This harvest plan should be used by the contractor when developing a tree felling plan. This felling plan should include the identification of areas of wind-throw or steep terrain and other issues that should be communicated to their crew before the harvest starts.

1.2 HAZARD MANAGEMENT

The principal has an obligation to do more than just provide information on the hazards. The ACoP states that the principal and the contractor (or employer) shall jointly determine measures to manage the hazards.

1.3 HEALTH AND SAFETY SYSTEM

Before any work begins, the principal is required to verify that the contractor (or employer) has a documented health and safety system in place. When a WorkSafe New Zealand inspector visits, they will want to see evidence of that system, and will look for the following things:

> the tree faller holds the appropriate unit standard and has been deemed competent using a robust process;
> where the faller does not hold that unit standard, that they are working towards achieving it and, in the interim, have been deemed competent to do the work or are under close supervision;
> there is a system to audit competence on a regular basis, especially for high risk work like felling wind-throw;
> there is a designated, competent observer for complex felling situations;
> there is a documented process to deal with a hung-up tree;
> there is a documented process to deal with tree driving;
BEST PRACTICE GUIDELINES // SAFE MANUAL TREE FELLING

> there is a process to deal with an unsuccessful tree drive, including stopping the work until an observer is available;
> there is a documented process to stop tree felling due to high winds or other extremes of weather; and
> there is a documented process to establish the two tree length zone and communicate the boundaries of the zone to all affected parties.

These processes can be customised by the contractor (or employer) for their operations, and should be reflected in their training records and hazard register. The processes should be known to, understood, and followed by, the tree faller. There should also be a system to record any on-the-job deviation from the planned processes.

ACOP

Rule 2.5.1
The employer shall ensure that a competent person is in charge of each operation, who shall supervise and ensure work is supervised and performed in a safe manner.

2.1 PLANNING

The person in charge of tree felling operations controls and supervises the work to ensure that safety precautions are being observed. That person should be fully experienced in the kind of work to be undertaken.

HAZARD IDENTIFICATION

The tree fallers and the person in charge of the operation shall identify hazards specific to the site.

COMPETENCY

Tree fallers need to be deemed competent to the task following a robust assessment process, and where there is a complicating factor such as a hung-up tree, the faller should have a greater degree of experience and proven skill.

2.2 FIVE STEP TREE FELLING PLAN

Any tree faller should ensure that they follow the five step tree felling plan.

1. Site assessment
   > Assess the stand for hazards relating to the trees, terrain, other operations, and power lines.
   > Assess the strength and direction of the wind and whether it will affect safety.
2. **Individual tree assessment**
   - Look for tree defects, decay, heavy lean, or any other characteristics of the tree that may affect the felling plan.
   - Note the ground condition and soil moisture.
   - Check the surrounding trees for interlocked branches, dead tops or branches that may fall into the work area.
   - Determine if you can fell it safely and plan the felling cuts.
   - Decide on the felling direction. This will help determine which side of the tree will be the safest for the escape route.

3. **Preparation of the work area and escape route**
   - Clear vegetation and obstacles from around the base of the tree.
   - Always think about your escape route before you begin any felling cuts. Where possible, the escape route should be at a 45-degree angle opposite the felling direction (see Figure 1).
   - Be sure your escape route is clear of obstacles or hazards before beginning.

4. **Fell the tree using safe felling techniques**
   - Good felling technique is critical to safe, accurate, consistent results.
   - All trees over 200mm at the stump must be felled using a scarf and back cut.
   - The degree of forward or back lean will determine how many wedges and/or whether a pull rope will be necessary and how much power may be required to pull the tree over.

5. **Retreat and observe**
   - Remember to finish the felling cut on the safe side of the tree and use your escape route as soon as the tree begins to fall.
   - Watch for falling material and be far enough from the base of the tree to avoid a kick back, butt swing, or bounce.
   - Avoid walking directly behind the tree.

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**Figure 1 – Escape route positioning**

- Scarf
- Hingewood
- Tree
- Backcut
2.3 THE SEVEN KEY CAUSES OF HARM

The seven key causes of harm in tree felling are:

1. Faller working too close to other people or plant
2. Incorrect or poor felling technique
3. Broken limbs or top hitting the faller
4. Hung-up trees left standing, or not felled using correct methods
5. Stem movement/rebound and butt swing
6. Felling dead trees
7. Faller being struck from behind by an object or tree

These seven key causes of harm need to be addressed. A process should be put in place by the principal and the contractor (or employer) during the harvest planning stage to assess a block before the tree faller starts work. This process will assist in developing hazard management plans for more obvious hazards in the stand.

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BPEST PRACTICE GUIDELINES // SAFE MANUAL TREE FELLING

1. Faller working too close to other people or plant

<table>
<thead>
<tr>
<th>ACOP</th>
<th>Rule 11.4.3</th>
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<tbody>
<tr>
<td></td>
<td>No person shall be closer than two tree lengths to a tree being felled, unless that person is:</td>
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<tr>
<td></td>
<td>&gt; the faller</td>
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<td></td>
<td>&gt; assisting the faller</td>
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<td></td>
<td>&gt; supervising</td>
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<td>&gt; training others or being trained</td>
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<td></td>
<td>&gt; observing or auditing.</td>
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<td></td>
<td>Any person within two tree lengths of a tree being felled shall be under the direct control of the faller.</td>
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<td></td>
<td>Exception: The faller is under the direct control of a trainer.</td>
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<td></td>
<td>Rule 11.4.4</td>
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<td></td>
<td>Aside from the tree faller no person shall operate a chainsaw within two tree lengths of a tree being felled.</td>
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<td>Buddy cutting is not permitted.</td>
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</table>
2. Incorrect or poor felling technique

The danger zone in the case of incorrect or poor tree felling practice consists of a circle with the centre at the felled tree stump and the radius equal to twice the height of the felled tree.

A number of serious harms have occurred where the felling technique was clearly contrary to standard recommended practice.

Basic tree felling practice should follow the five step tree felling plan.

1. Site assessment
2. Individual tree assessment
3. Preparation of the work area and escape route
4. Fell the tree using safe felling techniques
5. Retreat and observe

At the very first step, you should consider if you can fell the tree safely. Checking for hazards like dead or broken branches, rot, branch weight, and lean, as well as the surrounding trees, can help identify that you may need assistance to fell the tree.

The tree faller should hold the appropriate unit standards for the work they are doing, and undergo refresher training and competency assessments on a regular basis. Tree fellers should know and recognise the situations in which they can be fatally injured including when that situation is developing around them.

The tree faller should be audited on a regular basis to ensure that they are safely felling in different circumstances. These audits should be done by a person who is experienced and competent in auditing felling operations.

Fallers should know and adhere to the processes that require tree felling to stop until a support person is in place.

3. Broken limbs or top hitting the faller

The danger zone in this situation is equal to the width of the crown of the tree being felled, assuming the limbs or top fall while the scarf and back cuts are being put in.

In the event that a felled tree falls into or brushes past another, the danger zone extends some distance behind the felled tree, as the top or limb could rebound backwards. Note that the recommended escape route could be in the danger zone.

Assessing a tree and its surroundings should be the first step in felling, and at this time you may be able to identify broken limbs or top. If you can’t see the top of the tree, get an observer. If you are concerned about felling the tree safely, you could consider:

> using a felling assistant/observer;
> using a machine to fell the tree; or
> driving the tree (only where necessary).

4. Hung-up trees left standing, or not felled using correct methods

<table>
<thead>
<tr>
<th>ACOP</th>
<th>Rule 11.6.1</th>
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<tr>
<td></td>
<td>A hung-up or cut-up tree shall be brought to the ground immediately or the hazard managed until such time as it can be brought to the ground. If the cut-up tree is to be brought down, refer to section 11.7: Tree driving.</td>
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</tbody>
</table>

A hung-up tree is a cut-up, wind-thrown, or pushed tree that is caught up or lodged against another tree, which prevents it from falling. (A cut-up tree is one where felling cuts have been made but the tree remains standing.) Attempting to bring down a hung-up tree is the leading cause of fatal injuries in tree felling.
5. Stem movement/rebound and butt swing

Stem movement back into the work area after felling can be caused by a number of factors. These include:

> uphill felling;
> falling into standing trees; and
> the tree striking an obstacle as it falls, e.g. a rock, another stem, other terrain features.

In the event that a felled tree falls into or brushes against another, the butt of the tree can rebound and strike the tree faller. Spurs are most likely to rebound. A tree that is felled uphill may also slide back down the hill and strike the tree faller, so it’s important to move further along your escape route. Tree-to-tree contact can also snap off branches or tops of trees, which ricochet backwards. Any of these situations may compromise the escape route. Where a hung-up tree kicks back off the stump, the danger zone extends back behind it.

Figure 3 – Danger area when felling a hung-up tree

Figure 4 – Danger zone extending back into the escape route where a felled tree hits another and causes a rebound
7. Faller being struck from behind by an object or tree

Although it is not obvious what causes it, sometimes a tree or limb can fall from a tree behind the faller and the tree they are felling.

One cause can be intertwined branches or vines connecting the crowns of two trees. Occasionally the vibration from a large tree hitting the ground is enough to fell a dead or unstable tree.

Assessing the tree you plan to fell should include assessing the surrounding trees for damage and structural weakness. Look for branches interlocking with vines or branches of other trees. Clear vegetation around the tree, and make sure the escape route is clear.

The danger zone in this hazard extends from the felled tree to the tree behind with width equal to the width of the tree behind (see Figure 4). Note that this hazard is relative to the direction of fall, a factor that emphasises the importance of directional felling techniques and proper use of scarf and back cuts.

![Diagram of felled tree and escape route]

**Figure 5** – Danger area where the felled tree pulls another with it as it falls.
2.4 TREE DRIVING

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<tr>
<th>ACOP</th>
<th>Rule 11.7.2</th>
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<td>Tree driving shall not exceed one onto two trees.</td>
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</table>

**Rule 11.7.4**

The faller shall notify the person available to them that they intend to undertake a tree drive.

> The faller shall notify the person that the drive has been completed successfully.

> If a one onto two drive is unsuccessful, felling shall cease until an observer is present to help plan management of that hazard.

The term ‘driving’ means pushing a tree over by felling another tree into it. Tree driving may be used to fell trees that are hung-up, cut-up, or broken, or those leaning against the intended direction of fall which cannot be safely felled using wedges (ACoP rule 11.7.1). Where conventional felling methods have failed, driving may be used.

A competent person should be advised when a tree drive is to be attempted, and again when it’s successfully completed. That person should ask questions about safety issues and not just acknowledge that a drive is about to take place. If the drive fails, and another driving tree is needed, get an observer to help plan the next drive, and to warn on the movement of the trees.

Planning a tree drive should follow the five step felling plan, with some additional points:

2.5 WIND-THROW AND MACHINE ASSISTED FELLING

<table>
<thead>
<tr>
<th>ACOP</th>
<th>Rule 11.11.1</th>
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<td>In areas of wind-thrown salvage, machine assisted felling shall be the first choice of felling mechanism.</td>
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**Rule 11.11.2**

Any manual faller required to work in wind-throw shall have their competency assessed against NZQA Unit Standard 1270.

**Rule 11.11.3**

No person shall work directly under wind-wrenched trees.

Wind-thrown trees are very hazardous to deal with, as they can be unstable and unpredictable.
Wind-throw can cause:

> unstable root plates;
> suspended stems under high tension and compression;
> stems wedged between standing trees;
> stems leaning into standing trees;
> uprooted trees;
> spars;
> shattered tops;
> suspended hazards;
> heavy leaners;
> restricted access, i.e. heavy slash; and
> undesirable or disrupted felling patterns.

Wind-thrown trees should only be felled by competent persons. As wind-throw doesn't necessarily happen frequently or regularly, it's important to reassess the tree faller before felling wind-thrown. Each wind-thrown tree needs to be assessed individually.

**Wherever possible, wind-thrown trees should be felled by machine, rather than manually.**

Where access issues prevent machine assisted tree felling, you should ensure all possible movement of a standing tree or wind-thrown stem on release of tension or compression is assessed and cuts planned beforehand.