Management of New Plantation Broadleaves:

FORMATIVE SHAPING

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THINK LIKE A SAWMILLER

What does a sawmiller want?

- Straight stems
- First log as long as possible
- **No** large side branches
- **No** black knots
- Good diameters
- **No** bumps hiding hidden defects
- **No** internal defects or disease

Broadleaves: Natural regeneration v plantation forestry

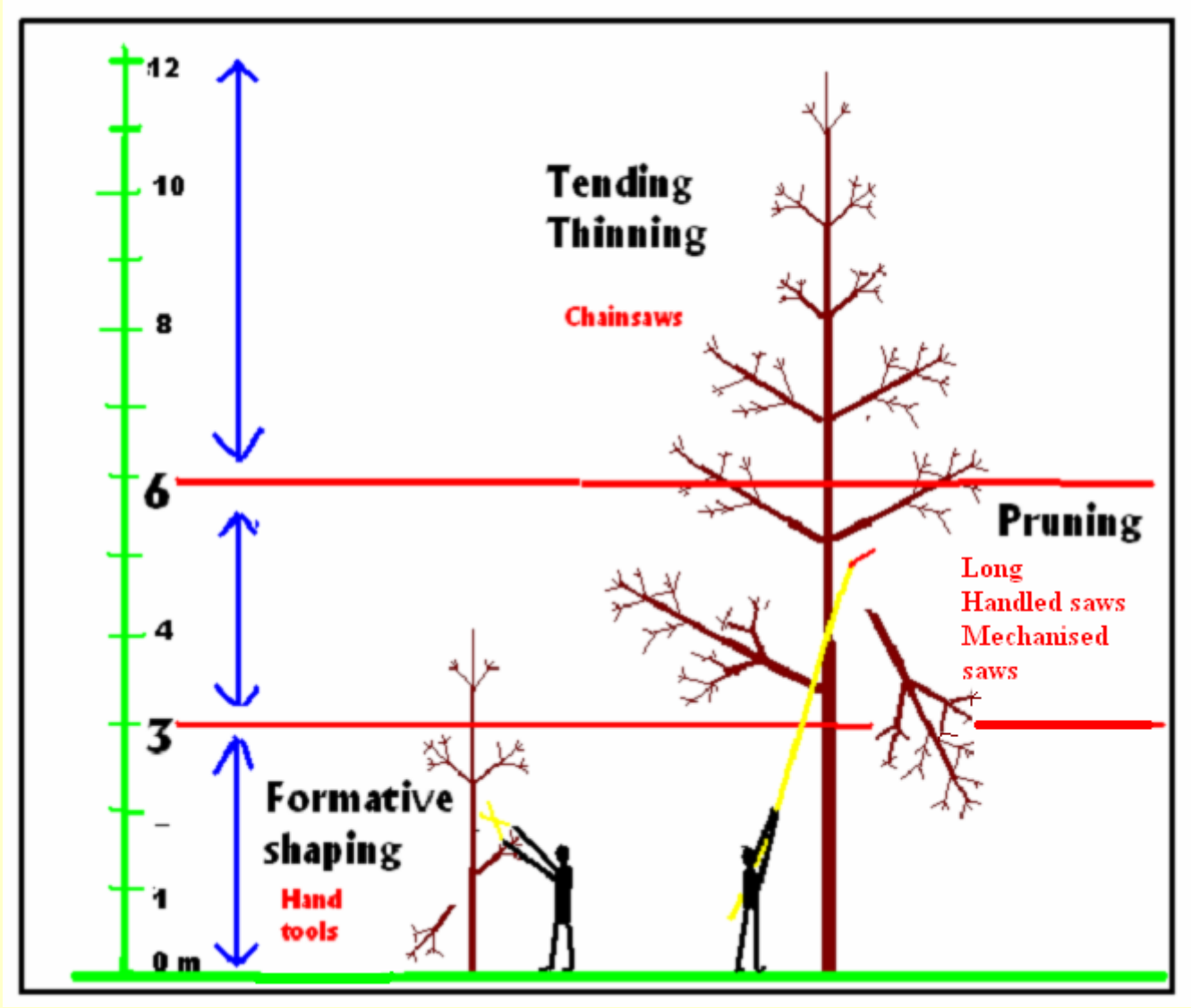
- In naturally regenerated forests trees are forced upwards by closely spaced competition
- Close spacing tends to produce straighter stems
- Lower branches tend to die due to lack of light
- In parkland situations broadleaved trees show poor apical dominance and stem shape
- Lower branches survive and grow to large sizes
- Trees in new plantations in former agriculture fields, at wider spacing (anything with one dimension of 1.2 m), are subject to exposure and lack of side shelter and tend to produce poorly formed stems

Plantation broadleaves: Two emerging approaches

- **Do nothing – wait until trees are 10/12 metres tall**
  - **Hope they will grow straight**
  - **Hope they will self prune**
  - **Hope there will be enough trees for final crop**
  - **Begin management at 10/12 metres**
  - **What happens to the lower stem if you are too late?**
- **Manage – do just enough to ensure an intermediate and final crop**
  - **Formative shaping 1- 3 metres**
  - **Pruning 3 – 6 metres**
  - **Thinning from 8 metres in height onwards**
  - **How much shaping do you need?**

Damaged base log

Height of different operations - Terminology



Formative shaping – First management step

Shaping is intended to have two effects:

- **to protect and stimulate the leading shoot**
- **to improve the quality of the stem.**

Formative shaping - procedure

Removal of branches from young 1 -2.5m stems to:

- Remove forks
- Remove competing codominants anywhere
- Remove large branches on lower stem
- Promote a definite leading shoot
- Promote a single straight stem
- Cannot improve curved or deformed stems

Why shape early?

- Trees recover form and straightness more readily
- Reduces Defect Core
- Prevents defects being ‘locked into’ the woody stem
- Concentrates growth into single leader
- Forces straightness on chosen leader
- Easier and cheaper
- Shaping emulates effect of natural pruning conditions

FORMATIVE SHAPING

Formative shaping only affects the portion of the stem that is available for shaping

Procedure for experiments on Formative shaping

- **Research carried out in farmer plantations ‘92 to ‘06**
- **Determine the effect of one shaping on quality**
- **One single shaping at the 1 - 2.5 m stage**
- **Annual measurements after growing season**
- **After leaf fall - stem-form is visible**
- **Ash, Sycamore, Cherry, Field maple, Walnut, Beech and Oak**
- **Over 10,000 individual stems individually shaped and recorded**

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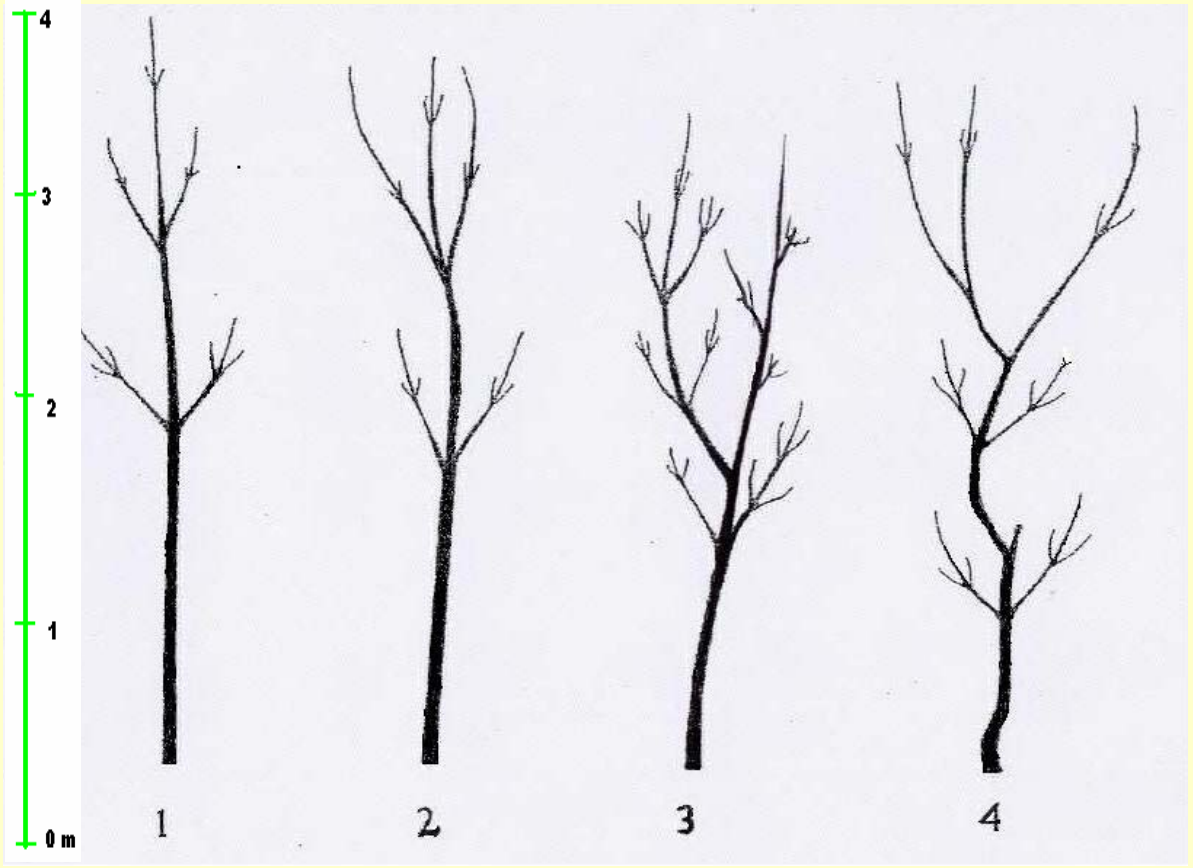
NEW CONCEPTS IN MEASUREMENT AND ANALYSIS DEVELOPED

INNOVATION for shaping research

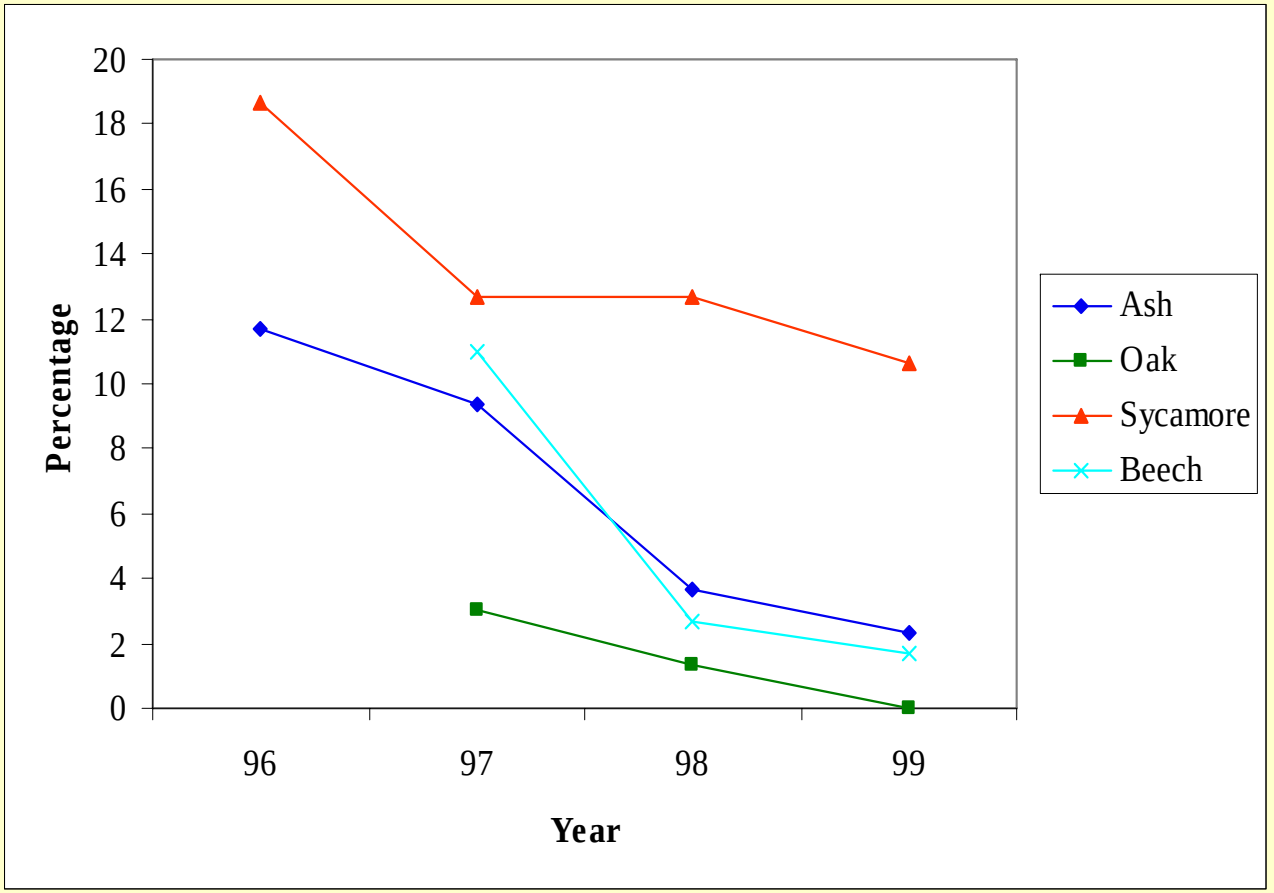
- Height and diameter not enough in broadleaves. It was necessary to develop:
  - a series of measurements that indicate stem quality
  - methods to quantitatively evaluate effectiveness of shaping
- **QUALITY CATEGORY**
- **HEIGHT CATEGORY**
- **CATEGORISATION OF DEFECTS**
- **DEFECT HEIGHT**
- **DEFECT CORE**
- **AMOUNT OF FOLIAGE REMOVED**

Quality Category of stems for shaping 1 - 4 metres

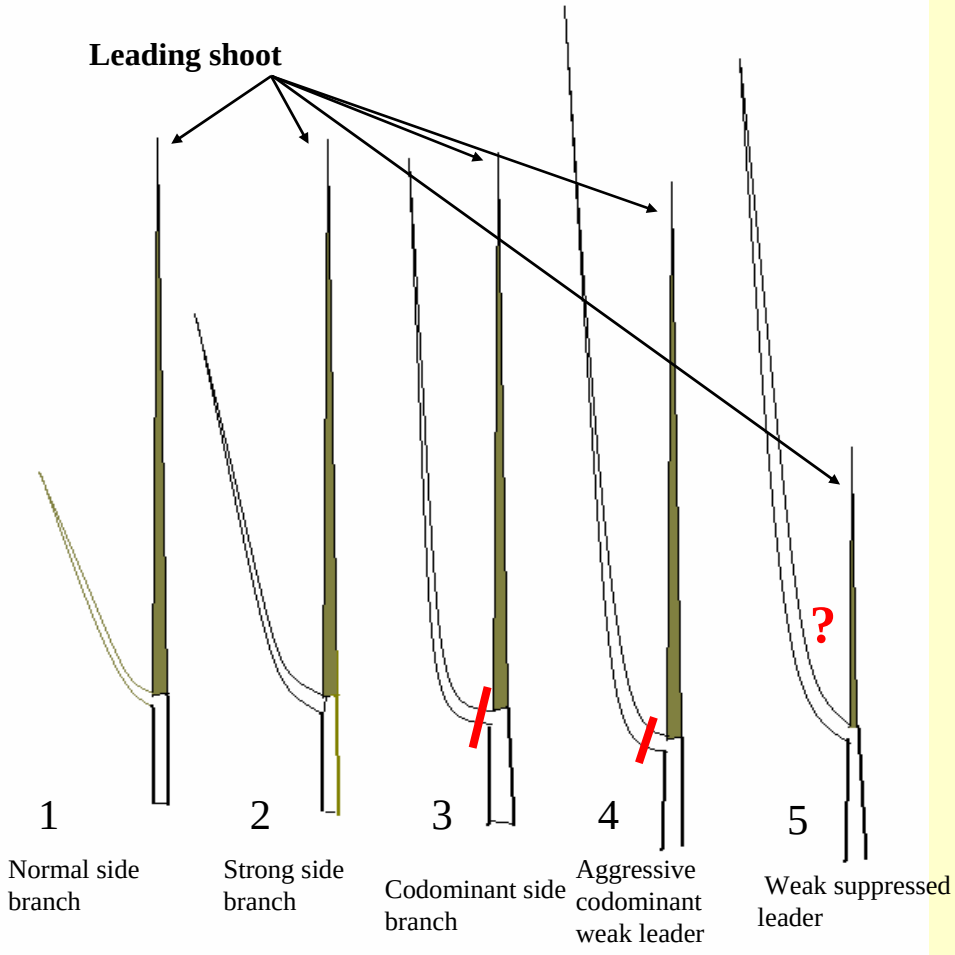


The decline in quality of plantation broadleaves

Percentage of 1 – 2.5m stems of Quality Category 1 remaining in Quality Category 1 in subsequent growing seasons in the unshaped (control) treatments



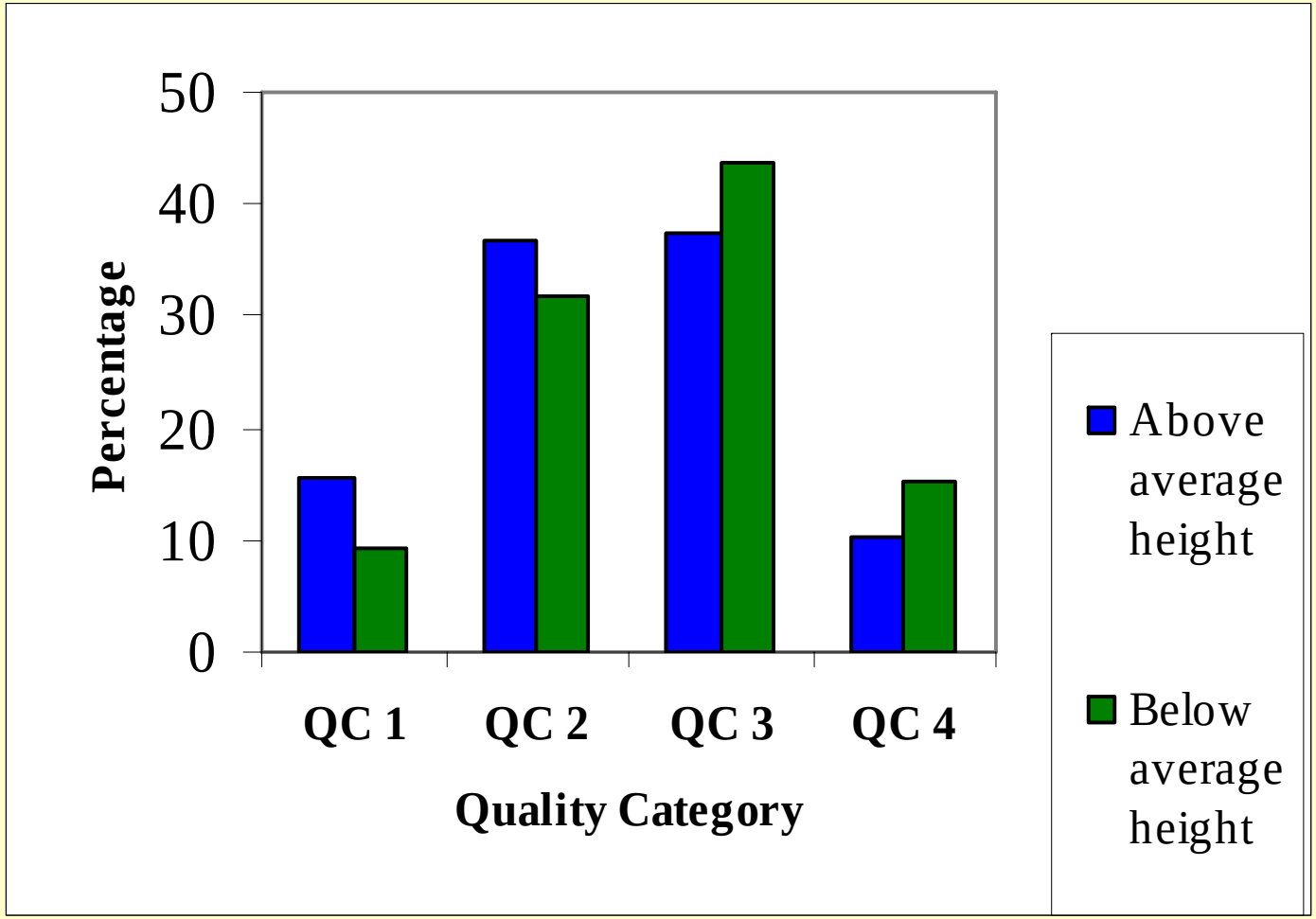
Formative Shaping –Ash leading shoot vigour



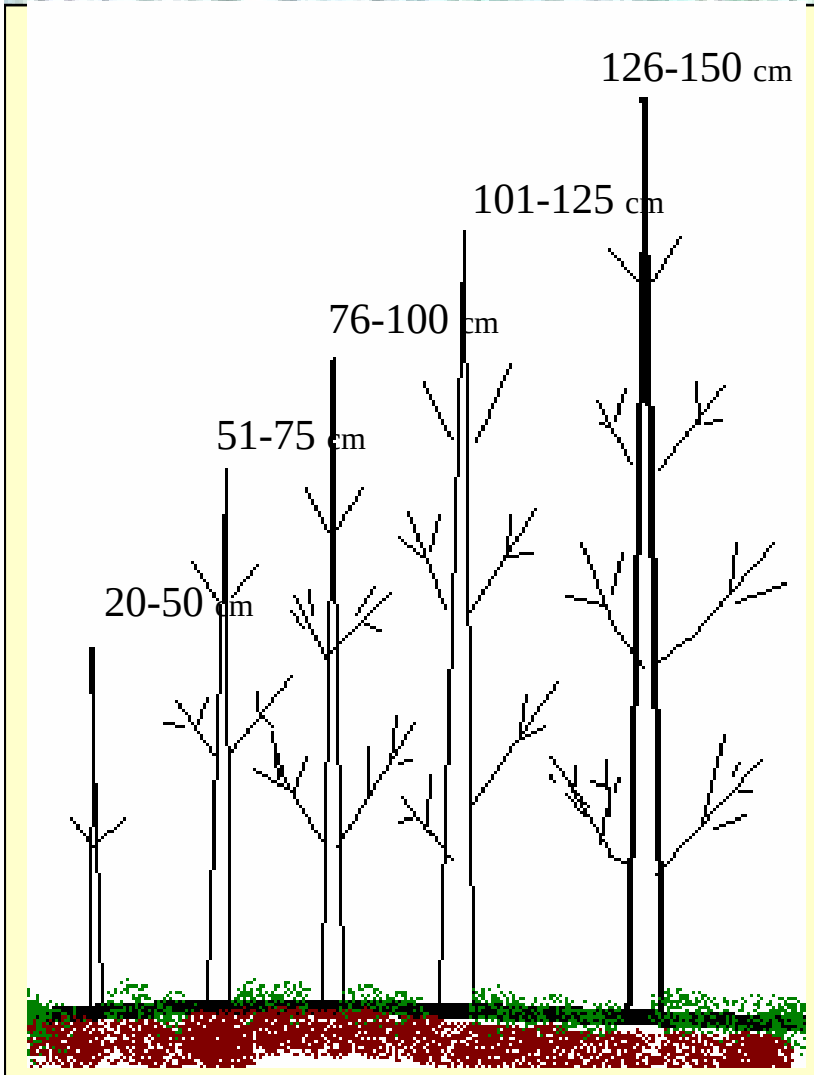
Leading shoot vigour
– relative strength of leader

1. Strong leading shoot
2. Strong leading shoot with strong side branch
3. Strong leading shoot but equally strong codominant shoot
4. Codominant stronger than reasonably vigorous leader
5. Now you have a problem!!!

Percentage of stems of above and below average height (114.1) in each Quality Category - ash, Moningtown 1996



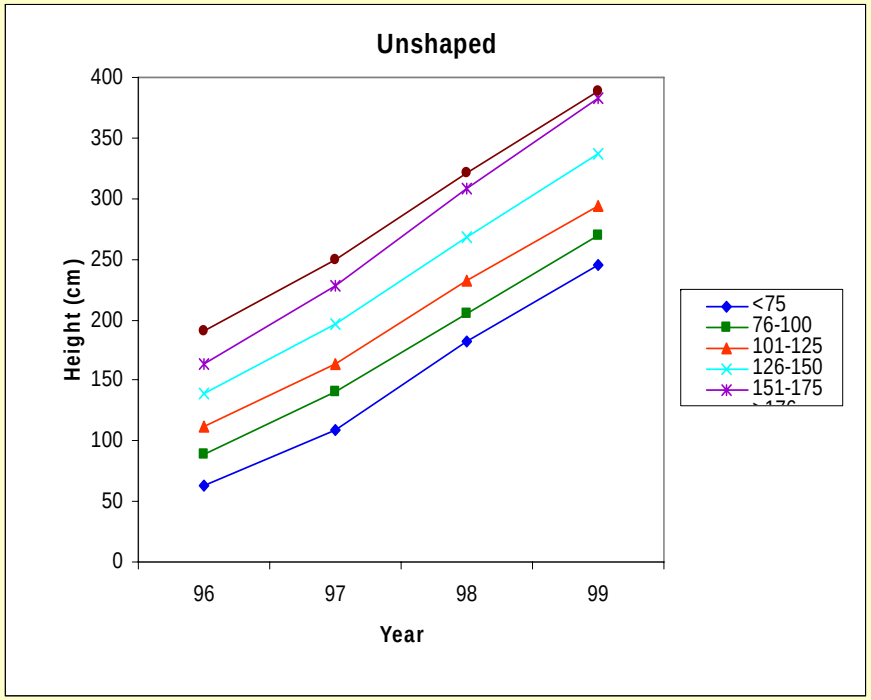
Definition of Height Category

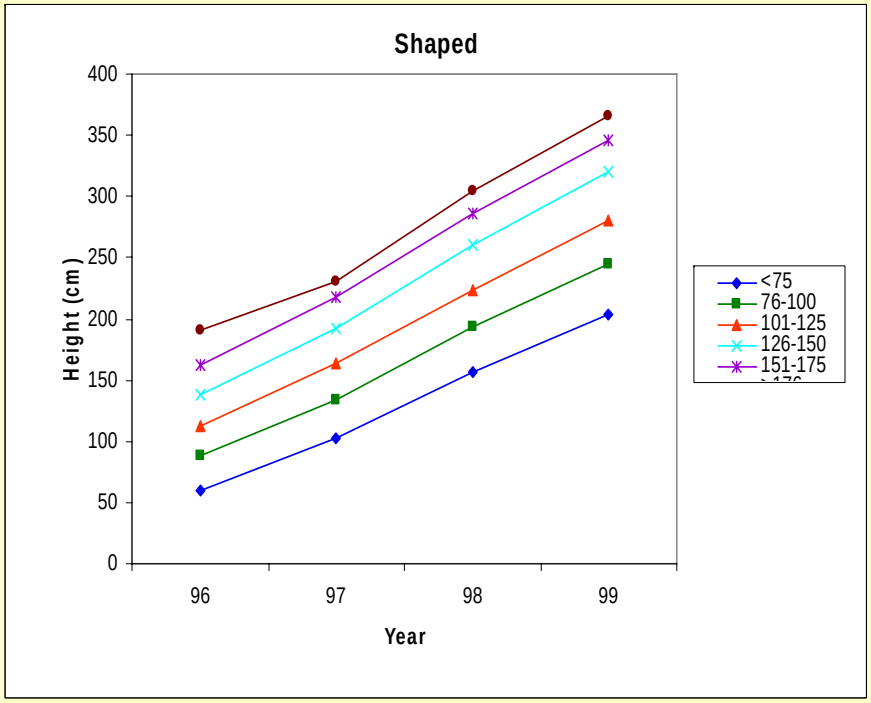


HEIGHT CATEGORY

- At a crop height of 1 - 2 .5 m
- Divide all stems into cohorts based on measured height
- Measurement is possible on the subsequent performance of each cohort
- Fast growers continue fast
- Slow growers stay slow

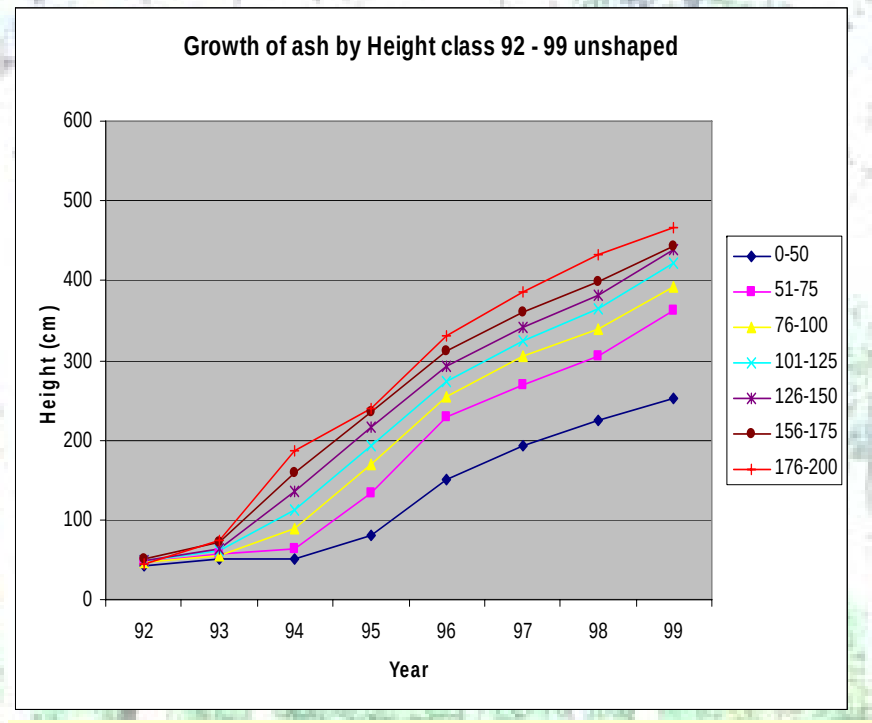
Height growth of ash over three growing seasons by Height Category in the unshaped (control) treatment and the light and heavy shaping treatments combined – ash, Moningtown 1996 - 99

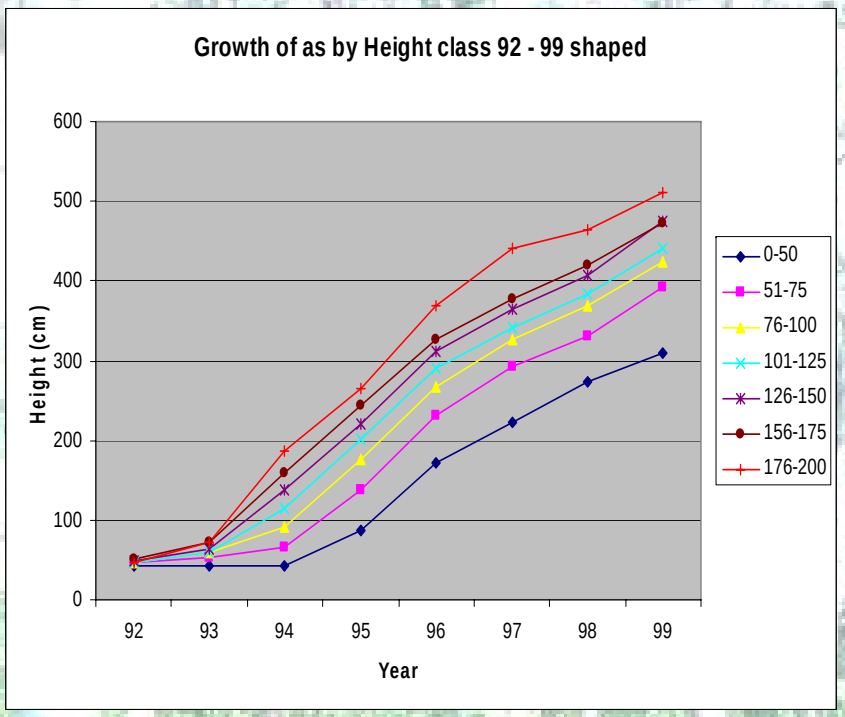




HEIGHT GROWTH BY HEIGHT CATEGORY

Progress of height cohorts in unshaped and shaped treatments at Kinsealy by **HEIGHT CATEGORY**

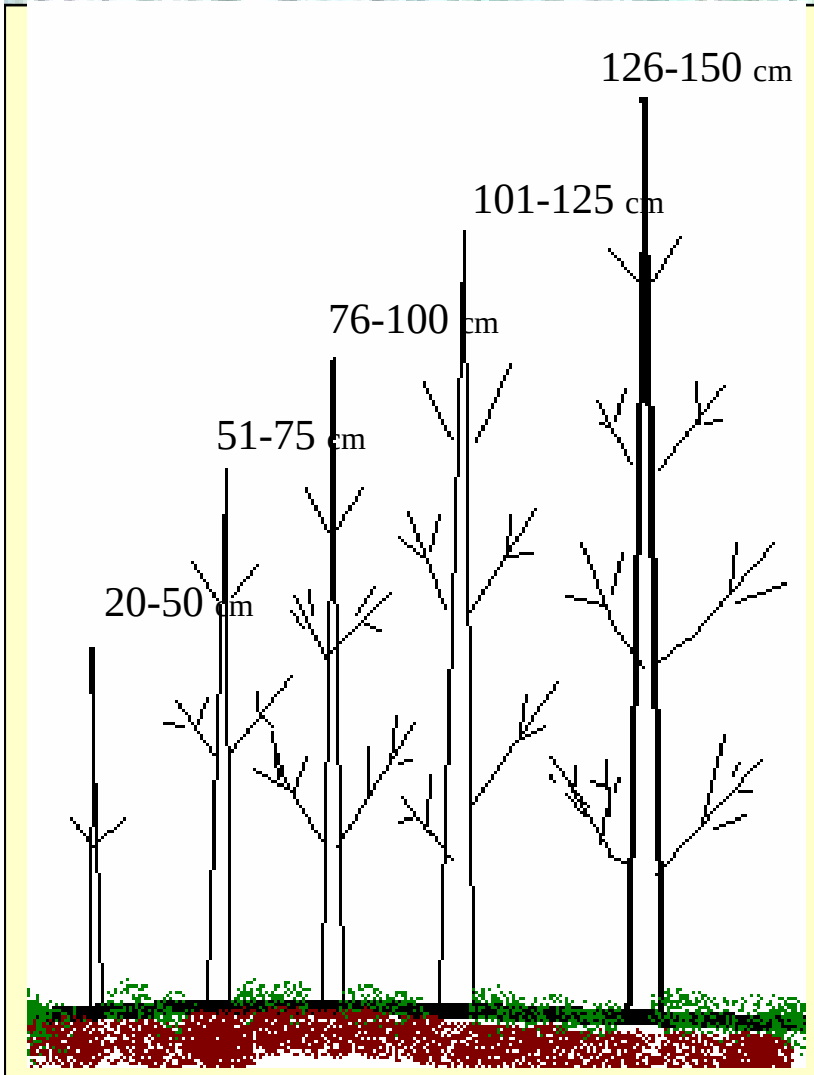




Note: Superior Height Growth for shaped

Smallest cohort losing out

Definition of Height Category



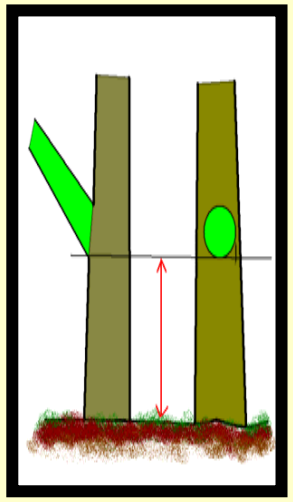
HEIGHT CATEGORY

The message!

- Fast growers continue to grow fast
- Slow growers stay slow growing

Defect height

Defect Height - examples

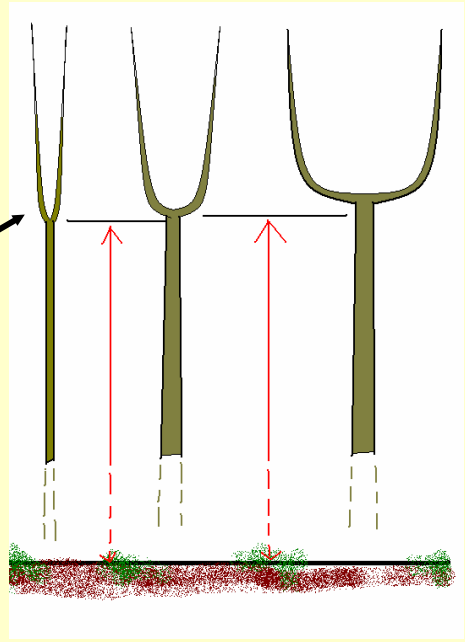


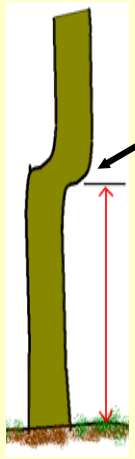
Disproportionately Large branch

Prune

Forks of increasing severity

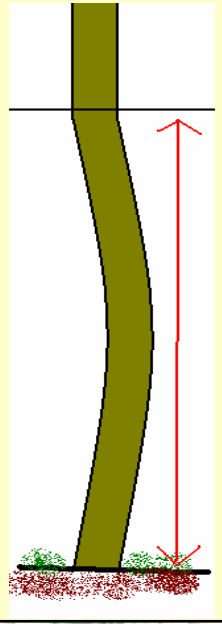
Prune early where useful





Bayonet or kink

No remedy



Curved stem

No remedy

DEFECT HEIGHT

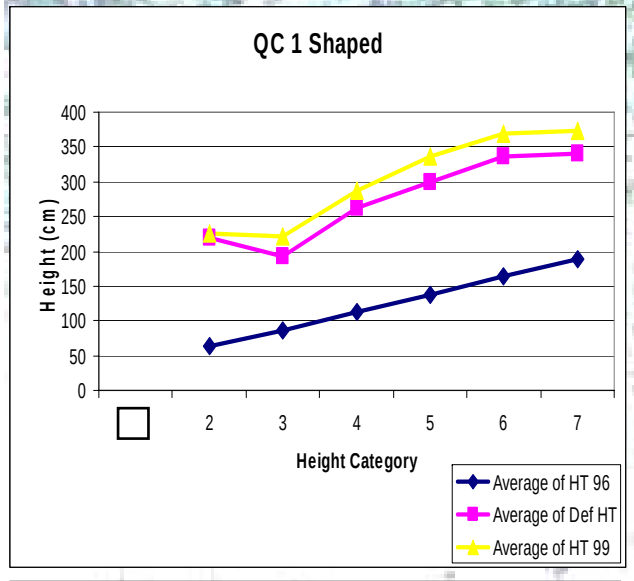
- Height from ground to first treatable (formative shaping) defect
- Consider only defects that can be removed by shaping
- Cannot do anything about crookedness or bayonets
- Do not waste time on deformed stems
- Removal of defect gives indication of additional clean stem added

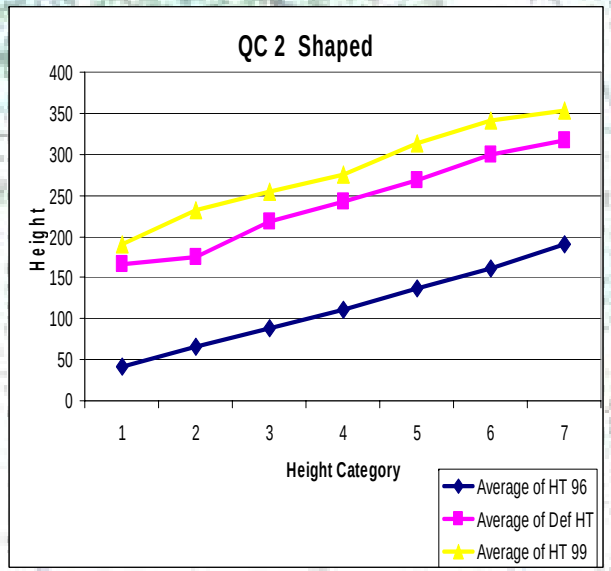
Effect of Formative Shaping on Defect Height

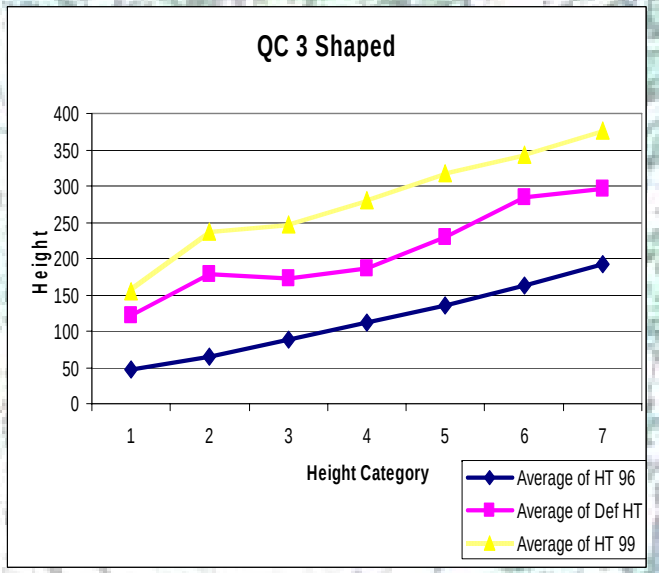
Effect of formative shaping on height to first stem defect

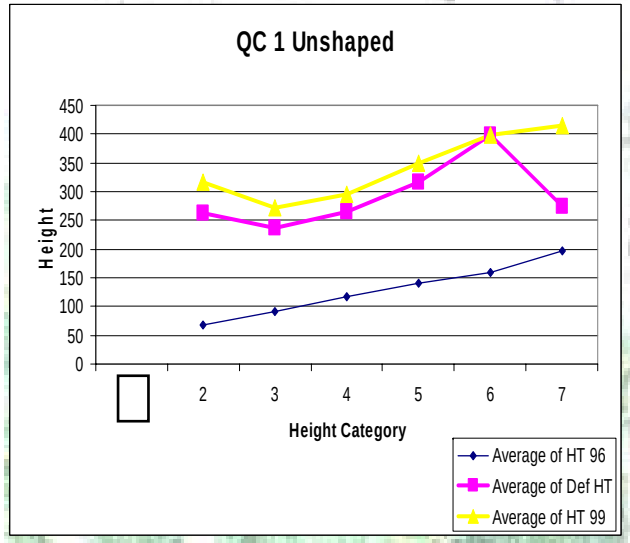
Treatment	Defect height
Control	186.5
Light	211.3
Heavy	221.0
C v L	*
C v H	*
L v H	NS

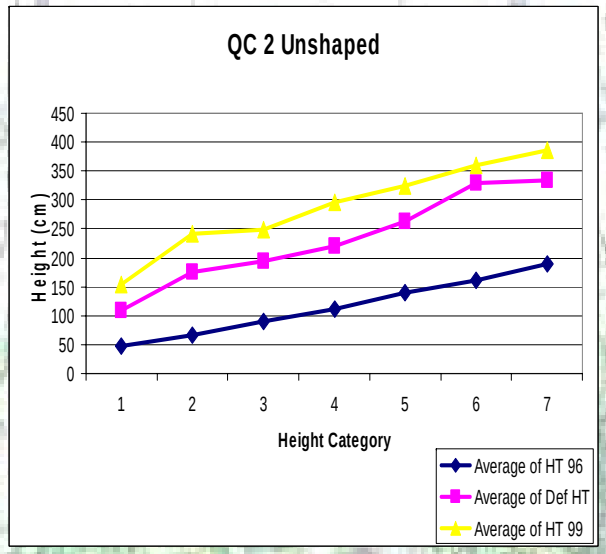
Relationship between Defect Height and Height Category by Quality Category

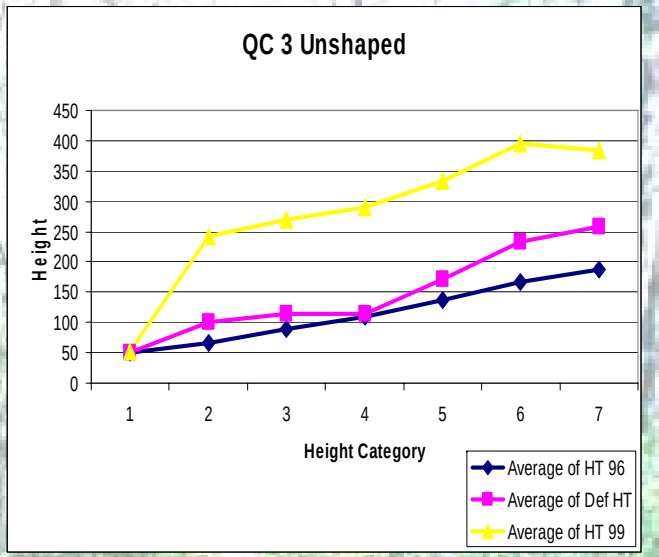






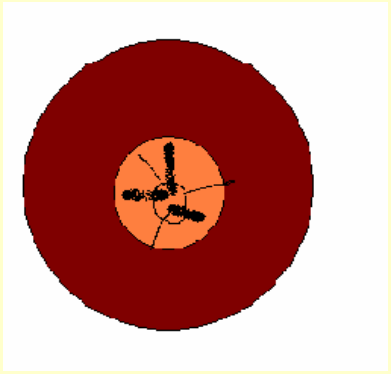


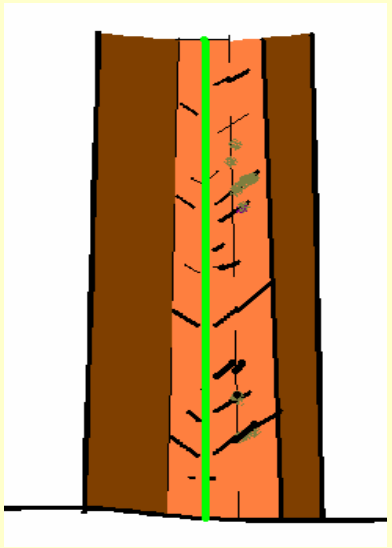




Defect Core

DEFECT CORE





Central core of trunk

Branch stubs

Black knots

Distorted growth areas around knots and wounds

Weakness in timber

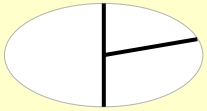
Veneer to 7-8 cm

Early pruning

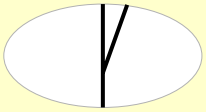
Prevents flattening/faceting/cylindricality

Increase 1cm in Defect core - 2.5% financial loss

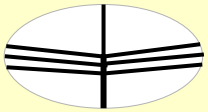
Classification of Form Defects Identified on Tree Stems



Disproportionate large branch

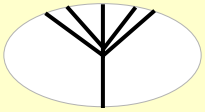


Acute angle of branch insertion

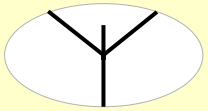


Whorl

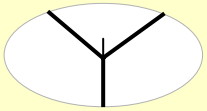
Co Dominant side shoots



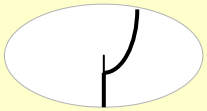
Multiple leaders



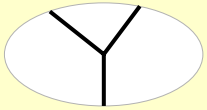
Dominant side shoots with retarded leader



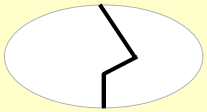
Suppressed leader



Bayonet shaped relay



Fork



Kink

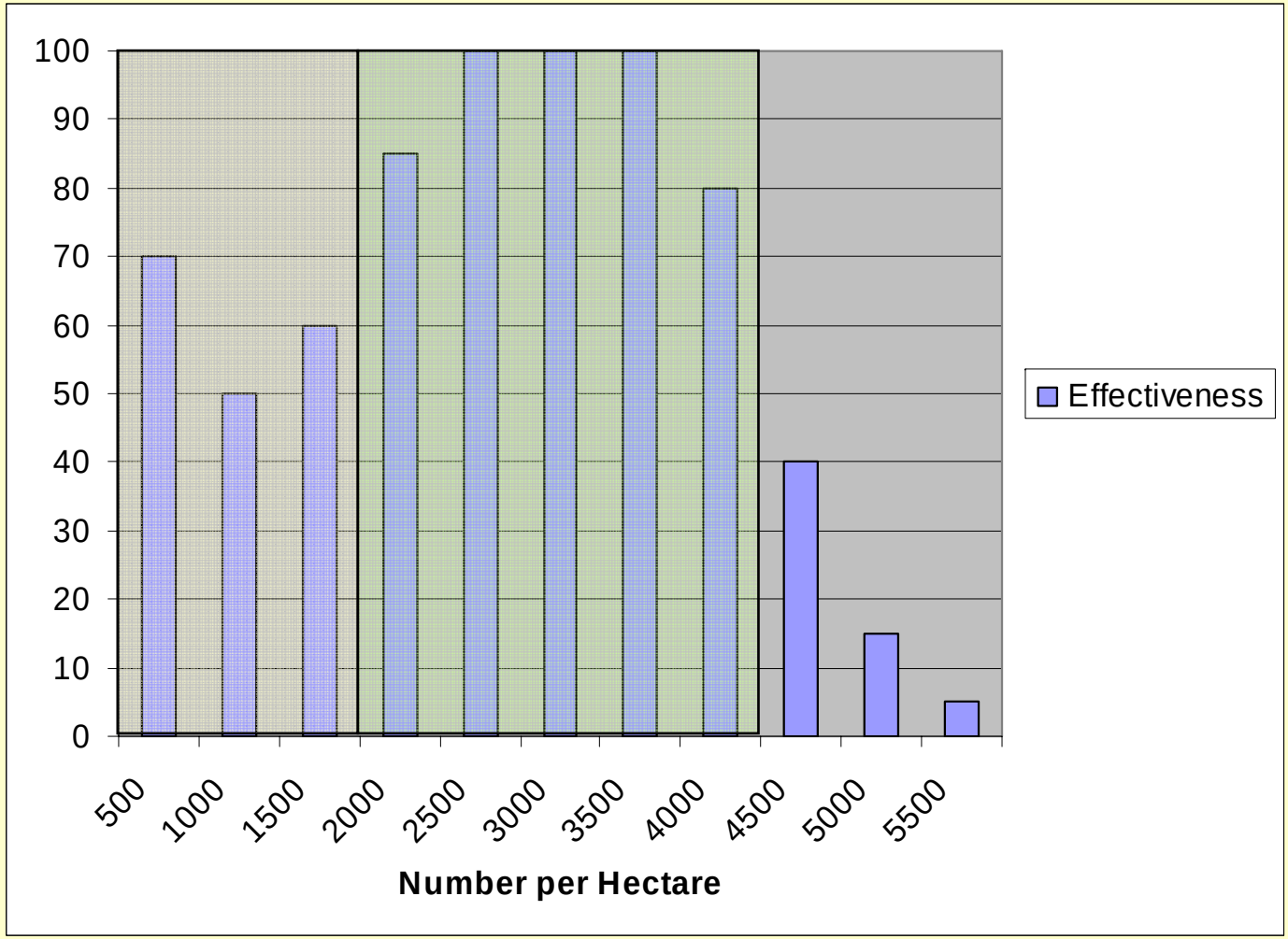
FORMATIVE SHAPING Protocol

- You know what a good stem looks like so -
- Begin formative shaping at 1- 2.5 metres in height
- Concentrate on Quality Category 1 and 2 stems
- Work on QC 1 & 2 stems of above average height
- Remove defects : forks, codominants, whorls, large branches
- If no QC 1 or 2 stems
- Work on QC 3 stems
- Shape 33% or more of stems (800 at 2500 and 1100 at 3300)
- Shape early - shape often – if at all possible!

General outcome for formative shaping by species

Species	Outcome
Ash (*Fraxinus excelsior*)	Very effective
Sycamore	Effective but – Grey squirrel
Beech	Very Effective
Oak	Limited success
Field maple	Very Poor form
Cherry	Abandoned - Bacterial canker
Walnut	Impossible - frost
Ash (*Fraxinus angustifolia*)	Impossible -very poor form

Potential effectiveness of shaping at different spacings (No stems /Ha)




THE END

BENEFITS OF SHAPING AND PRUNING

BENEFITS OF PRUNING

- Increases stem diameter and tree stability -swaying
- Increases height increment - gets stems away
- Makes sale of early thinnings more attractive
- Increases height from ground to serious stem defect
- Reduce the number of black knots and snags
- Reduces damage to retained trees - less branches
- Reduces squirrel damage - no low perches
- Improves management - increased view of wood

Some References

Bulfin and Radford – Irl

Nicol – UK

Mayhead and Price – UK

Kerr - UK

Hubert and Courraud - France

Balandier - France

Ledgard and Giller - NZ

Barton - NZ

Remphrey and Davidson US

Shigo - US