Visual Tree Assessment

Visual Tree Assessment (VTA) is the process used to evaluate the condition of a tree and make a work and safety plan for climbing, pruning, and/or removal. The assessment begins as we approach the tree, looking at the base, moving up the trunk, and inspecting foliage. We can determine quite a bit through this quick overview, and the more you know about tree biology, the more revealing this overview will be. This diagram illustrates some basics for consideration.

This is not training and is no substitute for the training, knowledge, and experience needed to work safely.

Suggested Reading
- Photo Guide to Evaluating Hazard trees, ISA
- Evaluating Tree Defects, Hayes
- Manual of Wood Decays, Mattheck
- Stupsi Explains the Tree, Mattheck

Foliage Discoloration
Unseasonal discoloration may indicate dead or dying limbs.

Co-dominant Stems
Often weaker, and may have included bark or be poorly attached and prone to failure.

Utility Lines
Only certified line clearance workers should attempt tree work near utility lines. Remember Minimum Approach Distances.

Obstacles
Bird baths, outbuildings, fences, etc., may all present obstacles for tree work.

Fruiting Bodies
Fungal bodies on the trunk or roots may indicate rot beneath the surface.

Bark Condition
Stripped bark, cracks, weeping, and bulges - all may indicate maladies that have damaged the tree.

Animal Habitation
Signs of animal habitation in the tree may include scat, tracks, etc. Raccoons, birds, and insects may all be present. Animals living in the tree may be a sign of compromised structure.

Hangers
Branches hanging in the canopy may be easily dislodged.

Tools
A selection of simple tools can aid your pre-climb inspection.
- Binoculars - inspect possible tie-in points, look for hangers, hazards.
- Mallet - sound trunks for cavities.
- Trowel - excavate soil to inspect roots.
- Screwdriver - a long screwdriver (10-12") is useful for checking the extent of rot.
- Thowline - use for pull-tests.

Root & Soil Conditions
Poor rooting, elevated soil level, change in grade, weeping, lack of root crown, and girdled roots may all indicate weakness at the base of the tree.
SRS & MRS Climbing

SRS (Stationary Rope System) and MRS (Moving Rope System). What is all this? We will break it down in this feature.

Let’s start with MRS (Moving Rope System). MRS is the industry nomenclature that now replaces DdRT (Doubled Rope Technique) DdRT was often referred to as “Double Rope” which could be confusing for a beginner or someone coming from another high angle workspace, as there is only a single rope.

More accurately, this is a rope system that moves with the climber. The end of the climbing line goes through an overhead anchor and attaches to the climber. The climber attaches to the other “half” of the rope with a friction hitch/slack tending pulley or a mechanical hitch like a Zigzag. This allows the climber to work position, ascend, and descend, and the rope moves with the climber. From this we get the more accurate name “Moving Rope System” to describe this setup.

Now, let’s go over SRS (Stationary Rope System). SRS replaces the term SRT (Single Rope Technique) to avoid confusion, as both SRT and DdRT used a single rope. In SRS the climber ascends and descends on a fixed rope which does not move. This rope can be anchored at the base or isolated in the canopy. Hybrid Ropewalker systems use a device like the Hitch Hiker or Rope Wrench as a chest ascender while ascending and as a rappel device for descent, and are very popular in SRS. This is a much more energy efficient way of ascending, and opens up positioning options in the canopy.

The climbing techniques are unchanged, simply assuming new names: SRS replaces SRT and MRS replaces DdRT. Both methods have their benefits and drawbacks depending on the situation and conditions.

Understanding the proper use and limitations of each part of the climbing system is critical to the safety and efficiency of the climber. Inspect and evaluate the tree and your gear on every climb. Go “low and slow” as you learn new gear and climbing systems.

This is not training and is no substitute for the training, knowledge, and experience needed for climbers to work safely.

Moving Rope System (MRS)

MRS is a traditional method of tree climbing. A single line is used with the rope doubled back from the Tie-in Point (TIP) to the climber. The doubling of the rope gives the climber a theoretical mechanical advantage in ascent, though this is reduced by friction in practice. The climb line must move freely between the climber and the TIP to allow smooth movements of the climber.

Ascent with MRS requires moving 2' of rope for every 1' of elevation. The muscles of the upper body do most of the work. Using a foot ascender on the running end of the climb line can be a big help in saving energy on the climb.

Advantages of MRS
- One system allows ascent, descent, and work-positioning
- Theoretical mechanical advantage
- Minimal gear required
- Single load on TIP
- No anchoring leg of line below to worry about
- More familiar systems for many

Disadvantages of MRS
- TIP must be isolated
- Less efficient ascent
- Requires more upper body muscles
- Doubled line has less energy absorption than single line
- Increased friction in system as line contacts the tree

Tie-in Point (TIP)
Be very sure of your TIP!
If you can’t see it - don’t use it.
In SRS, the TIP can be called the Primary Suspension Point (PSP). Use binoculars to verify a high TIP. Your TIP must be strong enough to safely load in all the intended directions.

MRS TIP Considerations
MRS climbing requires that a TIP be isolated, since both legs of rope will be moving in the system.
Force at TIP = 1 x Climber.

Rate of Progress
In MRS systems, the climber must move 2' of rope through the system to gain 1' of elevation.
Rate of progress = 1:2

Order online: www.WesSpur.com
Stationary Rope System (SRS)
The climber moves along a stationary line. The rate of ascent and rate of travel on the rope are at a 1:1 ratio, and there is no mechanical advantage. Super-efficient ascent and work positioning is possible with Hybrid devices.

**Advantages of SRS**
- No need to isolate the TIP - only one leg must be clear to climb
- Much faster, more efficient ascent
- Legs are used more - less upper body strength used
- Basal anchor can be set up to allow lowering / rescue of climber
- No increased friction on system from line contact with tree
- Many re-directs are easily possible
- Natural redirects can be removed after climber exits tree
- Less line needed to reach the ground on a spar pole
- Traversing and using multiple TIPs are ready options

**Disadvantages of SRS**
- TIP will be double-loaded if basal anchor is used
- May require changing hardware to switch from ascent to descent
- More knowledge and gear is required
- May not be appropriate for the codes of your jurisdiction
- Less familiar system for many

**PSP Considerations**
SRS climbing requires only a single leg of rope to be clear to climb. There is no need to isolate the Primary Suspension Point (PSP).

If the line is secured below the PSP, the force on the PSP will be 2 times the weight of the climber.

\[ \text{Force at PSP} = 2 \times \text{Climber}! \]

The line can be locked off on a limb to return to a 1 x climber force.

**Rate of Progress**
In SRS systems, the climber gains 1' of elevation for every 1' travelled on the rope.

\[ \text{Rate of progress} = 1:1 \]

**Basal Anchor Lower-Off**
Basal Anchors can be used to lower the climber in emergency. You may need a line 3 times the height of the TIP to lower off a climber. The most basic method is to secure the line to the tree and lower off using trunk wraps. Lowering devices on an anchor sling at the base provide the most control, and have the advantage of easily feeding the climber additional line if needed to move around the tree. **Climber must be tied into the tree any time the climb line is not fully secured.**

It may not be possible to lower off if there is too much friction from redirects.
SRS Systems & Equipment

SRS Ascent Systems must grab the line in two places, allowing the climber to put their weight on one grab while advancing the other. This allows the climber to move upward. A rope grab can be as basic as a foot lock technique or a prusik. Most climbers prefer the ease and efficiency of mechanical ascenders.

Ascenders: These mechanical devices use a cam that allows movement along the line in one direction, but holds the line from the opposite direction. The cams must always be engaged or completely disengaged. To remove the ascender, it must be completely unloaded. Ascenders are for ascent only! They are not designed for taking a fall or for lateral loading. **All ascent systems must include a descent system!**

Hardware used must be compatible with single line descent & the line diameter.

The climber must be able to rest on the line while installing the descent device. All ascenders must be completely off the line before descending. Practice your changeover and descent methods first!

Hybrid Devices

Hybrid devices allow ascent and descent without a gear change.

The Rope Wrench, Hitch Hiker, Unicender, or Rope Runner can be used for ascent, descent, and work-positioning in SRS. These devices are the climber’s primary secure connection to the line. A tether to the hand ascender can be used to provide a backup secure line attachment for ascent. To descend or work the line, the climber puts all their weight on the device, removes the ascenders, and is ready to descend or work. See pages 82-83.

Working from SRS

Plan the transfer from the access system to the working system you will use. A long lanyard that can be used as a short climbing line can be very useful for getting off the access line and tied into the tree.

Mechanical Advantage in SRS

Mechanical advantage on single line can be gained in any hybrid system (using the Rope Wrench, Hitch Hiker, Unicender or even the RIG/I'D.).

The hand ascender is left on the line above the intended work level. Just as in the RADS system, the running end of the line is routed through a pulley on the hand ascender. A wire gate DMM Revolver is ideal for this use.

Pulling on this tail allows the climber to ascend and descend with a feel much like a standard MRS system. The tail of the climb line can be clipped into the harness to keep it within reach.

With the Rope Wrench, you will have to take it off and run the only friction hitch while in this tripled line mode. Reinstall the Rope Wrench to return to SRS mode.

With SRS, the line can be re-directed to a new position in the tree. The climber lanyards into the tree, pulls up the climbing line, and routes it through the new path. A throw weight on the end of the climb line is a big help.

If it is necessary to position the hybrid device below or on the other side of the redirect, the device can be detached from the harness and clipped into a slip knot on the climb line to keep it in place while pulling the system through the redirect and back to the climber.

**Throw Weight Assist**

Attaching a throw bag to the climb line helps to weight the line and drop it through the foot ascender. Take the bag off after climbing up a few steps to have it on hand for redirects in the tree.
Sample SRS Climbing Systems

Frog SRS System
An ascender designed to be attached to the harness is a smooth way to provide a second secure line attachment for ascent. Some type of shoulder strap is necessary to keep the device in place with the climber as they move up and the foot ascender pulls the rope down.

Ropewalker with Floating Knee Ascender
This system is a lot like the Frog SRS, with a Hybrid device acting as a chest ascender. The key difference is that the hand ascender and foot strap is replaced with a floating knee ascender.

A second, life-support connection from climber to climb line is recommended in most systems.

Texas System
The Texas System uses an upper ascender tethered to the harness and a lower ascender connected to two foot loops and also tethered to the harness. The climber “sits”, loading the upper ascender, and then stands in the foot loops and advances the upper ascender. Slower ascent than a Rope Walker style, but some find it easier to master.

Yo-Yo or RADS
RADS (Rapid Ascent and Descent System) is a hybrid system that does not share the direct climbing of the rope with other systems. The Climber’s harness is secured to the line with a handle-operated rappel device, such as the Petzl Rig or I’D. A hand ascender with a foot strap and micro pulley is attached above the rappel device. The running end of the line is routed through the pulley and back down, creating mechanical advantage.

The climber sits and raises the hand ascender as high as they can reach to ascend, then, standing in the foot strap, they pull the running end of the line to take up the slack and move the Rig or I’D up.

To descend, the climber puts their weight on the rappel device, then removes the ascender and pulley from the line, and uses the handle on the Rig or I’D to control descent.

The Yo-Yo / RADS is very secure, and easy to switch from ascent to descent, though the rate of climbing is slower.

Tending SRS Devices
When using a chest ascender or hybrid device in a frog system, you need a means of holding the device to keep it in place as the rope is pulled through the bottom of the system.

Chest Box / Harness
A chest box or harness is a simple method for tending a device. See page 76.

Lanyard Over the Shoulder
A quick way to tend the device is to bring the climbing lanyard diagonally over the shoulder and attach it to the device. After ascent, the lanyard can be unclipped from the device.
Rigging Intro

Advanced equipment has made arborist rigging a much safer and easier job in many ways. The high tensile strengths of modern gear do not eliminate the need for a sound understanding of load calculations and vector analysis, nor do they lessen the value of a sound work safety plan. The size of the load, number of wraps on the lowering device, the amount of rope in the system, and many other factors can alter the simple calculation of rigging forces.

The following information is presented to offer information on a variety of rigging techniques and the gear required for each system. This is not training and is no substitute for the study, knowledge, and experience needed to rig safely.

Negative Blocking

The term “Negative blocking” was coined to describe scenarios where the load is dropped onto the block from above. This term references the line angle in relation to the load. A negative line angle indicates that the block and anchor are below the cut material, as opposed to rigging with a “high” or “positive” line angle.

Negative blocking results in much higher impact forces than rigging with a high angle advantage. The cut material has to free fall before it impacts the anchor (in this case, the block) since the anchor is below the load. Free-fall multiplies forces greatly; a 100-pound piece of wood can easily generate 1,000 lb of force after a short free-fall.

Negative blocking is unique to arboriculture. Rescue and other industrial rope professionals avoid these magnified forces; but in tree work there is often no other practical choice for rigging down a removal.

A basic negative blocking setup contains a rigging line, arborist block, loopie sling, lowering device (such as a Port-a-Wrap), and dead-eye sling. See page 113.

Advantages of Negative Blocking

- Allows placement of anchor (block) anywhere on stem
- Allows rigging of wood where no anchor above the load is available

Disadvantages of Negative Blocking

- The load must free-fall before being caught by the rigging system
- Loads in free-fall exert many times their weight in force upon the system
- High forces increase wear on equipment and may cause system/equipment failure

High Line Advantage

Mounting the rigging anchor (arborist block or pulley) above the load creates a much more beneficial rigging scenario with a “high line advantage." When the rigging anchor is above the cut material, the system can be tensioned to support the load prior to release - this can reduce peak loads and impact.

The same gear you use to rig from a negative blocking position can be used to gain high line advantage. A nearby tree may provide the opportunity to install a high anchor, eliminating the need to run a negative blocking system.

With a high anchor, satellite pulleys can be installed to lessen the load on the main block, reduce swing, and facilitate taking smaller pieces, generating lesser forces.

Advantages of Using a High Anchor

- Reduces forces on rigging system and anchors
- Positive rope angle relative to load
- Eliminates free-fall of the load
- Prolongs equipment life

Disadvantages of Using a High Anchor

- Suitable anchors may not be near removal tree
- May require climbing a 2nd tree to set anchors
- Improper force vectors can be created
Targeted Slide-lining (Speed-lining)

Attaching cut material to a Targeted Slide-Line (TSL) with a sling allows the climber to send the load over obstacles (house, fence, etc.) to a drop zone.

The high anchor of the slide-line can be in the work tree or a taller tree nearby; the lower end is anchored at the “drop zone” with a Z-rig. A groundie supports the load by tensioning the line with the Z-rig, and sags the line to place the load in the drop zone. (A Port-a-Wrap can be used to hold tension when slide-lining heavier weights.) The high anchor must be able to withstand the weight of the load, the forces created by tensioning the slide-line, and the increased forces as the load reaches the center span.

Set up a drop zone where you want it, and reduce mess in the yard, put less fatigue on ground personnel, and save time hauling material to the chipper.

A TSL is often used in conjunction with a block in the positive/high or even negative position. A trolley must be used to travel on the TSL when using heavy weights and incorporating a load/haulback line. A carabiner may suffice for lighter loads.

Advantages of Targeted Slide-lining
- Reduce mess and protect customer property
- Send wood directly to chipper or removal area
- Increased crew efficiency
- Avoid ground obstacles (slopes, fences, soft ground, etc)

Disadvantages of Targeted Slide-lining
- Requires more gear (Z-rig, speedline slings, haul-back)
- May have to climb a second tree to set anchors
- Improper setup can result in very high anchor forces

Vertical Slide-lining

Vertical slide-lining has the advantage of greatly reducing the amount of force exerted on the stem vs. negative blocking. The cut blocks are guided to the base of the tree on a slide-line anchored just below the cut at the top of the stem and again at the base, which can be tensioned with a 3-to-1 (Z-rig) in the same fashion as a targeted slide-line. The blocks ‘slide’ down the line attached to a sling. Longer slings are used to ensure that the cut material does not vector the vertical line outward and exert sideways force on the stem. This technique works well on marginal trees which may not stand up to the forces of negative blocking, and trees on banks, slopes, or other locations where the material could end up in unfavorable positions if unguided.

Advantages of Vertical Slide-lining
- Loads are restrained from leaving the drop zone
- Forces on the stem are reduced vs. negative blocking

Disadvantages of Vertical Slide-lining
- Loads impact area at base of tree at free-fall forces
Gear Inspection Checklist

This is a sample of typical inspection tasks for common tree climbing and rigging gear. Refer to manufacturer instructions and guidelines for more detailed information.

Ropes & Cords

Daily
- Inspect for consecutive cut strands
- Inspect for abrasion on sheath
- Inspect for flat spots, lumps, and irregularly stiff spots
- Inspect for discoloration and glazing
- Examine hitch cords for burned or glazed fibers
- Inspect splices for excessive glazing in the eye
- Ensure lock stitching at eyes is intact

Monthly
- Wash your lines to keep them free of pitch and dirt
- Let lines air dry before storage

Hardware (Carabiners, pulleys, etc)

Daily
- Ensure gate closes and locks smoothly
- Inspect load points for material loss
- Inspect body for deformation
- Inspect body for cracks, burrs, or nicks
- Check for corrosion

Monthly
- Clean using warm soapy water
- Lubricate with a silicone-based lubricant or 3-in-1 oil

Descent Devices

- Inspect anodizing for excessive wear
- Check that wear into the bar bar stock is not excessive

Auto Braking Descent Devices

Daily
- Ensure the brake and return to rappel function is working smoothly

Monthly
- Clean using warm soapy water
- Lubricate with a silicone-based lubricant

Pulleys/Blocks

- Inspect body and attachment points for deformity
- Inspect axle for excessive play
- Inspect pulley cheeks for excessive wear
- Look for rough or uneven movement of the sheave

Harnesses

Daily
- Inspect rope bridges as you would rope or cord
- Inspect stitching on bridge if applicable
- Inspect structural stitching (this is usually a different color)
- Inspect webbing bridges for cuts, abrasions, or damaged stitching
- Inspect attached gear (swivel, paw, etc.)
- Inspect harness body for damage (cuts, abrasion, etc.)

Monthly
- Inspect terminal connection points
- Inspect hard connections like hip Ds for corrosion or deformation
- Inspect webbing wear at crossover points
- Inspect all webbing for cuts or fraying
- Inspect structural stitching (this is usually a different color)
- Check that buckles & hardware function
- Inspect replaceable bridges & replace if needed
- Check for stains / disoloration that may indicate exposure to caustic substances
- Inspect gear loops and other non-terminal connection points

Helmets

Daily
- Inspect shell for cracks or chips
- Inspect shell for discoloration or pitting
- Ensure foam liner (if applicable) is intact
- Inspect suspension for glazing, cuts/fraying, or damaged stitching
- Ensure adjustment functions correctly

Monthly
- Check date of manufacture and retire if necessary
- Clean inside of helmet, washing removable padding

Other PPE inspection

Refer to manufacturer instructions

Spurs

Daily
- Check climber body for cracks or signs of oxidation
- Make sure gaffs are sharpened correctly (See manufacturer instructions supplied with climbers)
- Ensure gaff screws are tightened securely
- Check all straps for damage, rot, or excessive wear
- Remove climber pads and check that the screws that hold the spur sleeve are tightened securely