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## Tree Climbing: Crown Thinning and Topping

Crown thinning and topping are effective procedures for preventing blowdown in retention areas (e.g., riparian areas, wildlife tree patches, leavestrips along roads) by reducing the wind sail capacity of the crown. However, there are special hazards associated with this relatively new practice in the forest industry.

### General Procedures

- Climbing must be done safely, and not governed by production quotas.
- Climbers must be properly trained and experienced in recognized safe climbing, crown thinning and topping techniques.
- Climbers must be properly trained and experienced in the use of climbing equipment, ropes, cables, rigging and tree service tools.
- Climbers must use certified and approved climbing equipment.
- Climbers must routinely inspect climbing equipment for wear and fatigue, and must replace suspect gear immediately.

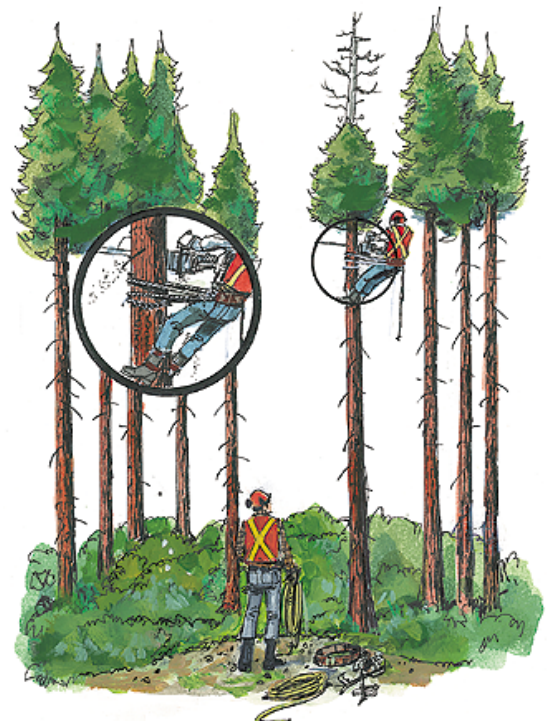
### Pre-Climbing

- Climbers must ensure that site-specific emergency procedures and equipment for tree top rescue are in place before climbing.
- Climbers must ensure that there is a support person on the ground, capable of climbing up and performing an emergency rescue.
- Climbers must ensure there is a spare set of climbing equipment on site.

### Climbing

- Climbers must not climb a tree until they have made a full assessment of the safety of the tree, using the procedure outlined in the wildlife/danger tree assessor's course. Climb only class 1 and 2 trees, or class 3 trees that have been bored and assessed as safe for climbing.

*Tree climbers must always have another qualified climber capable of rescue immediately available on site.*



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- Climbers must pay particular attention to:
    - ~ the size of the tree
    - ~ the tightness and thickness of the bark
    - ~ root damage and rot
    - ~ widowmakers
    - ~ hazardous lean
    - ~ pocket rot, cat faces, fungal fruiting bodies.
  - Climbers must not climb:
    - ~ in strong winds (the actual safe wind speed will depend on site-specific conditions)
    - ~ in fog (tree tops must be visible)
    - ~ where there is a snow hazard
    - ~ where there is a frozen wood hazard
    - ~ during, near or immediately after an electrical storm
    - ~ in areas made hazardous by adjacent danger/standing dead trees.
  - Climbers should use a rappel line for safety and to reduce fatigue.
  - Climbers must assess the stem for soundness on the way up.
  - Climbers must use a second safety/flip line to climb past limbs.
  - Free climbing is not permitted.

## **Topping**

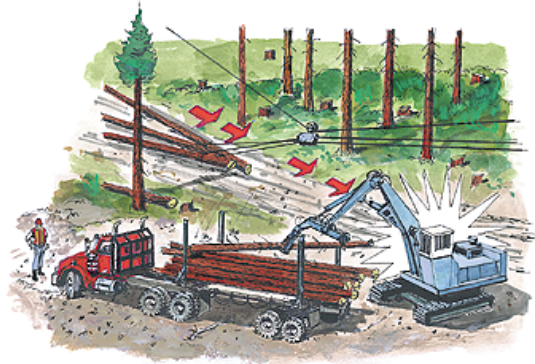
- Climbers must not top a tree with an unsound stem.
- Climbers should hook and safely tie a chain around the circumference of the tree, immediately below the topping cut, if they feel the tree bole could split downward during the topping process.
- In topping trees, climbers must:
  - ~ use proper cutting sequence to ensure the tops fall clear
  - ~ use proper safety equipment
  - ~ carry a wedge and small axe for wedging the top in the desired direction
  - ~ ensure the ground spotter is in the clear
  - ~ ensure that falling tops do not get hung up in adjacent trees.
- When topping leaning trees around creeks, climbers may require a rope tied to the top to pull it in the desired direction, away from the creek. Tops with a slight lean may be wedged in the desired direction.

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## Safety Check List for Cable-logging Methods

### Landings

- The logging supervisor must ensure that:
  - ~ the landing area is large enough to safely accommodate all landing activities
  - ~ all guyline clearances are felled and stumps, engineered rock bolts, etc. are used to anchor guylines
  - ~ the loader and trucks are not in lead with incoming turns or subject to hazards of runaway logs, loose rock, rolling root wads or broken yarding lines
  - ~ any trees that could interfere with rig-up, the movement of lines and equipment, or otherwise be pushed or pulled into work areas, be removed
  - ~ landings are stable and relatively flat
  - ~ cutbanks are stable
  - ~ log piles are stable.



*Loaders should not work in lead of incoming turns.*

### Yarding Corridors

- The logging supervisor must ensure that:
  - ~ rub trees are well-rooted and windfirm; consider topping if necessary to improve stability
  - ~ deflection is adequate to avoid up-ending logs
  - ~ the hazard of runaway logs, chunks, rocks and stumps is controlled
  - ~ rigging workers are not exposed to potential runaways.
- Corridors should be reflagged at roadside after felling is complete.

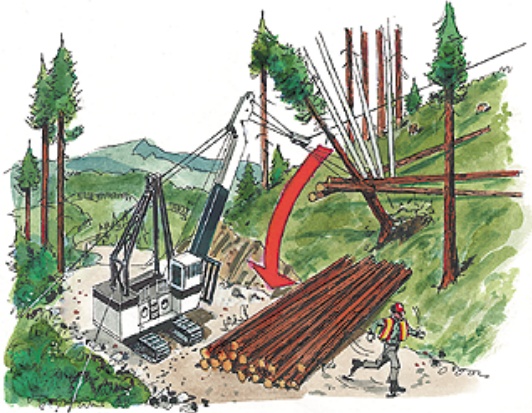
### Rigging

- The logging supervisor must ensure that:
  - ~ rigging lines through standing timber run free and clear
  - ~ the skyline does not strike trees in the residual stand
  - ~ the skyline is never overloaded
  - ~ backspars and intermediate spars are properly rigged
  - ~ backspars are properly topped by qualified climbers
  - ~ fibre or cable slings and all other rigging gear are regularly inspected
  - ~ all hazards must be identified and removed, or appropriate no-work zones established.
- The logging supervisor should ensure the use of skyline jacks with sheaves of material softer than the skyline.

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## Yarding

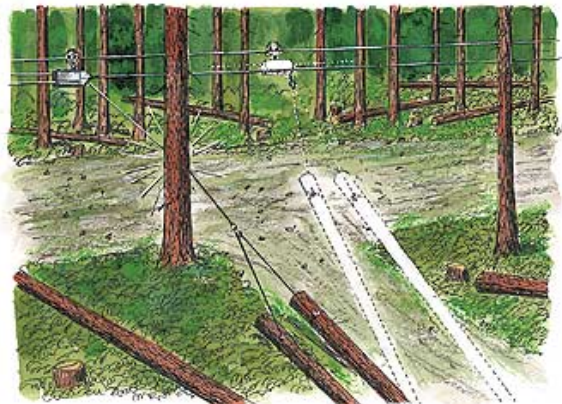
- The logging supervisor must ensure that:
  - ~ neither logs nor lines get hung up in standing timber
  - ~ loading and yarding crews do not create hazards for each other, especially when the rigging crew is in or near the landing
  - ~ trees or saplings will not be pulled over or pushed into the landing.



*Remove any trees that may be pulled into the landing by the turn.*

- The yarding crew must:
  - ~ not work below unstable slopes or any areas with the potential for runaway logs, root wads, boulders or dislodged snags/danger trees
  - ~ not work in the bight of moving lines or of trees that could be pulled over
  - ~ ensure logs are in a stable position before setting chokers
  - ~ stay well clear of any rigged spar trees under load/tension
  - ~ avoid rubbing leave-trees by machinery or cables
  - ~ monitor overhead hazards and trees made unstable by logging activities or wind events
  - ~ immediately remove any rub trees that become unstable as a result of yarding
  - ~ know and observe the wind speed and rainfall-based shutdown criteria.

*Position carriage to minimize line contact with rub trees.*



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## Safe Location

Workers must always locate a “safe location” and position themselves “in the clear.”

- In order to be in the clear before moving the turn:
  - ~ workers must be positioned behind and preferably above the turn so that they are beyond the arc of any log that might swing or up-end, and enough to the side to be well beyond any possible movement of the lines, grapples, carriage or rigging
  - ~ if a safe location is not available behind the turn, workers may go to the side of the turn provided they are a distance at least twice the length of the longest choked or grappled log. Swinging logs may strike something, break and shower workers with debris, or may fly through the air for a distance limited only by the length of the choker and the rigging. Break the turn out slowly and “go ahead” slowly until the logs are in lead with the skyline.
- Workers must be facing the turn prior to a “go ahead” signal.
- On steep ground, various activities of yarding, landing and loading can dislodge logs and other material that can run away or roll downhill, possibly endangering workers. The work area must be evaluated to determine if the potential for this hazard exists. If the hazard exists, the setting must be logged in a manner that will ensure that workers are not positioned in the potential path of these rolling and runaway hazards. It is not acceptable to rely on constant vigilance and fast reaction time to outmanoeuvre the moving material, or to cower behind a tree or stump in the hope of avoiding injury.



*Workers must stay in safe locations to avoid overhead hazards and swinging of the log turn. These workers are not in the clear.*

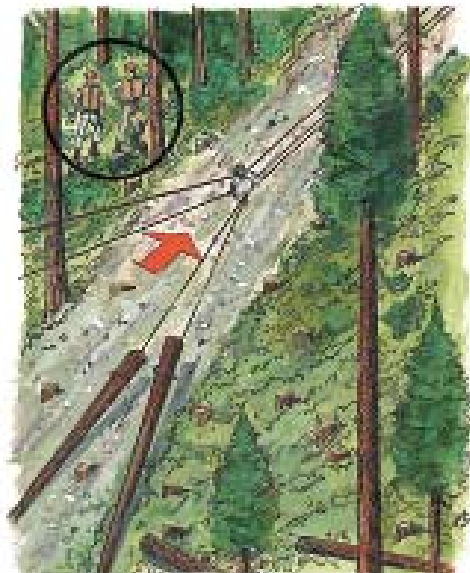
- When uphill yarding in steep runaway-prone areas:
  - ~ yarding roads should be laid out sufficiently biased or cross-slope such that when the crew clears the turn (preferably behind and above) and signals “go ahead,” any dislodged material will move away from the crew
  - ~ the area must be logged such that each yarding road is progressively lower than the previous road and the crew clears upslope, into the previously logged-off area, thus above the turn and not below any felled timber that could roll if disturbed
  - ~ attempting to progress uphill with successive yarding roads is not permitted because when the crew clears to a safe position above the turn, that position will be amongst felled timber, where they are exposed to an unacceptable risk of moving or rolling logs.

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- Straight uphill yarding, in steep, runaway-prone ground is extremely hazardous and is only permitted when no other possible rig-up is available, and then only when the following procedure is followed:

1. Workers clear the turn and any potential runaway areas *before* signalling to “go ahead.”
2. Yarding and loading activity is then permitted while the turn is in motion and being landed and while the rigging is skinned back out.
3. Workers *stay in this safe position* until the rigging is “spotted.”
4. After the stop whistle is blown and workers are walking into, setting and clearing the turn, *all landing activity that has even the remotest possibility of dislodging material or logs is prohibited.*
5. Workers clear to a safe area as in (1), signal to “go ahead,” and the cycle of yarding and landing activity starts again.
6. If the landing crew cannot keep up, the rigging can be “hung up” on the landing until they catch up.

This procedure will ensure that chunks or logs are not dislodged to slide downhill onto the crew while chokers are being set. Workers must also follow this procedure when working close to the landing, without sufficient distance from landing and loading activities, to the advantage of the cross-slope.

- Uphill yarding must only be considered temporary and not used as a general practice because:
  - ~ the rigging crew usually has to walk an excessive distance to a safe position, and fatigue and production pressures will surely cause risk-taking
  - ~ workers will still be exposed if there is any mistake, breakdown in process or “naturally occurring” or delayed runaways while the crew is entering, setting or leaving the turn.
- When the rigging is coming back, the rigging crew must be:
  - ~ at least 1.5 choker-lengths away from the rigging
  - ~ alert for and clear of any material that could be caught up by and carried back by the rigging, carriage or chokers.
- If a dropline system is used, the dropline must not be lowered while the carriage is returning because the dropline or rigging can hang up and swing to reach workers.
- When choosing a safe location, workers must allow for the swing and cast capability.



*Uphill yarding on steep slopes with workers in safe position.*

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## Safety Check List for Helicopter-logging Methods

### Project Management

- The logging supervisor should ensure that:
  - ~ flight paths during logging will not affect travelled roads; active roads may be closed off, either with flagmen or gates
  - ~ radio frequencies between air and ground crews are coordinated
  - ~ workers hold daily meetings prior to starting the shift to discuss safe operation for the day
  - ~ locations of workers are regularly communicated to the first-aid attendant and the pilot of the support aircraft
  - ~ all workers receive proper job safety training
  - ~ all work activities adhere to recommendations in the WCB handbook *Helicopter Operations in the Forest Industry*
  - ~ all trees within reach of the work area are assessed for hazard as per the procedures described earlier in Section One , under *Inspection of Remaining Stand*.
- The heli-logging company is responsible for ensuring that all safety requirements of heli-logging are met and that the workers will not be exposed to any undue risk.
- All project personnel should be provided with a map which shows log landings, sorting and loading areas, choker and support helicopter landings, refuelling locations, emergency evacuation landing, etc.

### Layout

Helicopter logging is most suited for group retention cutting patterns (e.g., corridors and patch cuts) where the work area is free of standing trees and workers “in-the-open” are least exposed to dangers associated with rotor wash.

Although dispersed retention cutting patterns are possible (e.g., the uniform distribution of leave-trees across the cutblock) they greatly increase the size of the work area, complicate the rigorous hazard assessment procedure that must be applied in standing timber and increase worker exposure to the overhead hazards of rotor wash.

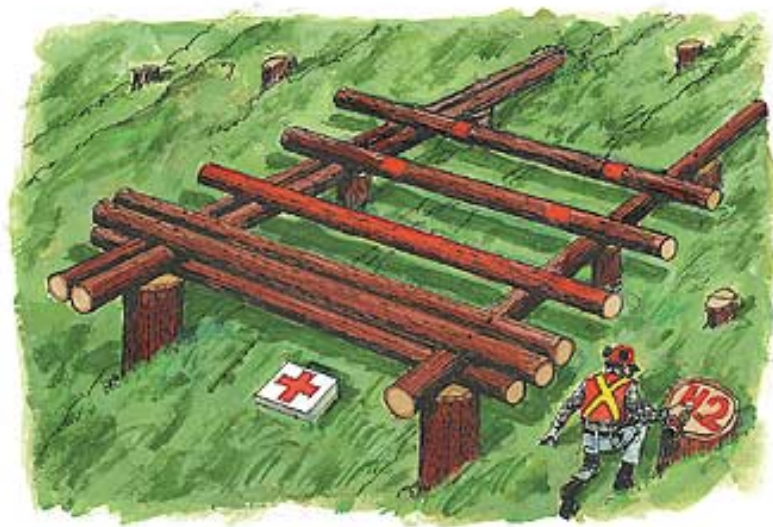
### Drop Zones

- The logging supervisor should ensure that:
  - ~ flight paths into/from the drop zones are clear of crews and support aircraft
  - ~ all perimeter trees which could be blown or knocked over onto the landing area are felled before activities start
  - ~ boom boats are out of the way when water drops are being used
  - ~ landings are large enough to accommodate all planned work activities
  - ~ “head” chasers are designated to supervise landing activities.

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## Helipads

- The logging supervisor will ensure that:
  - ~ helipads are properly designed and constructed for the intended machine
  - ~ helipads are located within 20 minutes walking distance of work areas
  - ~ saplings, trees and debris are moved two helicopter lengths (from outer edge of main rotor to outer edge of tail rotor) from the helipad
  - ~ helipads are numbered and marked, and their locations clearly marked on logging maps
  - ~ the date of construction and materials used in helipads is recorded and noted on the map
  - ~ an emergency shelter and supplies are kept on sites where there is poor access and for evacuation purposes
  - ~ a work shutdown policy for fog, wind, rain and mechanical problems is established and followed
  - ~ helipads are regularly inspected by a qualified or experienced person during heli-logging operations
  - ~ damaged or hazardous pads are repaired or dismantled promptly.



*Clearly identify usable helipads.*



## Felling and Bucking

- When felling, fallers will:
  - ~ leave marked retention trees only if normal safe work procedures will not be compromised
  - ~ fell small trees on rock bluffs which could otherwise be blown down onto workers.
- When bucking, fallers will:
  - ~ buck or split logs to safe lifting weight for the size of helicopter
  - ~ ensure that all cuts are complete or, if unsafe to complete buck, clearly mark and notify supervisor
  - ~ not chase runaway trees in steep ground
  - ~ not buck below felled or bucked timber if deemed unstable (buck later and reposition if necessary).
- Excessively steep ground where logs cannot be held for safe bucking should be excluded from the cutblock.



*This leave-tree should have been substituted with another tree by the faller to avoid creating dangerous conditions for the rigging crew. Remove such trees before flying the wood or tag a safe distance away.*

## Turn Procedures

- The hooktender/pilot will select a turn that:
  - ~ is free of overhead hazards
  - ~ does not brush leave-trees.
- The hooktender will ensure that choker sizes are appropriate for the logs being harvested and that chokers are in good condition.
- The hooktender will ensure that workers remain in the clear until the turn is gone, dislodged material has stopped moving, and there is no hazard from a broken choker or hung-up log.
  - ~ “In the clear” is:
    - preferably upslope and 90° away from the flight path
    - out of the bight area of the logs, long line and aircraft position
    - at least one log length away from closest hooked log end
    - not below any loose material
    - away from trees and saplings damaged or leaning due to logging activity
    - outside the no-work zone of any wildlife/danger tree, wildlife tree patch or riparian management areas.
- Pilots and hooktenders must not operate beneath rock bluffs with loose debris and/or small trees which may be blown down onto workers.



*Ensure a clear flight path is available.*

## Landings

- The logging supervisor will ensure that:
  - ~ choker retrieval, log decking and loading activities are coordinated
  - ~ the loader is positioned in such a way that it is not in the lead with incoming logs or aircraft
  - ~ all trees that could be struck and knocked into the landing are removed
  - ~ a “head” chaser is designated to supervise landing activities.



*Keep the flight path clear of crews, support aircraft and boom boats.*

## Rotor Wash

Helicopter logging in partial cuttings can be extremely hazardous, mainly due to the effects of rotor wash. The wind velocity associated with helicopter rotor wash may blow trees down, dislodge hazards in trees, or fling debris around, making rotor wash very dangerous to workers. Therefore, safety procedures for helicopter logging operations must be more rigorous than those employed for other logging methods.



*Minimize exposure to the hazards of rotor wash.*

- The logging supervisor must ensure that all standing dead trees that can reach or endanger fallers/logging crews are removed, regardless of lean, because rotor wash can:
  - ~ cause trees to fall against their lean
  - ~ dislodge bark and limbs
  - ~ cause trees that are blown over or damaged along the upper boundaries of a steep setting to slide or roll downhill.

Rotor wash can also:

- ~ blow the tops off trees, particularly in hemlock/balsam stands
- ~ dislodge school marms and suckers
- ~ cause loose chunks and tops from the felling phase to be blown downhill
- ~ blow over trees and saplings
- ~ blow small trees off rock bluffs.

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## Hazard Assessment

Supervisors will ensure that:

- all designated leave-trees within the operational area have been assessed for stability and overhead hazard prior to felling, and that all danger trees are removed;
- a competent individual inspects all areas to ensure that all hazards (e.g., danger trees; damaged, hung-up or brushed trees damaged during felling; widowmakers; loose bark; small trees on bluffs) are identified and removed before logging;
- a safety inspection flight is performed before logging to confirm the removal of any hazards created during felling;
- the work area is thoroughly inspected for windthrow hazards after significant storm events, especially after weekend storms.

Refer to procedures outlined earlier, in Section One under *Inspection of Remaining Stand*.



*Always perform a safety inspection flight prior to logging  
to ensure all hazards are removed.*



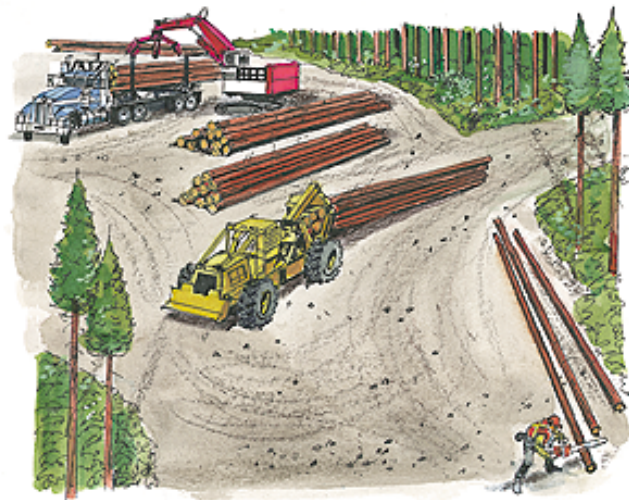
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## Safety Check List for Ground-based Logging Methods

### Landings

- Workers must not work in the immediate loading area and must obtain the attention and “come ahead” approval of the loader operator before entering the loading area and/or passing by the truck or loader.
- Logging supervisors will ensure that landings are large enough:
  - ~ for specific equipment combinations and harvest methods
  - ~ to allow for safe log processing if whole-tree harvesting is to be employed.
- If a landing is small, logging supervisors should consider:
  - ~ sorting elsewhere (possibly the mill yard)
  - ~ limiting the number of skidders
  - ~ using line or hydraulic loaders, since they need less space and allow for roadside loading
  - ~ bucking and limbing or processing in the bush, to ensure that slash and logging debris will not clutter the landing.
- Logging supervisors should:
  - ~ check the stability of log decks, particularly short wood decks
  - ~ schedule trucks carefully to minimize the need for large deck size and to keep decks at a safe height.

*Any tree that will interfere with safe landing activity must be removed.*



*A well-organized landing of sufficient size is essential to safe operations.*