchor. That end of the rope can then be pulled upward into the tree and a multi-pitch DRT climb can proceed from there.

In the event that the entry pitch involves rope placement along a cleared and isolated route, it is possible to avoid tying the rope off at ground level and the climber will have both free ends of the rope available to advance the climb when the top of the entry pitch is achieved. A clear and isolated route is one in which the rope travels upward to the anchor limb and down the other side with no intervening limbs or other obstructions between the "up" rope and the "down" rope. This is an ideal setting and will allow the climber to anchor the rope at the top of the pitch rather than at ground level. As the rope is hauled into the tree along such a cleared and isolated route, the hauling is halted as soon as the rope has passed over the top of the anchor limb. A small loop is tied into the rope at ground level, a steel link placed in the loop, and the haul line also placed through the link. Hauling continues until the steel link has been pulled snugly against the anchoring limb. The climber may then climb SRT on the side of the rope that has been passed through the link. Once the top of the climb is reached, either end of the rope may be used to rig a DRT setting. The major advantage to this sort of rigging is that the climb can be accomplished without the assistance of ground personnel.

Inability to achieve a clear and isolated route creates a situation in which the rope will probably need to be tied off at ground level. This happens frequently in tropical forest with lianas and dense understory. If the climber does go ahead and rig as described above then it must be understood that the climber will only be able to climb as high as the obstruction between the "up" rope and the "down" rope. This is acceptable as long as the climber is able to get a free end of the rope placed over a suitable setting in such a manner as to facilitate a switchover to DRT.

Combining SRT with DRT allows the climber to make a fast initial ascent into the canopy before switching to another system in order to move about in the canopy.

Double Rope Technique and the "Spider," or double anchor.

Double rope technique allows the climber the use of two rope ends while only having to climb with one rope; in effect this is the same as if the climber had two ropes. Not only does this allow the climber to advance through the canopy while alternately using the two rope ends, it also gives the climber the opportunity to traverse horizontally after creating a double-anchored or "spider" setting. The "spider" technique involves nothing more than having the climber suspended in the apex created by rigging two DRT settings on or near the same vertical level, but separated laterally. The climber is able to move horizontally from one side of the "spider" to the other by advancing forward on one side of the setting while moving away from the other side of the setting. The "spider" also allows the climber to visit a point in the canopy between two settings. A climber who intends to spend a lot of time at one spot in the canopy can also create an extremely safe stationery position by rigging into a "spider". A climber with DRT settings rigged to both left and right, with no slack in either, while perched on a limb, is in a virtually infallible position of security.

Double Rope Technique and The Third Rope.

The DRT climber not only has the use of two rope ends but a third rope can be realized by utilizing the middle of the rope between the two ends. A daisy rope is a short length of rope usually carried by professional arborists as they climb and is used for tying off in the tree for extra security. The "double daisy" technique is a staple of professional climbers. It is not necessary, however, to carry along an extra rope in order to create a double daisy when climbing. In order to create a double daisy while in possession of only one rope, the climber simply pulls up some of the rope hanging beneath, ties a figure-eight-on-a-bight making a small loop in the rope, and attaches that loop to the harness alongside the already existent DRT connection. A slipknot is then tied in the rope a short distance beyond the figure-eight-on-a-bight, and a large bight of rope pulled through this slipknot. This large bight is then passed around a suitable anchor, either a limb or the tree trunk itself, and the loop inserted into the same carabiner used to fasten the figure-eight-on-a-bight. This creates a "double daisy" that is adjustable by increasing or decreasing the size of the loop created by the slipknot. The friction of the rope passing through the slipknot and over or around the anchor is sufficient to keep the climber in place once slack is taken up in the daisy. The writer has chosen to refer to this system as “The Third Rope." This arrangement is useful as a means of creating a third point of support in situations where the climber may choose to occupy one spot in the canopy for extended periods. It can also be used to secure the climber in situations where it may be necessary to have both rope ends free, or while the climber is in the process of transferring from using one rope end to use of the rope's other end. The arrangement can also be used to advance a climb in place of a standard DRT system when necessary, although descent in such a situation is not easily accomplished due to the increased friction inherent in the double daisy. (Maher, J., 2004)

Summary

Most canopy researchers are using only those methods of canopy access described as conventional Single Rope Technique (SRT). Most canopy climbers are unaware of alternative styles of climbing, most notably double rope technique (DRT). Both SRT and DRT have their shortcomings, both have their strong points. This article proposes the idea that the climber that has access to both techniques, and that is willing to employ either, will be the more efficient and able climber.

Most importantly, canopy climbers need to accept the idea that there is now a sizeable body of knowledge and technique developed specifically for climbing trees and that it is no longer necessary to confine oneself exclusively to methodology conceived for use by rock climbers, alpine mountaineers, and cave explorers.

This article also suggests that in addition to serving as an alternative means of climbing into the canopy, DRT can be used to advance beyond an entry pitch, create a "spider" setting for maximum security and/or traverses within the canopy, and to create a "third" rope when one is needed through use of a mid-line daisy configuration.

The best climbers will be those having the most options at their disposal when challenging climbs are encountered. The best climbers will be those willing to use whatever technique will work best in any given situation. The best climbers will be those who can climb safely and efficiently while having options at their disposal to resolve whatever issues and challenges may be encountered in the canopy.

Acknowledgements

I wish to thank Geoffrey Sorrell, Auburn University graduate student, for suggesting that I write this article and then providing encouragement and editorial support. His assistant, Shawn Lindey, is also deserving of thanks for the same reasons and Carlos Ormond for editorial support.

Dr. Peter Lahanas, Director of the Institute for Tropical Ecology and Conservation, ITEC, and his entire staff have all contributed in one way or another to the knowledge and experience contained herein. Special thanks to Dick Flowers, Abe Winters, Peter Jenkins, Alain Houle, Tim Kovar, Bill Maher and all the other climbers from whom I have learned along the way to becoming a climber myself. A most special "Thank You!" to all of the students at ITEC, too numerous to be named, who have unknowingly served as test subjects as I have experimented with various ways of teaching access into the tropical forest canopy.

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CLIMBERS' CORNER

Safe and Efficient Tree Ascent: Doubled Rope Techniques (DdRT), Part Two

By Mark Adams

This article illustrates and describes some of the different systems that are available to tree climbers to make their ascent fast, safe, and efficient. It also looks at some of the gear and equipment that can be used in various combinations to create different types of ascent systems. Part one (see June 2007 issue of *Arborist News*) looked at different types of tethers, the secured footlock technique, and several types of ascenders. This article will show additional types of tethers and several other ascender setups. Readers are cautioned to practice using new gear and equipment carefully and thoroughly while on the ground before attempting to use them in a tree. Training organizations and additional reference materials are listed at the end of the article.

Corrections

On page 51 of the first article, it was stated:
D stands for "**D**escending device"—because the ascender cannot be used to descend …

The text should have read:
D stands for "**D**escending device"—because the friction hitch cannot be used to descend …

On page 54 of the first article, under the heading "Warning!" it was stated:
There is one method that has been used as a backup that will not work and should not be used.

The text should have read:
There is one method that has been used for secured ascent that should not be used.

Review

For all of the techniques that are discussed in this article, it is assumed that an arborist climbing line has been set high in the tree with a throwline. All of the techniques described in this article are examples of doubled rope technique (DdRT). Some DdRT systems allow the climber to alternate between ascending the doubled line in either a static or dynamic manner. It is important to understand that in both static and dynamic DdRT, both legs of the rope can move. In a dynamic system, their movement is what moves the climber up (or down) the tree. In a static system, the climber grasps both legs of the line and climbs them together as if they were one. But, if either leg of the doubled line were pulled by itself, the other leg would move in the opposite direction.

There are some precautions that the climber needs to take when using ascenders, and these precautions are easily remembered with the acronym THADDS.

T stands for "at**T**ach"—the ascender must be properly attached to the host line.

H stands for "**H**ands away from the cam(s)" so that the cam(s) is not accidentally released.

A stands for "**A**scent only"—ascenders are not to be used for descent.

D stands for "**D**escending device"—because the ascender(s) cannot be used to descend, the climber must carry some device that will allow him or her to descend to the ground in an emergency. Many climbers carry a figure-8 or an extra HMS carabiner specifically for forming a Munter hitch.

D stands for "**D**ebris"—if debris (small pieces of leaves, bark, twigs, or even candy) gets onto the rope and prevents the cam(s) from having consistent, steady friction with the host line, the ascender could fail. It is important to keep the rope and ascender clean and free of all types of debris.

S stands for "**S**pread"—ascenders on a doubled line will work only if both legs of the doubled line are close together. If the legs of the line are spread too far apart, one leg of the line may pop out of the ascender. To avoid this, the climber should stay below the branch a distance that is at least five times the diameter of the branch.

Tethers

The tethers shown in the first article were examples of what is commonly called a Prusik loop. The ends of a length of cord are tied together with a grapevine knot (often incorrectly called a double fisherman's knot) to form an endless loop. The loop is then secured to the doubled climbing line with a friction hitch, most often a three-wrap, six-coil Prusik or Klemheist.

One problem with any type of tether is that when the climber lifts his or her legs to move up the line, a loop of slack is created in the tether, and this loop can sometimes catch on some other part of the climber's equipment. Some climbers attach the tether to their shirt, run the tether through their shirt, or tape the two legs of the tether together so that there is less cord that can catch on something. Another solution is to use a single piece of line rather than a doubled line. Figure 1 shows five different types of tether setups, each of which uses a single length of line or cord. Note that ANSI Z133.1-2006 states:

> 8.1.9 Prusik loops, split-tails, and work-positioning lanyards used in a climbing system shall meet the minimum strength standards for arborist climbing lines [5,400 pounds].

When a Prusik loop is used for the tether, a cord or rope is doubled to form the loop, and each leg of the loop bears only half the load. The Z133.1 safety standard (quoted above) requires that the loop have a minimum strength of 5,400 pounds. Because each leg of the loop bears only half the load, each leg has to have a minimum strength of 2,700 pounds (2,700 × 2 = 5,400). Thus, the cord or rope that is used to form a Prusik loop has to have a minimum strength of only 2,700 pounds. But all of the tethers shown here use only a single piece of line rather than a doubled line (loop).

The entire load (the weight of the climber, plus all of his or her gear) is on a single leg of the line, so the line must have a minimum strength of 5,400 pounds.

Figure 1A shows a 1/2-inch, 16-strand tether that has a small, spliced eye for the upper attachment; a scaffold knot (also often incorrectly called a double fisherman's knot) for the lower attachment; and a webbing sling as an adjuster. This can be used only with ascenders. The climber can clip into the lower attachment and/or the adjuster, and the lower attachment could be used to lock off the stopper knot below a floating false crotch. The webbing adjuster is difficult to move after it has been loaded, and the bury of the eye splice makes it difficult to move the adjuster any closer than about 12 to 14 inches below the carabiner.

Figure 1B shows a 1/2-inch, 16-strand tether that has a spliced eye for the upper attachment; a double overhand stopper knot (also often incorrectly called a double fisherman's knot) on the bottom; and a webbing sling as an adjuster. This can be used only with ascenders. The climber clips into the adjuster, and the double overhand knot is left free or can be clipped to the saddle to keep it out of the way. The webbing adjuster is difficult to move after it has been loaded, and the eye splice makes it difficult to move the adjuster any closer than about 12 to 14 inches below the carabiner.

Figure 1C shows a 1/2-inch, 16-strand tether that has a scaffold knot for the upper attachment; a double overhand stopper knot on the bottom; and a Micrograb as an adjuster. This can be used only with ascenders. The climber clips into the adjuster, and the double overhand knot is left free or can be clipped to the saddle to keep it out of the way. The Micrograb adjuster is very easy to move even after it has been loaded, and the scaffold knot allows the Micrograb to be moved right up under the carabiner.

Figure 1D shows an 8-mm, double-braid tether that has a large, stitched eye for the upper attachment; a small, stitched eye for the lower attachment; and no adjuster. This tether can be attached directly to the doubled climbing line with a Prusik or Klemheist, or the large eye could be girth-hitched to a carabiner and used with ascenders. The small eye is clipped directly to the saddle. A Micrograb cannot be used as an adjuster with this particular cord, but a compatible webbing sling could be used. A Micrograb could be used if the line were larger (a Micrograb must be used on a line with a minimum diameter of 9 mm). If an adjuster is used, the tether could be moved only as far as the stitching that forms the eyes.

Figure 1E shows a 3/8-inch hollow braid tether that has a large, spliced eye for the upper attachment; a small, spliced eye for the lower attachment; no adjuster; and a built-in elastic cord. This tether can be attached directly to the doubled climbing line with a Prusik or Klemheist, or the large eye could be girth-hitched to a carabiner and used with ascenders. The small eye is clipped directly to the saddle. An adjuster cannot be used with this type of tether because of the elastic cord. When there is no tension on the tether, the elastic pulls the loose tether together (indicated by the brackets { } in the photo). When the climber raises his or her legs to take a lock on the line, there is less slack that could potentially get tangled in the saddle. When the climber stands up on the lock, the elastic easily stretches, allowing the tether to be extended to its full length.

These photos show just some of the components that can be used and the combinations that are possible when assembling a tether for ascending a tree. When trying new combinations, always make sure that all of the components of the system are compatible (for example, do not use a Micrograb on an 8-mm cord).

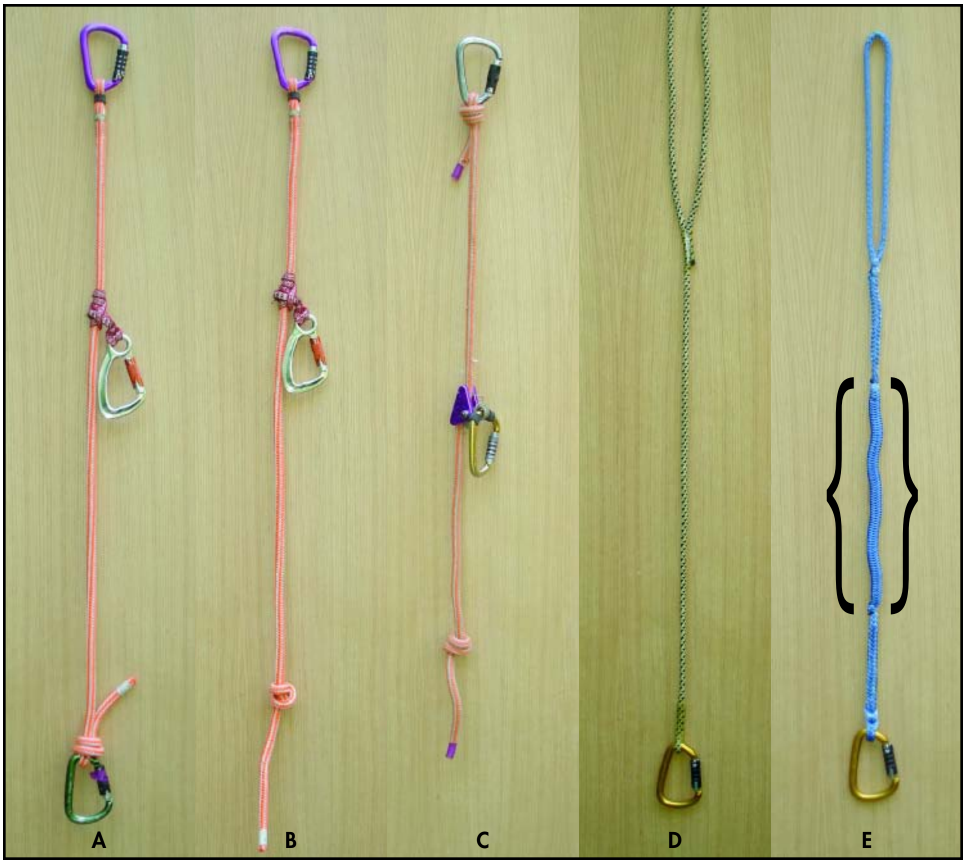

Figure 1. Five different types of tether setups, each of which uses a single length of line or cord. Because these tethers use only a single piece of line rather than a doubled line, the line must have a minimum tensile strength of 5,400 pounds.

Static Versus Dynamic DdRT

In both static and dynamic DdRT, both legs of the rope can move. The disadvantage of this is that if one of the cams in the doubled system fails and there is no backup, then the climber will fall to the ground. The advantage, however, is that when using ascenders, the climber may perform either a static ascent on both legs of the doubled line or may pull down on one leg of the line and perform a dynamic ascent. This dynamic ascent is very similar to body-thrusting except that the climber does not have to advance a climbing hitch—the ascender(s) moves up as the climber pulls down. Thus the climber can easily alternate between footlocking, when there is a clear path of ascent, and body-thrusting, when ascent is hindered by branches or the trunk of the tree. This type of dynamic ascent can be accomplished with the double-handled ascender (the Kong Twin), which was shown in the first article, or with two single-handled ascenders.

►

Note: This is ***not*** possible and should ***not*** be attempted with a Prusik, a Klemheist, or any other type of friction hitch. The hitch will fail and the climber may fall to the ground.

Single-Handled Ascenders

Figure 2 shows the left and right, single-handed Petzl Ascension ascenders on the two legs of a doubled line. In Figure 3A and 3B, the ascenders are still on the two legs of a doubled line but have been placed next to each other and connected with a single carabiner. That carabiner has a tether attached to it, and the other end of the tether attaches to the saddle of the climber. This setup functions just as the Kong Twin, but the handles are next to each other rather than 180 degrees to each other as they are on the Twin. A backup system is still recommended, such as the Rock Exotica Dualcender. (Note: Petzl sells the gold as the left ascender and the blue as the right ascender so that the cams can be manipulated with the thumb of the respective hand. This works when the ascenders are placed one above the other on a single line, but when they are placed side by side, the cams face and interfere with each other. When used on a doubled line, as here, the blue Ascension should be on the left and the gold Ascension should be on the right.)

Other single-handled ascenders, such as the CMI Expedition, can also be used in this manner. But when two single-handled ascenders are placed side by side, only one hand will fit in the handles. Therefore, the grip is rather awkward, and there is excess movement between the two ascenders. Another available option is a type of frame that joins two single-handled ascenders securely together to create a single unit. A system that uses this setup is the Mar-Bar, which was created by longtime climber Paul Sisson. Unlike the Kong Twin, which is manufactured as a double-handled ascender, Mar-Bars use two single-handled CMI Ultracenders to form a single, double-handled upper ascender for the hands and two more Ultracenders to form a single lower ascender for the feet (Figure 4). The climber is attached to the upper ascender only and uses the lower ascender simply to assist in his or her inch-worm progression to the top. Because the climber is attached only to the upper Mar-Bar, it is recommended that another system be used as a backup.

Figure 2. The left and right Petzl Ascension single-handled ascenders on the two legs of a doubled line.

One difference between the Mar-Bars and the Kong Twin is the position of the hand grip. The Mar-Bars have a horizontal grip, while the Twin has an angled grip.

Figure 3A. The left and right Petzl Ascension single-handled ascenders placed next to each other on the two legs of a doubled line and connected with a single carabiner. That carabiner has a tether attached to it (here a Prusik loop), and the other end of the tether attaches to the saddle of the climber. This setup functions just as the Kong Twin, but the handles are next to each other rather than 180 degrees to each other, as they are on the Twin.

Figure 4. Mar-Bars use two single-handled CMI Ultracenders to form a single, double-handled upper ascender (with yellow strap) for the hands and two more Ultracenders to form a single lower ascender for the feet. The climber is attached to the upper ascender only and uses the lower ascender simply to assist in his or her inch-worm progression to the top. Because the climber is attached only to the upper Mar-Bar, it is recommended that another system be used as a backup.

Figure 3B. Different view of Figure 3A.

If a climber prefers the angled grip of the Twin and still wants to use the lower Mar-Bar for his or her feet, the upper Mar-Bar can be easily exchanged for the Twin (Figure 5). Some type of backup system is recommended.

There are many options available for ascending into a tree. There are many different types of components for tethers, ascenders, and backups, and many of these may be interchanged in various ways. Ascent systems can make tree climbing safer, more efficient, and more ergonomic. Arborists need to learn how the components of these systems were intended to be used and to integrate them into their work in appropriate ways. Because these tools are so useful, it is hoped that there will be more discussion and consideration of these devices in future revisions of the Z133.1. These tools are like any other tool. If used properly, they can be a great asset, but if misused and misunderstood, they can fail.

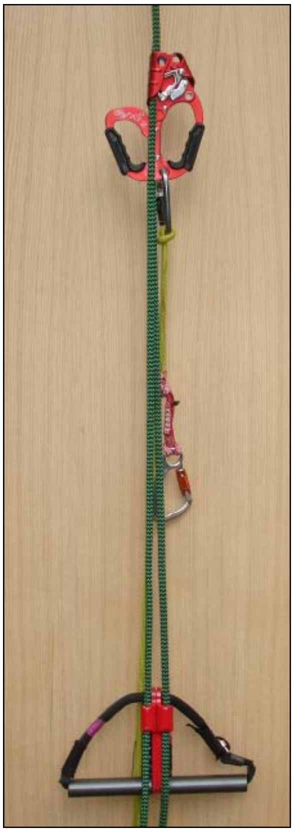

Figure 5. If a climber prefers the angled grip of the Kong Twin and still wants to use the lower Mar-Bar for his or her feet, the upper Mar-Bar can be easily exchanged for the Twin. Some type of backup system is recommended. Here the tether attached to the Twin is a Prusik loop with a webbing sling as an adjuster.

The safe use of a certain piece of gear is not simply a matter of tensile strength but knowing that the item is "fit for the purpose." The user must thoroughly understand how the item works and how it functions as a component in different types of climbing (and rigging) systems. Please climb and work safely.

Credits

The acronym DdRT for "doubled rope technique" was suggested six or eight years ago by Tom Dunlap on the (now defunct) discussion forum of ISA's Web site.

The acronym THADS for "Tie, dress, and set; Hands away from the knot; Ascending only; Debris; and Spread" is often used by ArborMaster Training as a mnemonic for tying the Prusik loop to the host line. THADS was suggested to ArborMaster by Tom Green when he was a student in one of their classes. I added the second D, for Descender, and applied the same acronym to ascenders.

Training Resources

Arboriculture Canada Training and Education: www.arborcanada.com
ArborMaster Training: www.arbormaster.com
North American Training Solutions: www.northamericantrainingsolutions.com

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Figure 4 courtesy of SherrillTree. All other photos courtesy of the author.

Minutes of the
NSS Vertical Section Executive Committee E-Meetings
August 2009 to June 2010

The NSS Vertical Section Executice Committee held a series of E-meetings on a variety of issues during the period from August 2009 to June xx, 2010. Executive Board members participated in the meeings via email.

June 2010 - NSSVS Awards

The VS Board has been making efforts to formally recognize those who have made significant contributions to and otherwise served the Vertical Section over the years. Bruce Smith of the Awards Committee received a nomination recommending that an award be given to Dick Mitchell for his many years of leadership and contributions to the vertical community. After review, on June 6, 2010, Bruce Smith made a motion to award a plaque to Dick Mitchell at the 2010 NSS Convention. As of June 23, 2010 there were 7 votes in favor of the award and the motion carried. The VS Board conducted this action without Chairman Dick Mitchell's knowledge.

NOTE: There were other discussions on various topics between Executive Committee members throughout this period. None of these are recorded in these minutes since no motions were made or voted on and they did not constitute E-meetings.

Respectfully submitted,
Bill Boehle

(Rev.0)
Approved by EC e-meeting xx/xx/201x

Minutes of the
NSS Vertical Section Executive Committee Meeting
August 1, 2010

The NSS Vertical Section Executice Committee held a meeting on Sunday, August 1, 2010 at a motel near the 2010 NSS Convention in Essex Junction, Vermont. Executive Board members present were Chair Dick Mitchell, Secretary-Treasurer Bill Boehle, At-Large Executive Members Miriam Cuddington, Terry Mitchell, and Rory Tinston, Vertical Techniques Workshop Coordinator Terry Clark, and Contest Coordinator Bill Cuddington. Education/Training Coordinator Bruce Smith and Nylon Highway Editor Tim White could not attend the convention and no proxy was designated. Vertical Section member (and rebelay course coordinator) Gary Bush was also in attendance.

Meeting opened at 7:10 PM by Chair Dick Mitchell.

The purpose of the meeting was to discuss and deal with various issues that needed to be addressed before the annual business meeting on Thursday.

1. Education/Training Coordinator. Dick Mitchell reported that Bruce Smith had sent him an email containing his report for the business meeting.

2. Bill Cuddington reported that this year PMI donated two 600 foot lenghts of EZ Bend rope for the climbing contest. Rigging would begin at 8:30 AM on Monday.

3. Terry Clark reported that the workshop would use some of the contest rope. He also informed us that the rigging must be done in Vermont under the supervision of an OSHA approved person. This has been arranged for. (Note: this was mainly to operate the lift to reach the rigging points.)

4. Gary Bush discussed the rebelay couse to be held at this years convention. While there were some rigging issues to be addressed, no significant problems are expected.

5. Terry Mitchell and Bill Boehle briefly went over the Constution and Bylaw change allowing for a Vice Chairman to take over for the Chairman in the event that person is unavailable to conduct business. This language had previously been circulated to the EC and would be presented to the membership at the business meeting. If the membership approves the Constitution change, then the EC would vote on the accompanying Bylaws change.

Adjournment - Motion to adjourn was made and carried. Time of adjournment was approximately 8:48 PM.

Respectfully submitted,
Bill Boehle

(Rev.0)
Approved by EC e-meeting xx/xx/201x

Minutes of the
2010 NSS Vertical Section Meeting
August 4, 2010

The 2010 NSS Vertical Section meeting was held Wednesday, August 4, 2010 at the Vermont EXPO Center in Essex Junction, Vermont. Executive Board members present were Chair Dick Mitchell, Secretary-Treasurer Bill Boehle, At-Large Executive Members Miriam Cuddington, Terry Mitchell, and Rory Tinston, Vertical Techniques Workshop Coordinator Terry Clark, and Contest Coordinator Bill Cuddington. Education/Training Coordinator Bruce Smith and Nylon Highway Editor Tim White could not attend the convention and no proxy was designated. Approximately 16 additional Vertical Section members were in attendance.

I. Meeting opened at 1:07 PM by Chair Dick Mitchell.

A. Announcements - Welcome to everyone who came. Agenda, minutes, and other information available in packet. Membership/Attendance roster circulated. Introduced EC members present.

II. Minutes of the Last Meeting - were published on the website and there were no amendments or changes. A motion was made (Gary Bush; second - Miriam Cuddington) and the minutes were accepted as published.

III. Officer's Reports:

A. Secretary's Report - Bill Boehle. See attached. Accepted as presented.

B. Treasurer's Report - Bill Boehle. See attached. No further discussion. Accepted as presented.

C. VS Symbolic Items - Bill Boehle. See Treasurer's Report for sales numbers.

D. Nylon Highway Editor's Report - No report.

IV. Committee Reports:

A. Contest Committee - Bill Cuddington. Thanks to PMI for donating 1200 feet of EZ`Bend rope this year for the climbing contest. We noticed some fuzzing in the first 30 meters of the main rope (89 climbs), but it was not excessive. We may use some of the Pit Rope next year for comparison. Thanks to all who help during the vertical contest, especially Miriam and Virginia Clark on the books and Ernie Coffman and Barry Ferguson on the racks. We appreciate any help from section members and others with timing, pulling rope, running the rack (the racketteers), etc. Awards will be given out at 1:00 PM on Friday.

B. Vertical Workshop - Terry Clark. This year we have 15 people signed up so far. With a smaller group, students will get more reps. Thanks to PMI for their support of the vertical workshop. We are cutting up the contest ropes for use in the workshop. This way we are getting more use out of the donated ropes and have less gear to haul to the convention. Terry wants to recognize and thank the instructors who help him and Lynn run the vertical workshop. It makes his job easy. We have a new batch of instructor T-shirts available this year for instructors who have helped out for three or more years. It was suggested that the workshop manual be handed out to students during registration rather than at the end of the session. This way they could be referred to during segments like knot tying.

C. Training/Education - Bruce Smith provided report presented by Dick Mitchell.

Bruce has been in contact with many grottoes who are using the Basic Training Course. He notes that he is amazed with how many "regional modifications and adaptations" are made to the basic course as published. At what point is it no longer the Vertical Section course if they are making substantial changes to the course? If you are aware of significant changes or modifications to our training guidelines being used locally, Bruce would like those people to communicate with him so that we can evaluate what people are doing around the country. This way we can update the course to incorporate better or "other" ways to do things and share this information with everyone.

Last year we completed the Intermediate Course and made it available via download for no charge on the website. However, we have had no students register that they are starting the course or who have filed for a certificate of successful completion. The lack of feedback makes us wonder on if, and how, the intermediate course is being used by the vertical community. Some discussion followed. Terry Mitchell reported that in his grotto about 10 people started working on the intermediate course last year and that 7 are still actively working on the training, with 2-3 close to completing the course. Since it is a self-paced, mentor driven course it is taking a longer time to get it done than Bruce may have anticipated. Other than the time it is taking, Terry has experienced no problems with the course itself. Other experiences are that many people are not willing to commit the time that is needed to learn the techniques in detail. Most seem to prefer the one-day overview type training, which is not what the intermediate course is all about.

D. Re-Belay Course / "Dial In Your Gear" Session - Gary Bush and John Woods. This year about 15 people showed up for the rebelay training. It started off slow, but they were busy throughout the day. Terry Mitchell helped out all day with Gary. As in the past, John spent a lot of time with people setting up and adjusting their gear. It was well received by all who participated.

E. Awards Committee - Dick Mitchell. Last year we completed our project to recognize and thank all those individuals who have served the Vertical Section since 1972 as officers, at-large board members, committee chairs, and Nylon Highway editors. This year we wanted to recognize PMI for it's long time support for the Vertical Section. The EC approved a special award to PMI that was presented to Steve Hudson at the National Rescue Council symposium in Colorado. Needless to say, Steve was completely surprised and grateful for the recognition in front of his peers. Dick pointed out that the Awards Committee is open to nominations for future recognition.

Gary Bush took over this portion of the meeting to make a presentation for the EC. Many people volunteer to further the goals of the NSS, the Vertical Section, and caving in general. It is the purpose of these awards to recognize these people for their long time contributions. The EC voted to award a lifetime achievement award (letter and plaque) to Dick Mitchell for his leadership and contributions to caving including his development of the user-friendly Mitchell Climbing System which is used by many people today. Much tears and applause followed the presentation. Note: Dick was unaware this award was coming since the votes on this subject were done without his knowledge by the rest of the EC.

F. Bylaws Committee - Bill Boehle and Terry Mitchell. Bill Boehle reported that he and Terry have been working on both a Constitution change and a related Bylaws change concerning the addition of a Vice Chairman position to the EC and the process of selection the Nylon Highway editor. If the Chairman should be unavailable for any reason, it would be difficult for the EC to conduct business. The EC discussed this last year and the Bylaws Committee was charged to find a way to incorporate a Vice Chairman position to facilitate the conduct of business in the event any problems. After evaluating suggested options from the EC, we determined that the changes necessary were not that complicated. The proposed changes were sent out via the Section listserv and are include in today's agenda and information packet. Our solution is to amend the Constitution to authorize the EC to also elect a Vice Chairman from the existing at-large members, similar to how the Chairman is currently elected. It does not add a new EC member. Also proposed is to move the Nylon Highway Editor from an elected position to an appointed position. The reasons for this being an elected postion are no longer relevant in the age of electronic publication. A corresponding change to the Bylaws setting the duties of the Vice Chairman and other minor cleanup is also proposed for EC vote if the Constitution change is approved by the membership today. These proposed changes will be addressed under new business.

G. Web Page - Gary Bush webmaster. Gary reported that we finally incorporated a photo gallery on the website where we can display photos from past events. If anyone has photos of past meetings, contests, or other events, they should send them to Gary Bush to be included. Please identify dates, locations and people, if possible. If people would like other things on the website, send Gary an email and we will see what can be done.

Gary also asked that the EC needs to discuss and consider whether we want to continue the password access to the Nylon Highway since we have discontinued the dues requirement for Section membership. John Woods pointed out that if you Google the topics contained in a Nylon Highway article, that the search bypasses the password security that we have. Gary acknowledged that we never set up a strong security system. Ernie Coffman suggested that if we remove the password that we put some type of disclaimer on the website to protect us from people who might improperly use information they may access.

V. Old Business:

A. Following up on last years request for any information on the old Nylon Highway editor who stole funds from the Section, Bruce Smith received an email from that person with his explanation of events and containing an apology to the Vertical Section. The current status remains that his NSS life membership was revoked, but that none of our funds was recovered.

VI. New Business:

A. Proposed change to the Constitution Re: Vice Chairman position. This proposed change was discussed under the Bylaws Committee report above and previously distributed to the membership via the VS listserv and in today's meeting packet. Barry Ferguson made a motion to adopt the Constitution change proposed. Gary Bush seconded the motion. The motion PASSED.

The adopted Constitution change to paragraph IV now reads as follows:

IV. EXECUTIVE COMMITTEE

A. The Vertical Section shall be governed by an Executive Committee (EC) of nine members, composed as follows.

1. Elected members. The Secretary-Treasurer and four Committee Members At-large shall be the elected members of the EC. The section Chairman and Vice Chairman shall be elected annually by the EC from the four At-large EC members.

2. Appointed members. A Newsletter Editor, a Contest Coordinator, a Vertical Techniques Workshop Coordinator, and an Education Coordinator shall be the appointed members of the EC.

B. Elections for the Executive Committee shall be held annually by secret ballot at the Vertical Section meeting at the NSS Convention. Terms of Office for the four Members At Large shall be two years, with terms staggered by electing only two at each annual election. All other members' Terms of Office shall be one year. The Secretary-Treasurer and two of the four Committee Members At-Large shall be elected annually by the Section Membership. The Chairman and Vice Chairman shall be elected annually from the four Committee Members At-Large by the elected members of the Executive Committee. The Editor, the Contest Coordinator, the Vertical Techniques Workshop Coordinator, and the Education Coordinator shall be nominated by the new Chairman and confirmed by the elected members of the Executive Committee. In the event that an NSS Convention is not held, the elections shall be held by mail in September of that year.

C. No changes

D. No changes

B. Proposed change to the Bylaws Re: Vice Chairman position and related changes. These proposed changes were discussed under the Bylaws Committee report above and previously distributed to the membership via the VS listserv and in today's meeting packet. This is an EC vote. Bill Boehle made a motion to adopt the Bylaw changes proposed. Rory Tinston seconded the motion. The motion PASSED.

The adopted Bylaws changes to Bylaw 4) is as follows:

ADD paragraph 4) (B) (iii) to read:

(iii) VICE CHAIRMAN

- Assume the duties of the CHAIRMAN when that individual is not present or unable to perform the duties of the office.
- Ascend to the office of CHAIRMAN if that office becomes prematurely vacant.
- Assist the CHAIRMAN in conducting section business and temporarily perform additional duties as directed by the CHAIRMAN.

CHANGE paragraph 4)(B) as follows: Re-number existing sub-paragraphs 4)(B)(iii) to (viii) as 4)(B)(iv) to (ix).

CHANGE paragraph 4)(C)(iii) as follows: (iii) Order of Election: - Election of the Secretary-Treasurer will be held first. Elections for the At-Large Committee Members will then be held, with unsuccessful candidates from the first contest eligible to run.

CHANGE paragraph 4)(C)(iv) as follows: (iv) Chairman: - The Chairman shall be selected by the elected Executive Committee from the At-large Committee Members.

ADD paragraph 4)(C)(v) to read:

(v) Vice Chairman: - After selection of the Chairman, the Vice Chairman shall be selected by the elected Executive Committee from the remaining At-large Committee members.

C. Bob Thrun continues to be unhappy with the Nylon Highway as posted on the website. Gary Bush stated that the oldere PDF copies are at least as good as the original documents from which they were created (by scanning). The newer files are created directly from the original digital documents. He acknowledges that the last two years have not yet been converted to PDFs. Any comments should be sent to the editor (Tim White).

VII. Elections:

A. Secretary/Treasurer (1 year term) - Bill Boehle was nominated and reelected by acclamation.

B. At-Large Board Members (2 year term, 2 to be elected) - Dick Mitchell, Terry Mitchell, and John Woods were nominated. A ballot of the section members present was conducted. Dick Mitchell and Terry Mitchell were elected by a majority of the votes cast. [Note: Current At-Large members Miriam Cuddington and Rory Tinston have 1 year remaining in their terms.]

VIII. Adjournment - Motion to adjourn was made and carried. Time of adjournment was approximately 2:16 PM.

[Additional note: Subsequent to the Meeting, the Board Members elected Dick Mitchell as Chair and Terry Mitchell as Vice Chair. The four appointed members were re-appointed to serve for another year. They are:
* Contest Committee - Bill Cuddington
* Vertical Techniques Workshop Committee - Terry Clark (Assistant: Lynn Fielding)
* Education Committee - Bruce Smith
* Nylon Highway Editor - Tim White

Respectfully submitted,
Bill Boehle

(Rev. 0)
To be approved at 2011 Convention meeting

NSS VERTICAL SECTION

SECRETARY'S REPORT

August 2010

By Bill Boehle

Number of Members (current/just expired)	......	240
Number of Members Current as of 2010	......	232
Number of Subscribers Current as of 2010	......	12
Number of Annual Volumes Paid for 2010	......	4
Number of Complementary Subscriptions	......	3

YEARS PAID:	MEMBER	SUBSCRIBER	ANNUAL VOLUME
Comps			3
2010	7	1	4
2011	1	0	0
2012	0	0	0
2013	125	3	0
2014	99	8	0
2009 Totals:	232	12	7
Expired 2009:	8	1	
Totals:	240		

NSS VERTICAL SECTION

TREASURER'S REPORT

August 2010

By Bill Boehle

INCOME:

Nylon Highway Annual Volume Sales	.....	$0.00
2009 Convention Workshop Registrations	.....	$775.00
Symbolic Item Sales	.....	$301.00
Nylon Highway Back Issue Sales	.....	$0.00
Shipping/Postage Charges	.....	$3.50
Donations	.....	$0.00
Bank Interest (Ally) July 2009 - June 2010	.....	$213.20
TOTAL INCOME:		$1,292.70

EXPENSES:

Shipping/Postage Costs	$0.00
NSS - wesite hosting fees (2002 - 2010)	$108.00
2009 Vertical Workshop Transportation Expense Subsidy (Terry Clark)	$305.00
2009 Climbing Contest prizes	$0.00
Vertical Workshop & Rebelay Course Supplies/Expenses	$0.00
Nylon Highway Annual Volume Production & Mailing Costs	$0.00
Symbolic Items Restocking (T-shirts, Sweats, etc.)	$0.00
VS Recognition Awards Production & Shipping	$49.16
Climbing Contest Record Boards (balance)	$263.70
Printing/Photocopying - Climbing Contest	$2.00
Photocopying for 2009 NSS Convention paperwork	$22.52
Petty Cash for postage	$2.58
Training/Education Committee Printing Costs	$0.00
TOTAL EXPENSES:	$752.96

ACCOUNT BALANCES: (as of 6/30/2010)

TD Bank (NJ)	.....	$3,173.80
Ally (formerly GMAC)	.....	$9,981.56
TOTAL:		$13,155.36