



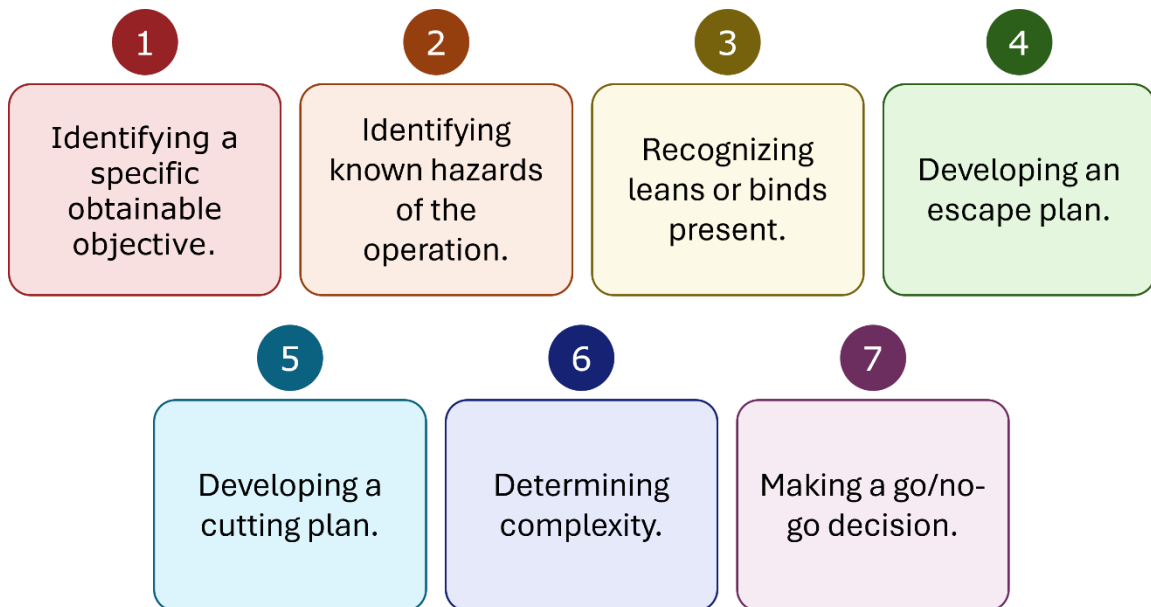
Intermediate Felling Operations and Tree Analysis Job Aid

This job aid is designed to serve as a field reference for critical information necessary to ensure safe chainsaw operations occur on the fireline.

Outside-In, Top-Down Approach	1
Steps in a Procedural Sizeup.....	1
Complexity Assessment Tool	2
Tree Anatomy, Species Considerations, and Defects Contributing to Failure	3
Tree Anatomy.....	3
Species Considerations	3
Assessing Decay Checklist	4
Determining Rind Thickness	4
Compounding Tree Defects	5
Determining Lean	6
Types of Leans	6
Determining Calculated Lean	7
Special Techniques	8
Quarter Cut.....	8
Boring Backcut	8
Creating Your Wedging Plan Using Segments	9
Segments Illustrated.....	9
Overcoming Lean with Wedges Checklist.....	10
Useful Resource Links	10

Outside-In, Top-Down Approach

The goal is to observe the big picture first, starting with a wide-angle lens and then moving in, narrowing your focus to the point where you will make the cuts.



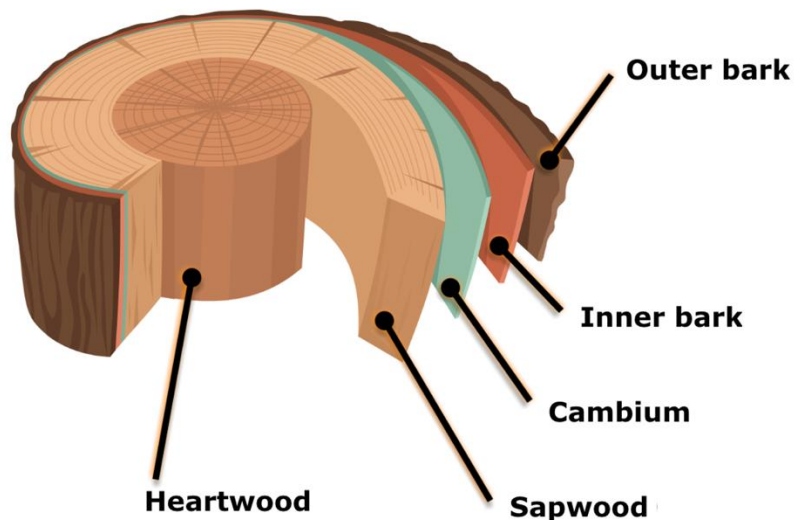
Complexity Assessment Tool

Factor	Low Complexity	Moderate Complexity	High Complexity
Objective	<ul style="list-style-type: none"> Multiple options available to safely fell tree <input type="checkbox"/>	<ul style="list-style-type: none"> Limited options available to safely fell tree <input type="checkbox"/>	<ul style="list-style-type: none"> Single option available to safely fell tree <input type="checkbox"/>
Hazards	<ul style="list-style-type: none"> Minimal hazards are present that will impact cutting operation <input type="checkbox"/>	<ul style="list-style-type: none"> Hazards are present but can be easily identified and understood <input type="checkbox"/>	<ul style="list-style-type: none"> Hazards are present but may be mitigated by altering cut plan and technique <input type="checkbox"/>
Leans and Binds	<ul style="list-style-type: none"> < 3 ft of side/head lean No back lean with intended lay Known low release of energy No wedging/sequence of cuts <input type="checkbox"/>	<ul style="list-style-type: none"> 3-5 ft of side/head lean 1" of lift to overcome back lean May require wedging <input type="checkbox"/>	<ul style="list-style-type: none"> > 5 ft. side/head lean 1"-2" of lift to overcome back lean High release of energy expected <input type="checkbox"/>
Escape Plan	<ul style="list-style-type: none"> Escape path is clear Multiple escape paths – easily accessible <input type="checkbox"/>	<ul style="list-style-type: none"> Access to escape could be limited (only one path available) <input type="checkbox"/>	<ul style="list-style-type: none"> Access of escape path(s) could be difficult and/or in steep terrain <input type="checkbox"/>
Cutting Plan	<ul style="list-style-type: none"> Single cut undercut Green or sound hinge Cuts can be made from one side of tree – escape to same side <input type="checkbox"/>	<ul style="list-style-type: none"> Compromised fiber Double cut undercut/backcut Requires moving from side to side of tree <input type="checkbox"/>	<ul style="list-style-type: none"> Requires more than double cut Terrain makes plan difficult Involves elaborate sequence, wedging, compromised fiber <input type="checkbox"/>
	Low Complexity	Moderate Complexity	High Complexity
Overall Assessment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remember: You can always refuse an assignment if the level of complexity is beyond what you feel you can safely handle in this moment. Don't forget to carefully consider your human factors!

Tree Anatomy, Species Considerations, and Defects Contributing to Failure

Tree Anatomy



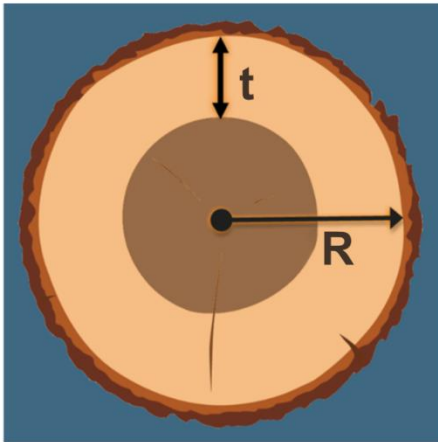
Species Considerations

Species Groups Cheat Sheet			
Hardwoods	General Considerations	Determining lean/weight distribution can be challenging with complex crown characteristics. Dense fiber is more prone to splitting and barber chairing.	
	Fast-Growing, Short-Lived	Poplars (Cottonwood, Aspen), Alder, Birch	Decay in branches/branch failures Fast-growing, heavy head lean – affects tension/compression More decay prone
	Long-Lived, Strong Fiber	Oaks, Maples, Ash	Heart rot can be extensive in older trees
Conifers	General Considerations	Mature stands often have trees that have grown closely together with tight canopies and interlocked branches that can present issues during felling and make observing overhead hazards difficult.	
	Resinous	Pine, Spruce, Douglas Fir	Long-lived, decay resistant, larger, can remain standing for decades as snags Decay doesn't generally develop until much older (150+ years)
	Non-Resinous	True Firs, Hemlocks	Short-lived, decay prone
	Decay Resistant	Cedars, Redwoods, Cypress	Decay resistant, very soft, when decay present often substantial, spiked top cedars – little decay in tops Long fibers prone to barber chairing or twisting fibers In large cedar often complexity with flared butt

Assessing Decay Checklist

- Look for external signs of decay (dead trees, dead limbs, insect or wood borer damage, conks, mushrooms)
- Sound tree to locate potential rot (soft 'thud' indicates presence of rot)
- Bore into tree to assess type and extent of rot
- Confirm sapwood and heartwood integrity (low resistance or mushy/powdery chips indicate rot)
- Determine rind thickness as part of procedural sizeup

Determining Rind Thickness



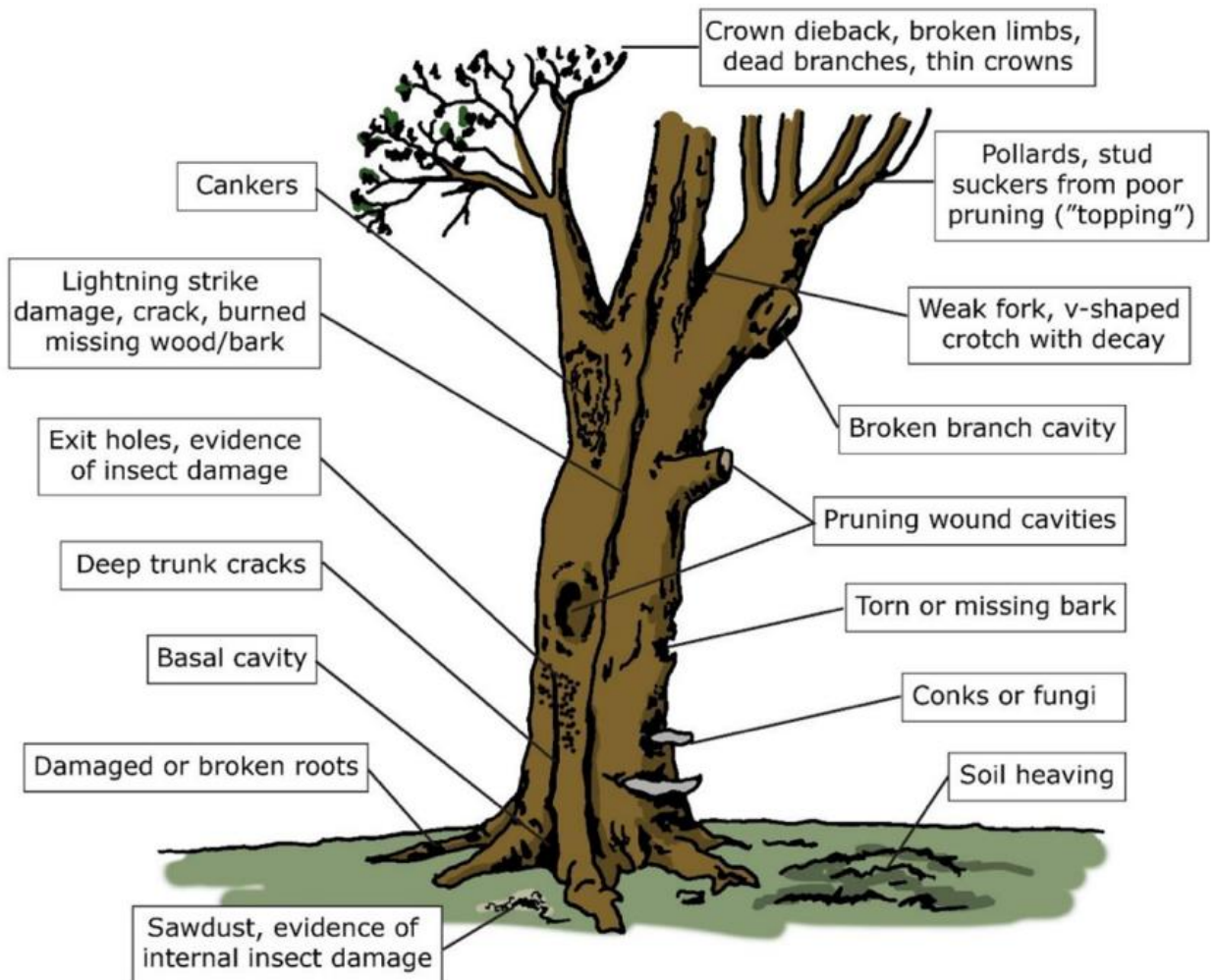
When **rind thickness (t)** is *less than* $\frac{1}{3}$ **radius (R)**, it is an indicator of increased complexity.

Watch out when $t/R < 1/3$

For example, $\frac{1}{3}$ of a 15-inch radius (**R**) is 5 inches. If (**t**) is less than 5 inches, consider an alteration to the cut plan due to the potential structural instability of the tree.

Compounding Tree Defects

Defects must be evaluated together with increased emphasis on how they interact and increase the risk of stem failure.



Determining Lean

Determine the type and amount of lean before planning cuts. Lean is influenced by limb size/location and canopy shape.

Types of Leans

Type	Description	Illustration
Natural	Direction gravity would take the tree if it fell on its own. Determined by the overall weight distribution (bole, limbs, foliage). Upper weight has greater influence.	
Calculated	Amount of lean (in feet) relative to the objective lay (intended fall direction). Includes front-to-back and side-to-side components. Used to develop cutting and wedging plan.	

Determining Calculated Lean

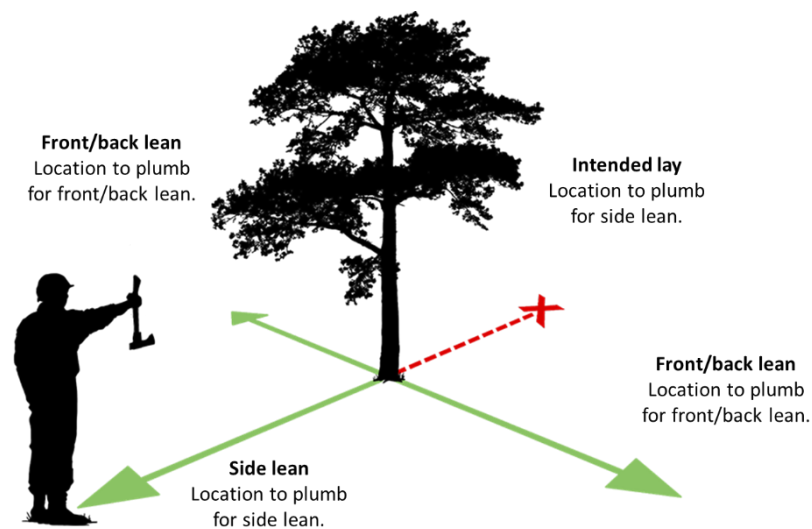
Front-to-Back Lean

- Stand perpendicular to the objective, about one tree length away.
- If the tree leans back, plan to wedge or change objective.

Side-to-Side Lean

- Stand in line with the objective (intended lay or opposite).
- “Plumb” the tree to measure offset – use straight-handled axe, plumb bob, or hands/eyes.
- The bad side is under the side lean – the tree will fall there if the hinge is fully cut.

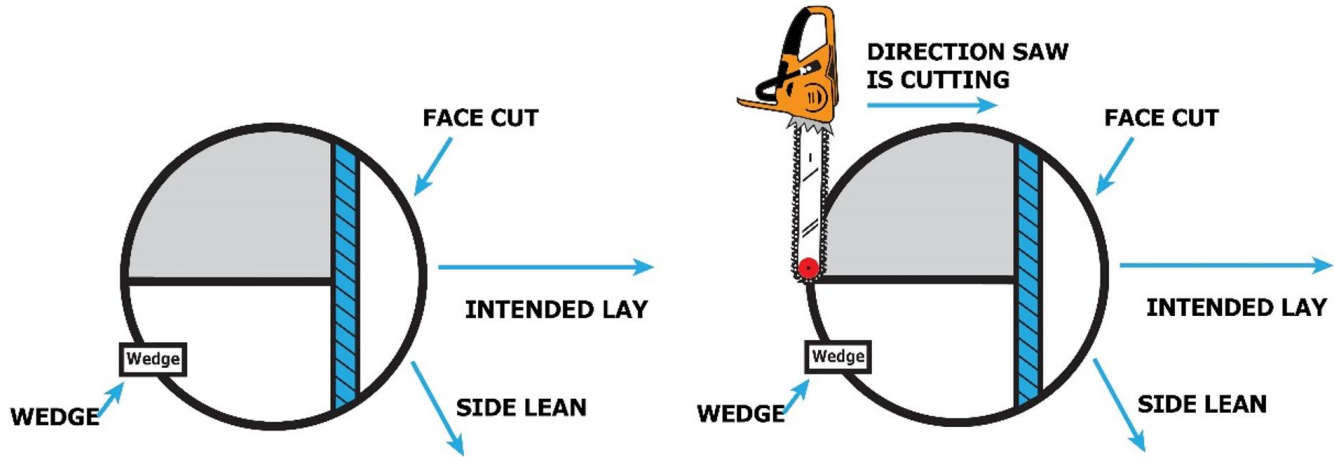
Plumbing a tree with an axe.



Special Techniques

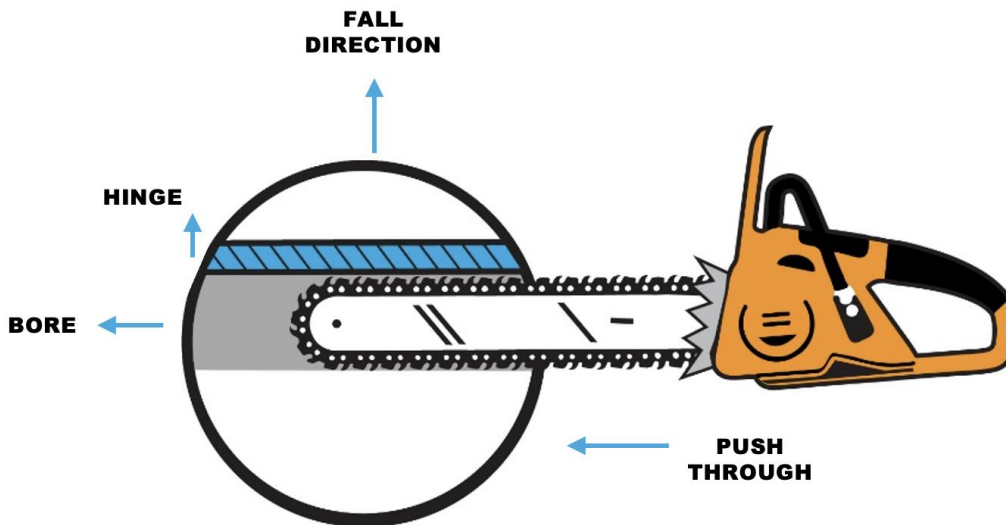
Quarter Cut

The quarter-cut technique can be used to create space for wedge placement when working with trees with side or back leans.



Boring Backcut

This allows the hinge to be set across the bole of the tree evenly before the tree begins to commit to the lay.

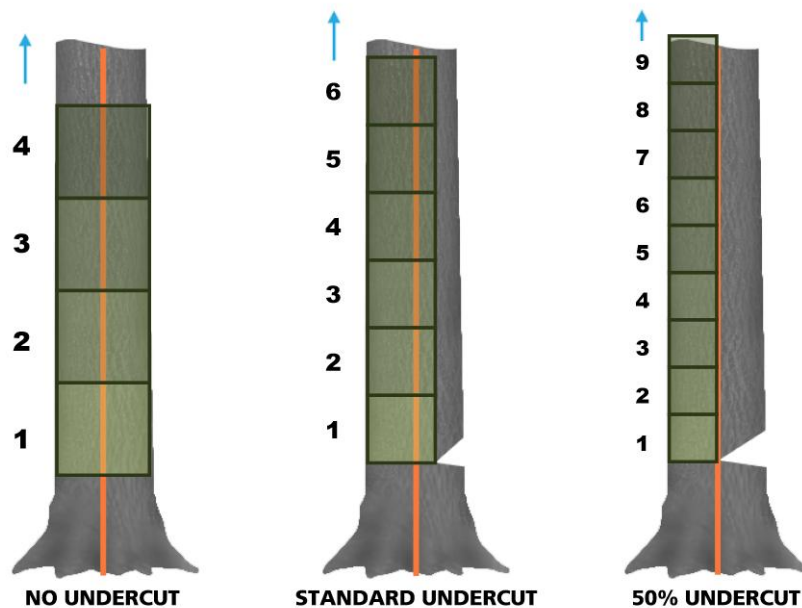


Creating Your Wedging Plan Using Segments

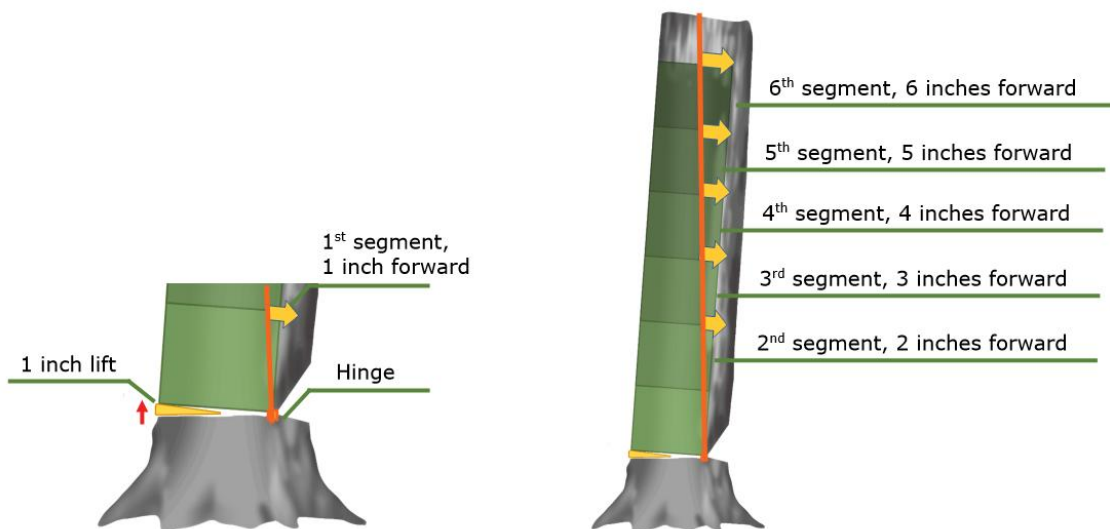
Segments Illustrated

Think of segments as square blocks, measured from the back of the tree to the front of the hinge, which are stacked on top of each other. You will need to first determine the tree's height in order to use the concept of segments.

Making an undercut removes the compressive fibers from the front of the lowest segment and increases the number of segments throughout the entire tree height.



When you drive a wedge under the bottom corner of the lowest block (or segment), as shown in the image below on the left, the segment lifts, and the opposite corner of the first segment moves forward an equal distance. The more segments in a tree, the more movement you can achieve at the top of the tree.



Overcoming Lean with Wedges Checklist

- Quantify lean(s)
- Determine tree height
- Determine segment block height (diameter minus depth of undercut)
- Determine number of segments (tree height/block height)
- Calculate amount of lean you can overcome with wedges (number of segments x height of wedges)
- Is this enough to overcome the lean and safely meet my objective?

Useful Resource Links

- [NWCG Standards for Wildland Fire Chainsaw Operations, PMS 212](#)
- [NWCG FAL2 Homepage](#)
- [NWCG YouTube Channel](#)
 - [How to Properly Refuse Risk](#)
 - [Working With Heavy Equipment](#)
 - [Emergency Medical Care Guidelines](#)
 - [Chainsaw Operational Complexity and Tree Size-up – When Complexity Changes](#)
 - [Assessing the Fire Environment to Anticipate Fire Behavior](#)
 - [Felling Hazard Trees: Communication, Decision Making & Responsibilities](#)
 - [The Risk Management Process: A Universal Tool](#)
 - [WFSTAR: Beyond Your Limits](#)
 - [WFSTAR: Situation Awareness](#)
 - [WFSTAR: Chainsaws and Human Factors](#)