

BRANCH MODELS TO PREDICT THE EFFECT
OF COMMON SILVICULTURAL TREATMENTS
ON *PINUS BANKSIANA* VISUAL LUMBER
DOWNGRADE BY KNOTS

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Chaire en
productivité
forestière

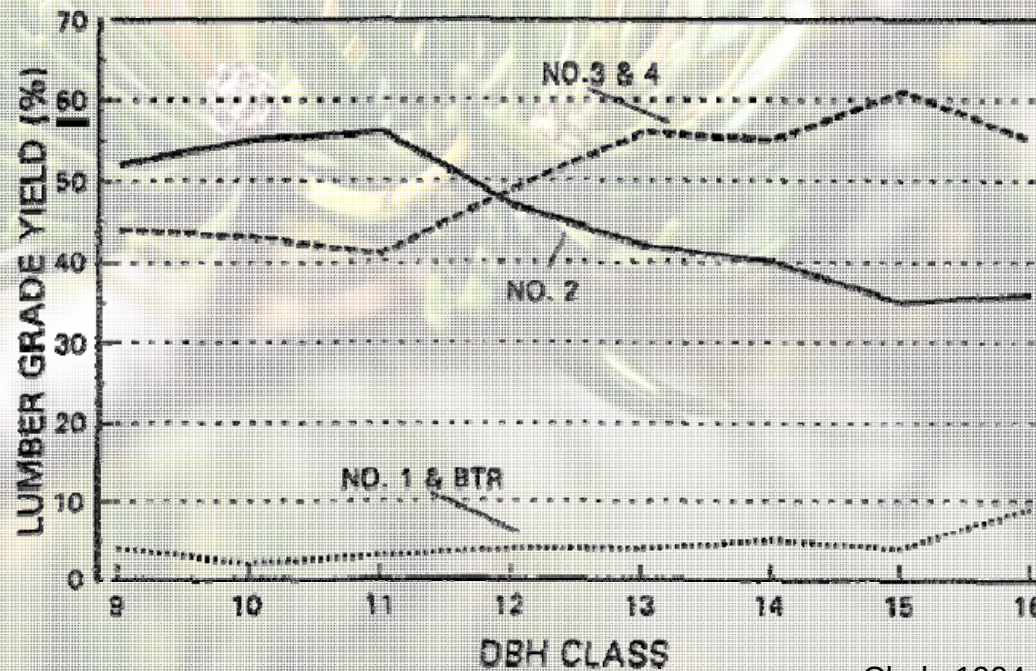
June 9th, 2008

CONTEXT

- Short supply of sawlogs in Eastern Canada
- Jack pine (*Pinus banksiana*)
 - large distribution area
 - 20% of softwood volume
 - Second fastest-growing conifer
- Industry moving toward intensified practices

PROBLEM

- ↓ plantation density 70's Vs 90's (Quebec)
- Scarce knowledge wood quality impacts

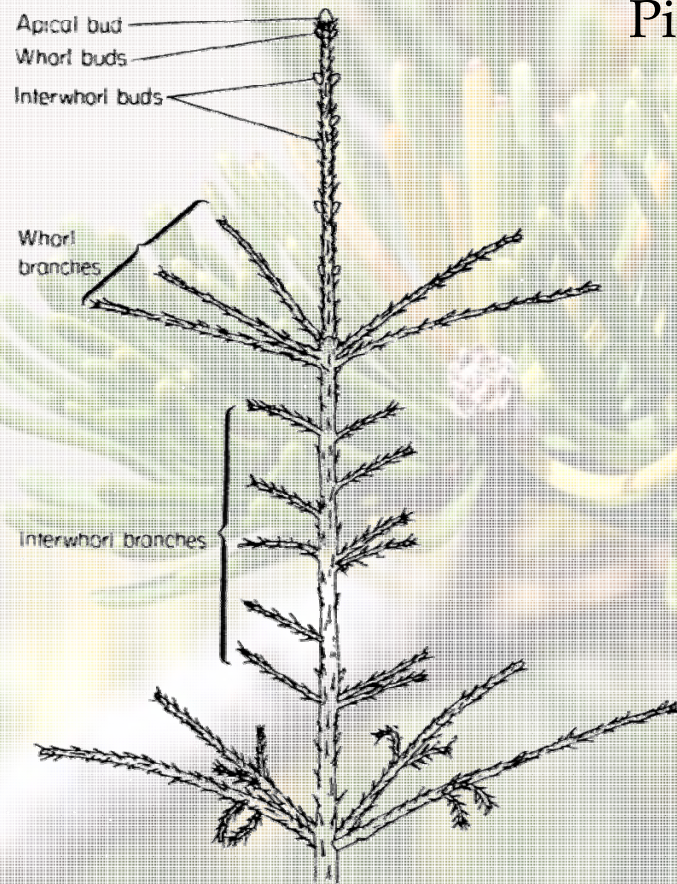


Clark, 1994

OBJECTIVES

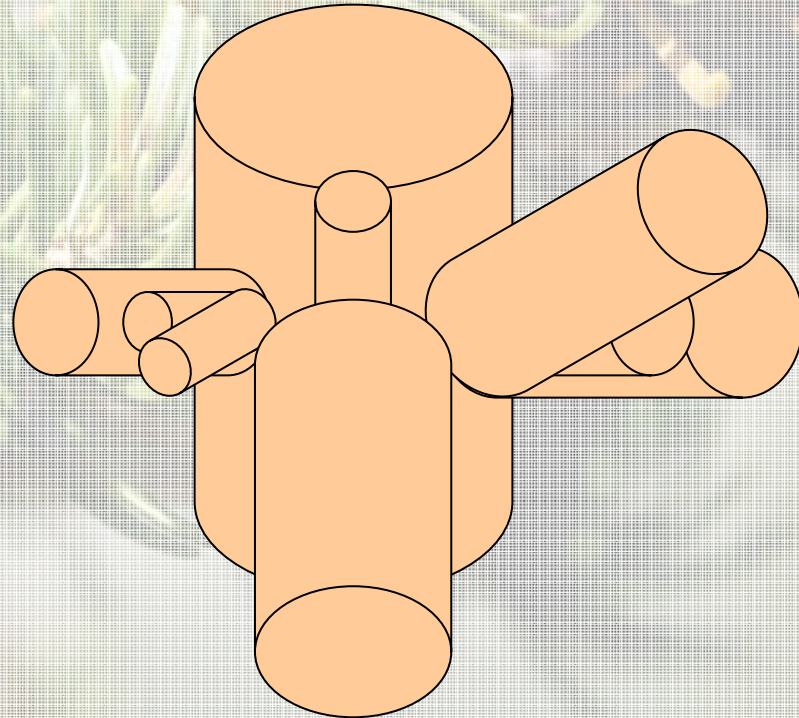
- **Aim 1:** Model branch characteristics
 - for leader: initial number of branches per whorl (nodal and internodal)
 - for individual branches: diameter and insertion angle
- **Aim 2:** Sawing simulation
- Grading
- Simulation of silvicultural treatments
- Dynamic assessment (volume and quality)
- Are we doing the right thing ?

1. BRANCH RELATIONSHIPS



Cochrane, 1978

PipeQual (Mäkelä and Mäkinen, 2003)
TREE - WHORL - BRANCH



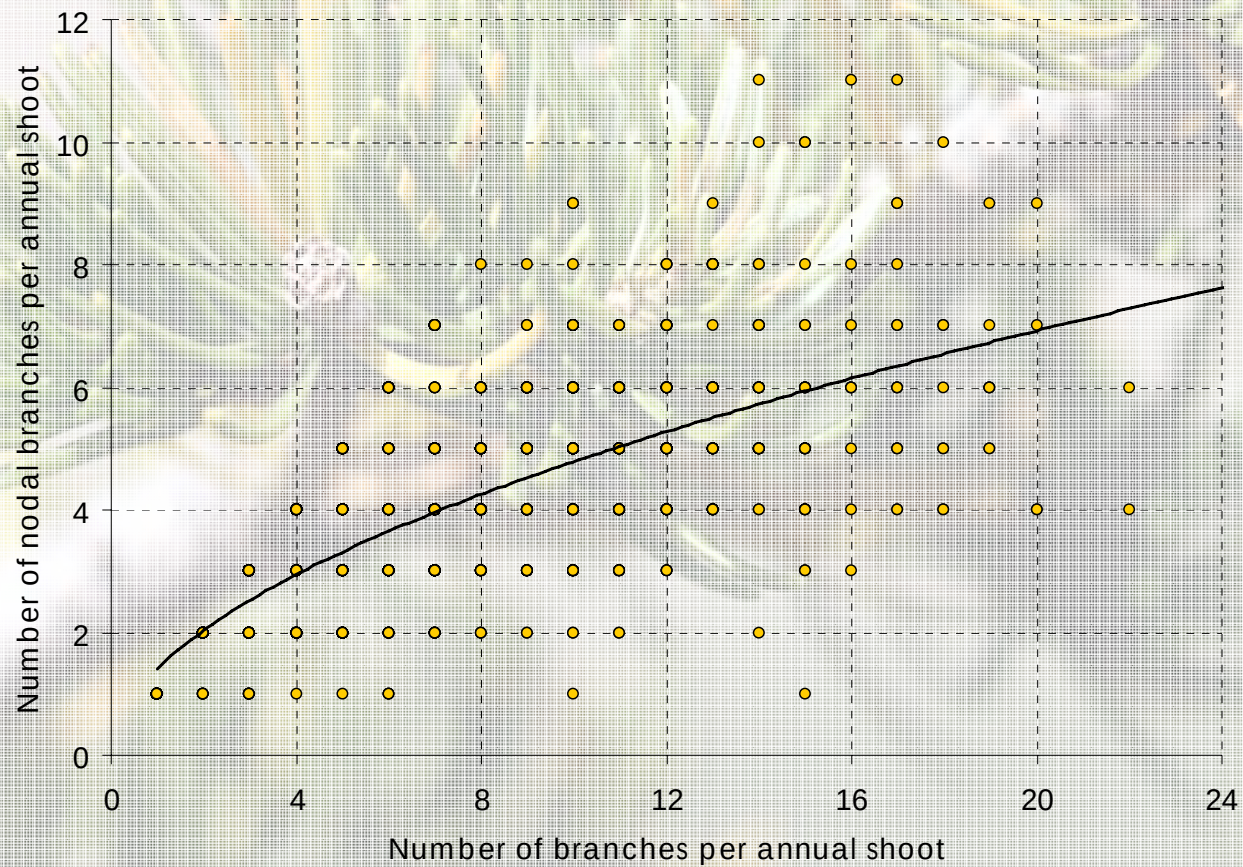
NUMBER OF BRANCHES

Number of Branches in Function of the Annual Shoot Length for Different Values of Basal Area in *Pinus banksiana*

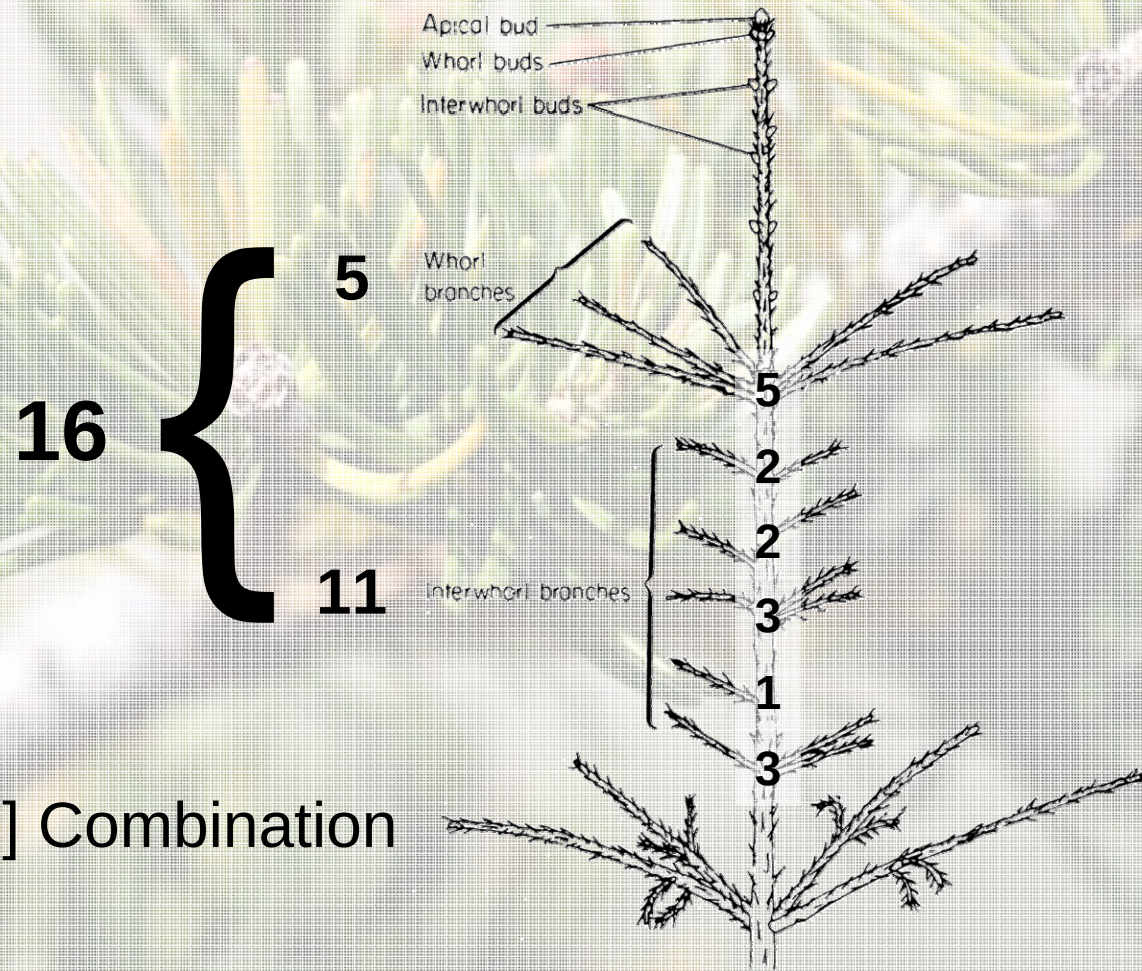


NUMBER OF BRANCHES DECOMPOSITION

Number of Nodal Branches in Function of the Total Number of Branches per Annual Shoot in *Pinus banksiana*



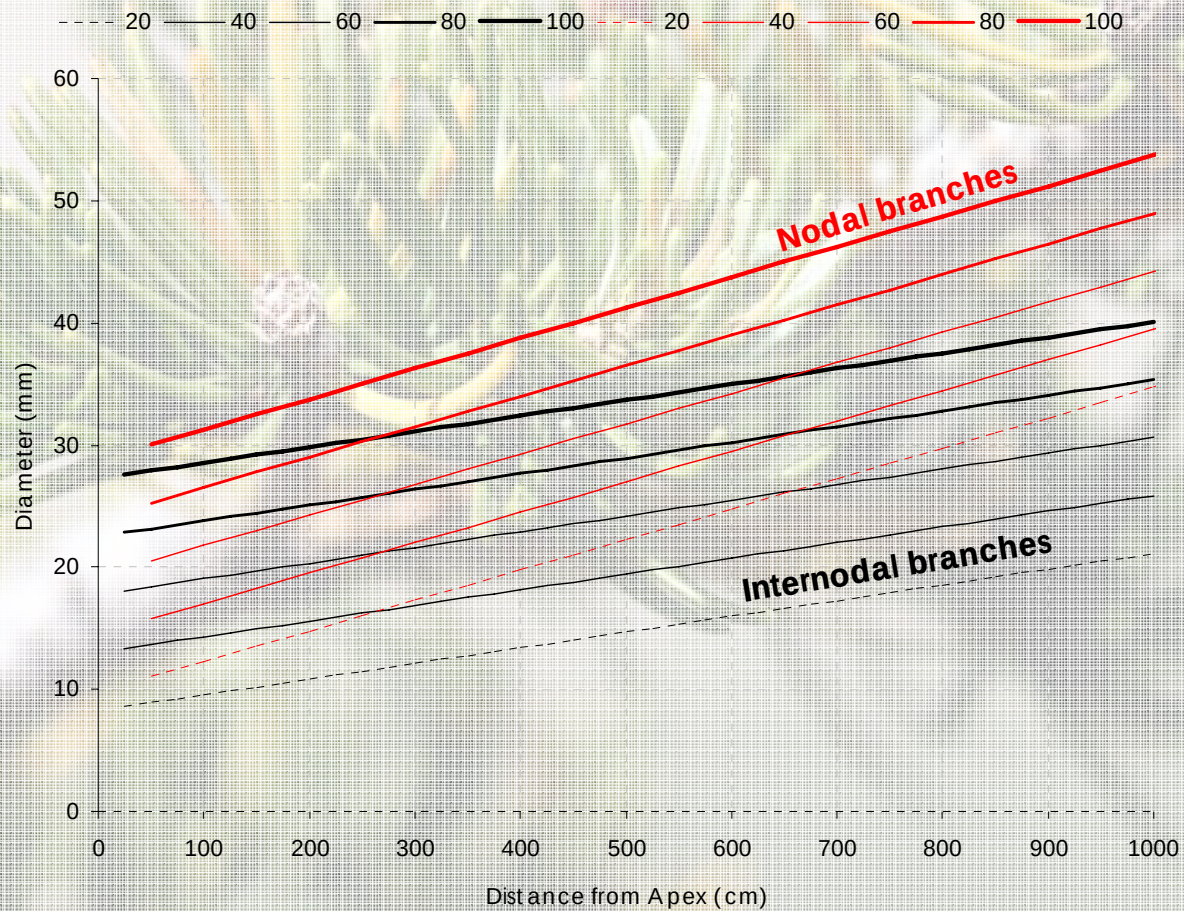
NUMBER OF BRANCHES DECOMPOSITION



[22313] Combination

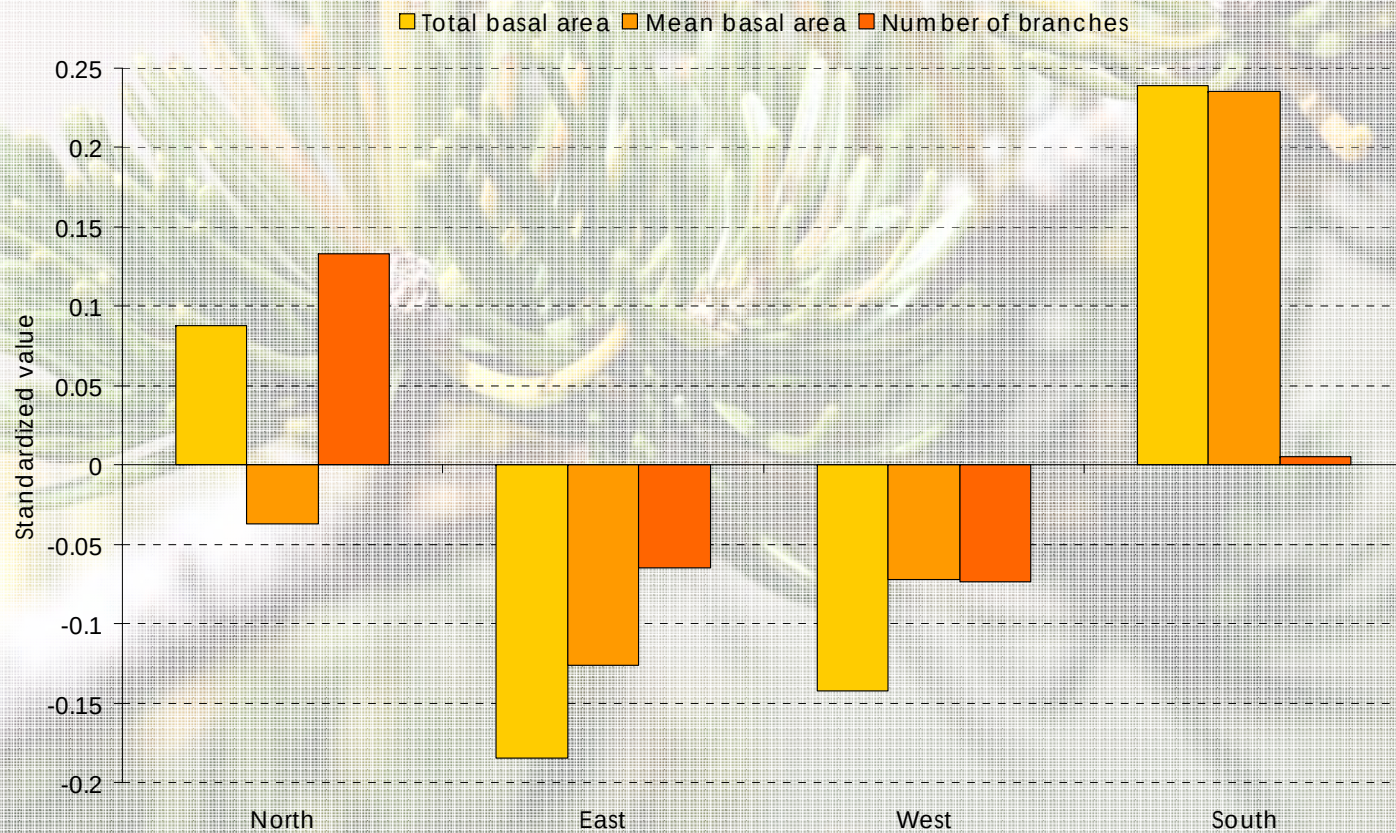
DIAMETER

Diameter of branches in Function of the Distance from Apex for Different Branch Ages in *Pinus banksiana*



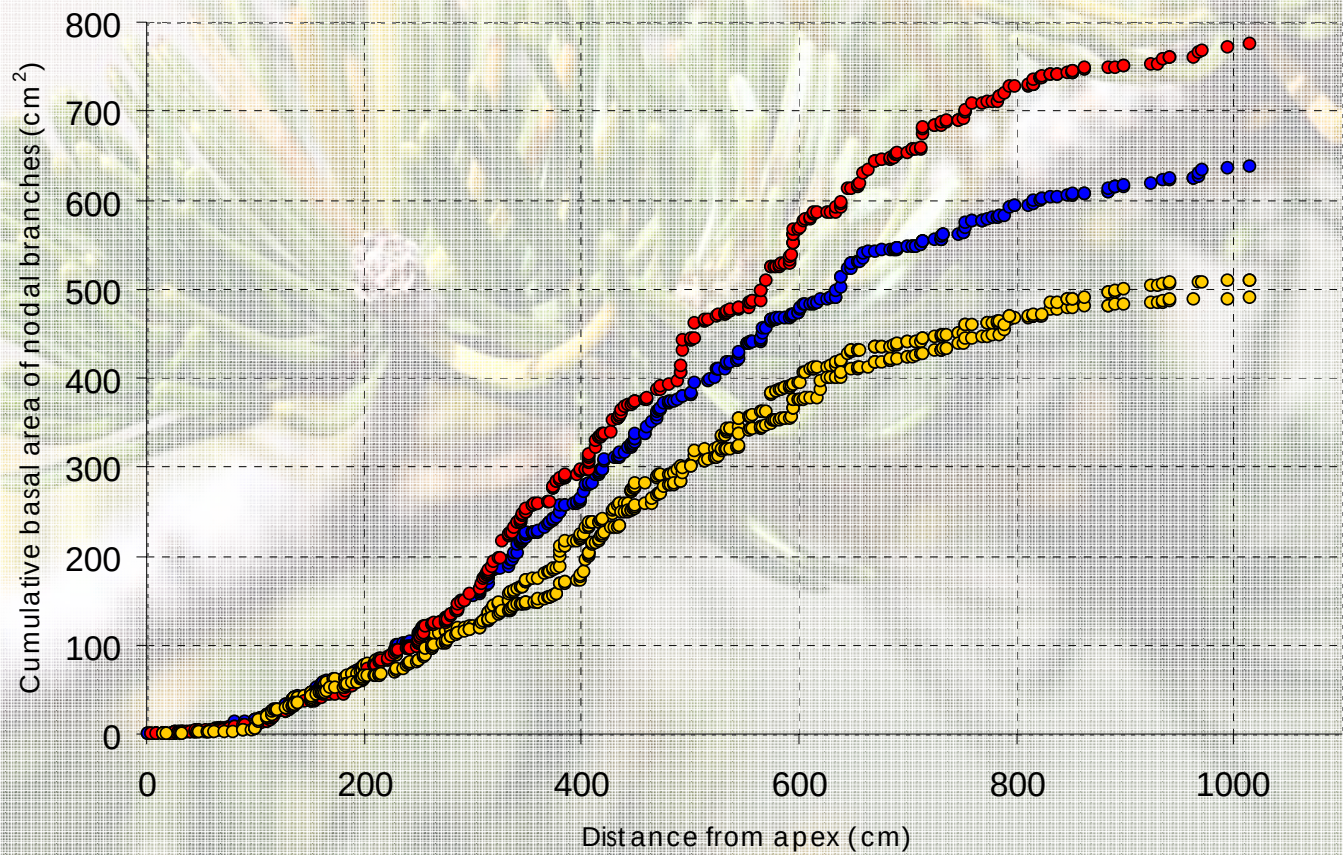
CARDINAL DIRECTION

Standardized Total Basal Area, Mean Basal Area, and Number of Nodal Branches in *Pinus banksiana*



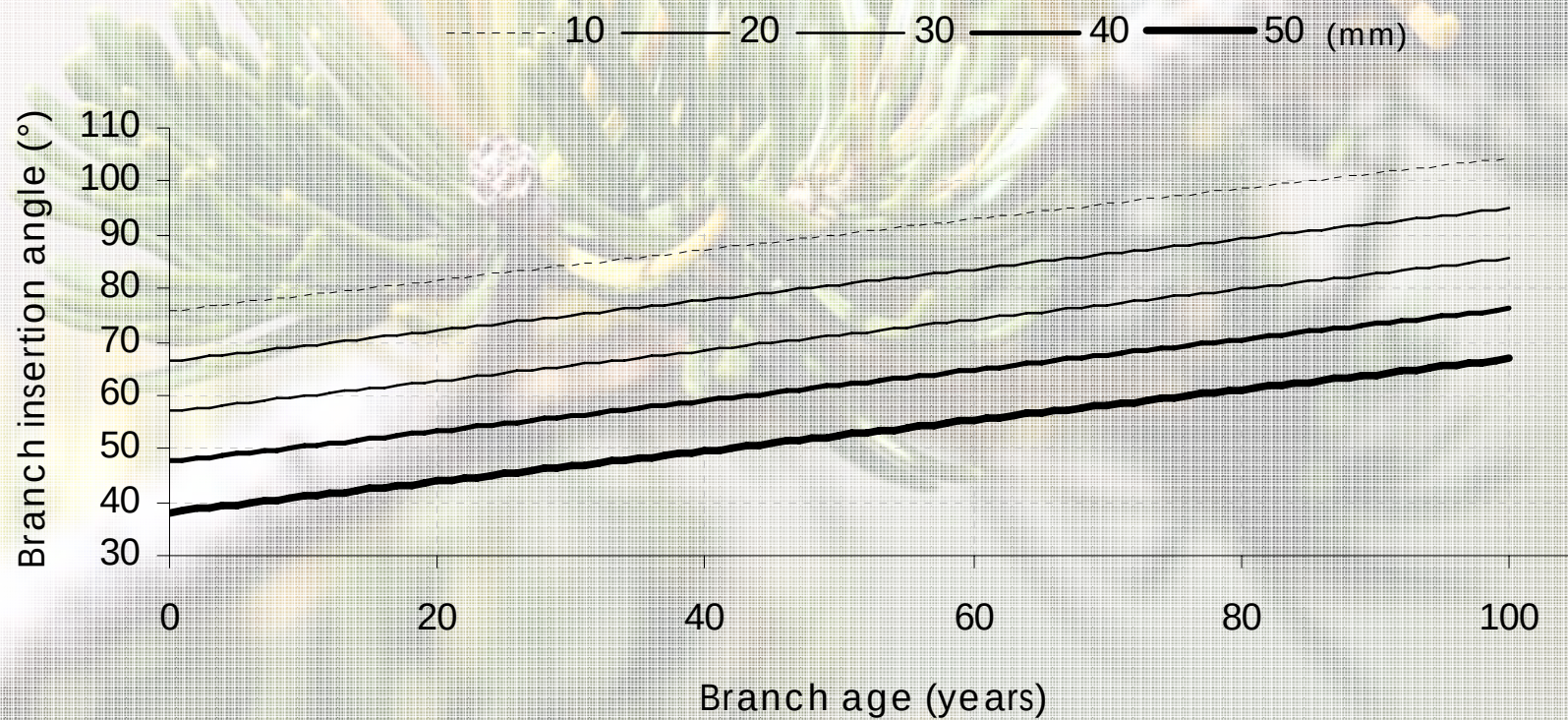
CARDINAL DIRECTION

Influence of Cardinal Direction on Cumulative Basal Area of Nodal Branches with Distance from Apex in *Pinus banksiana*



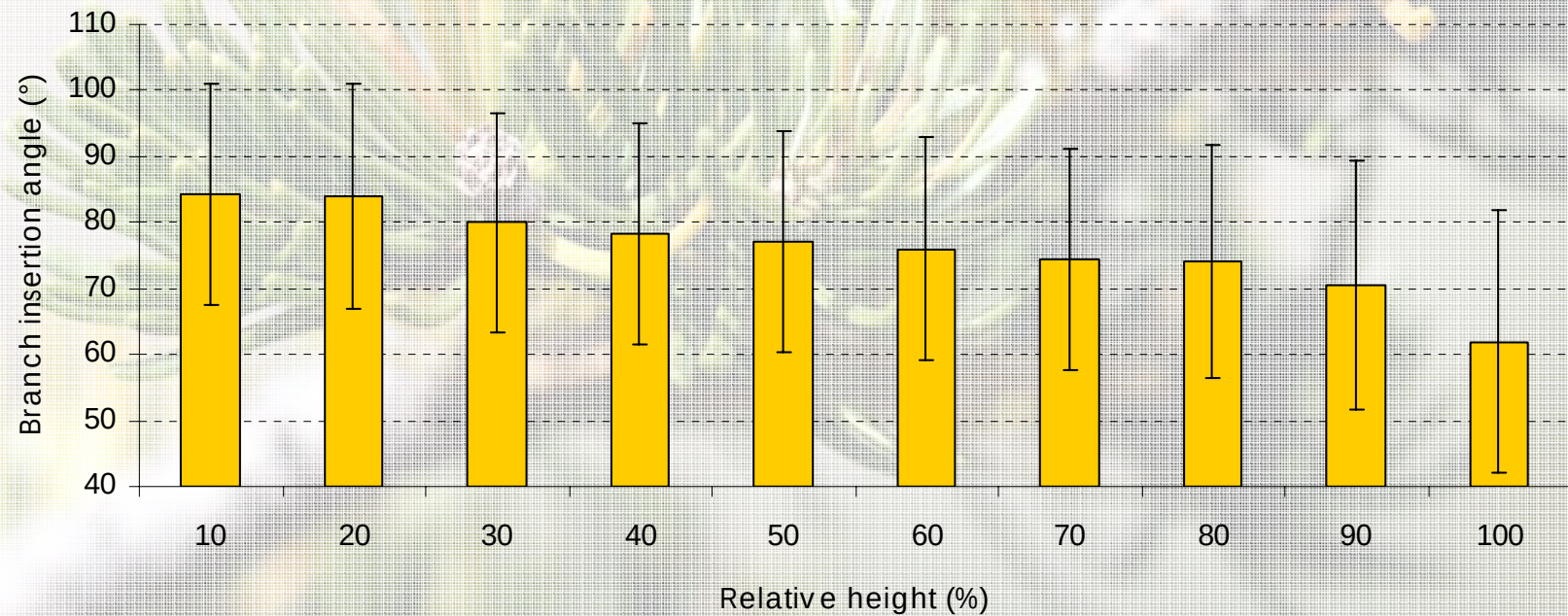
INSERTION ANGLE

Branch Insertion Angle in Function of Branch Age for Different Diameters
in *Pinus banksiana*



INSERTION ANGLE

Branch Mean Insertion Angle in Function of Relative Height in *Pinus banksiana*



2. WOOD QUALITY

- **Aim 2** : Simulate sawing with Optitek© and assess visual lumber downgrading by knots

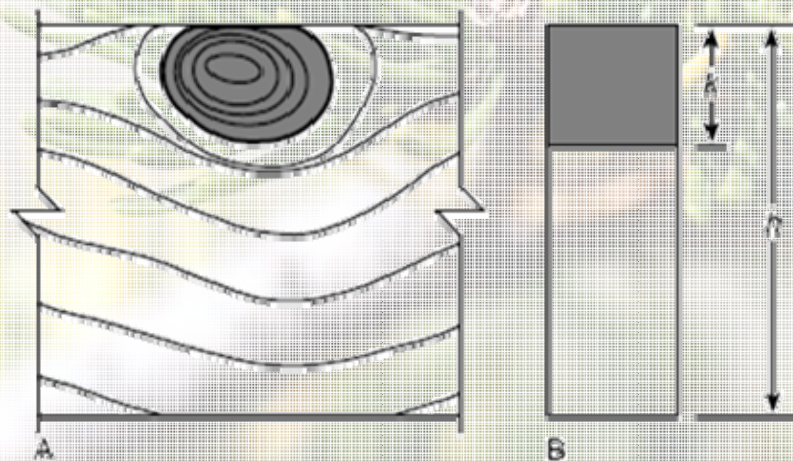


Figure 6-2. Effect of edge knot: A, edge knot in lumber and B, assumed loss of cross section (cross-hatched area).

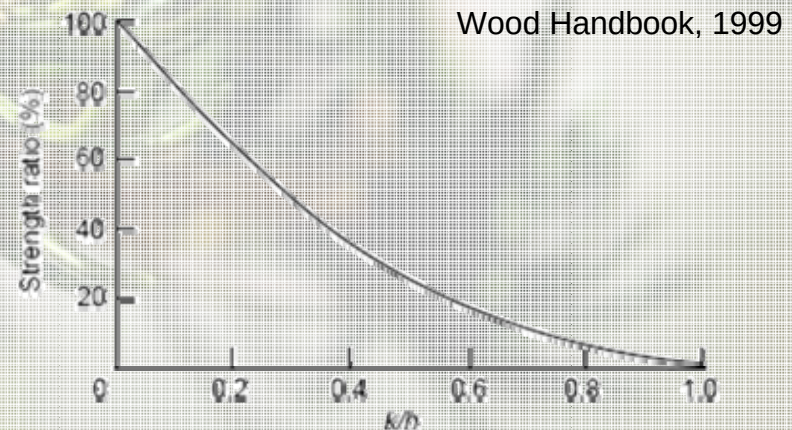
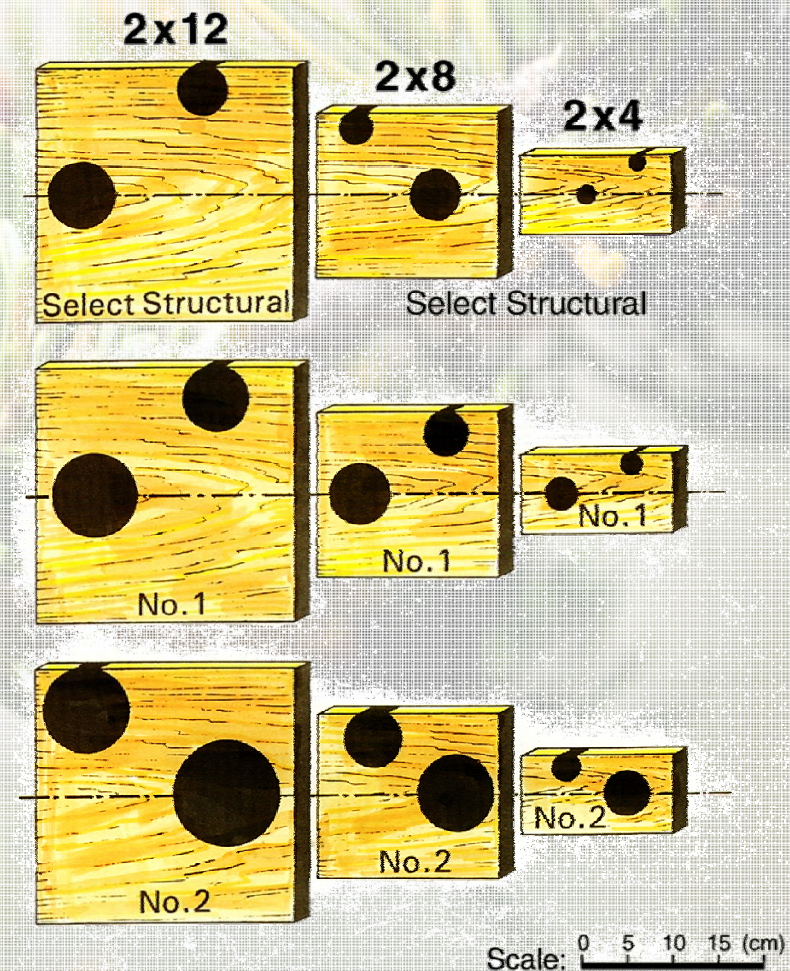
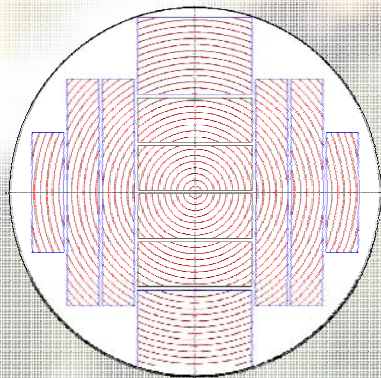
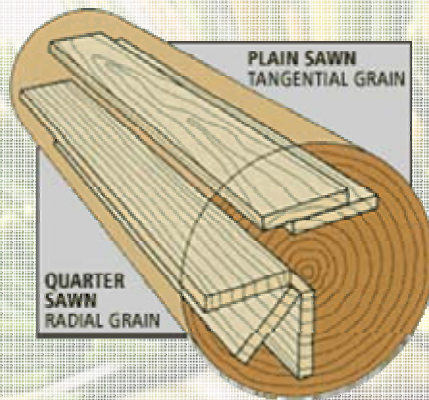


Figure 6-3. Relation between bending strength ratio and size of edge knot expressed as fraction of face width. k is knot size; h , width of face containing the knot.

SAWING SIMULATION AND GRADING

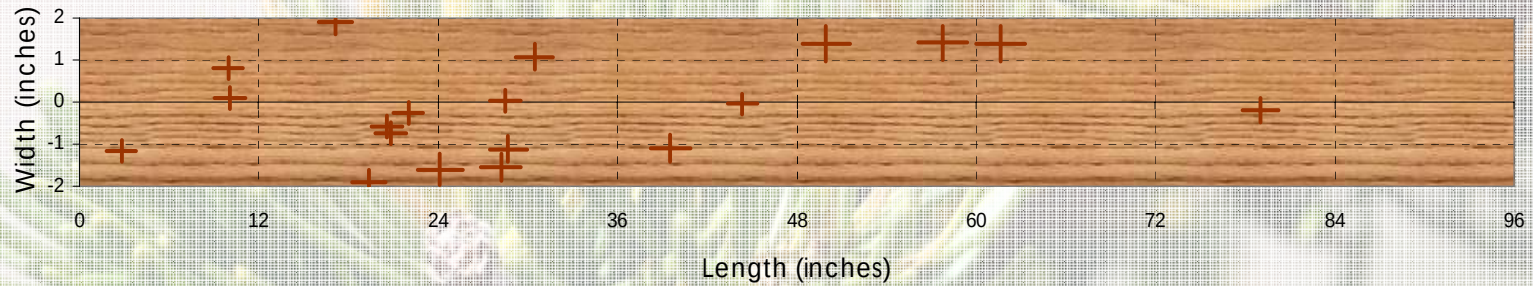
- Stud mill Vs random length
- Optimized sawing pattern



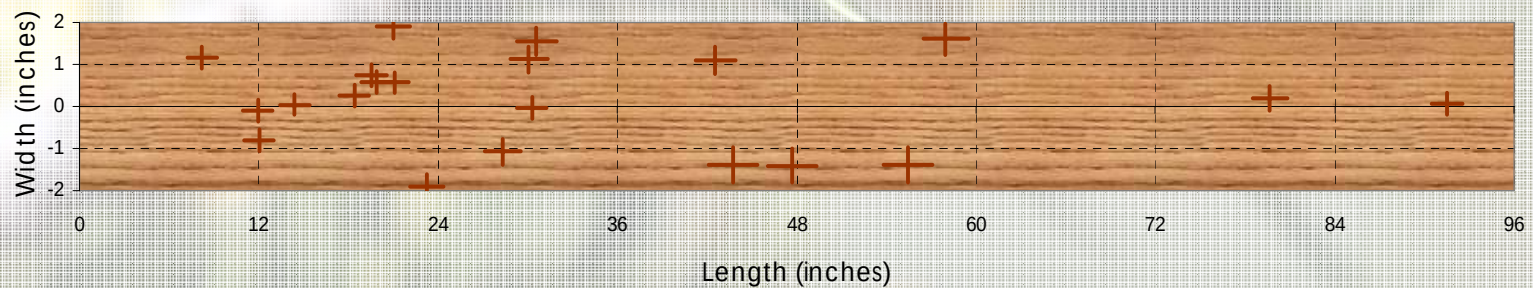
Jozsa, 1994

EXAMPLE OF KNOTS ON BOARDS

Knot Location and Size on 4" Wide Board (South side)



Knot Location and Size on 4" Wide Boards (North side)



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