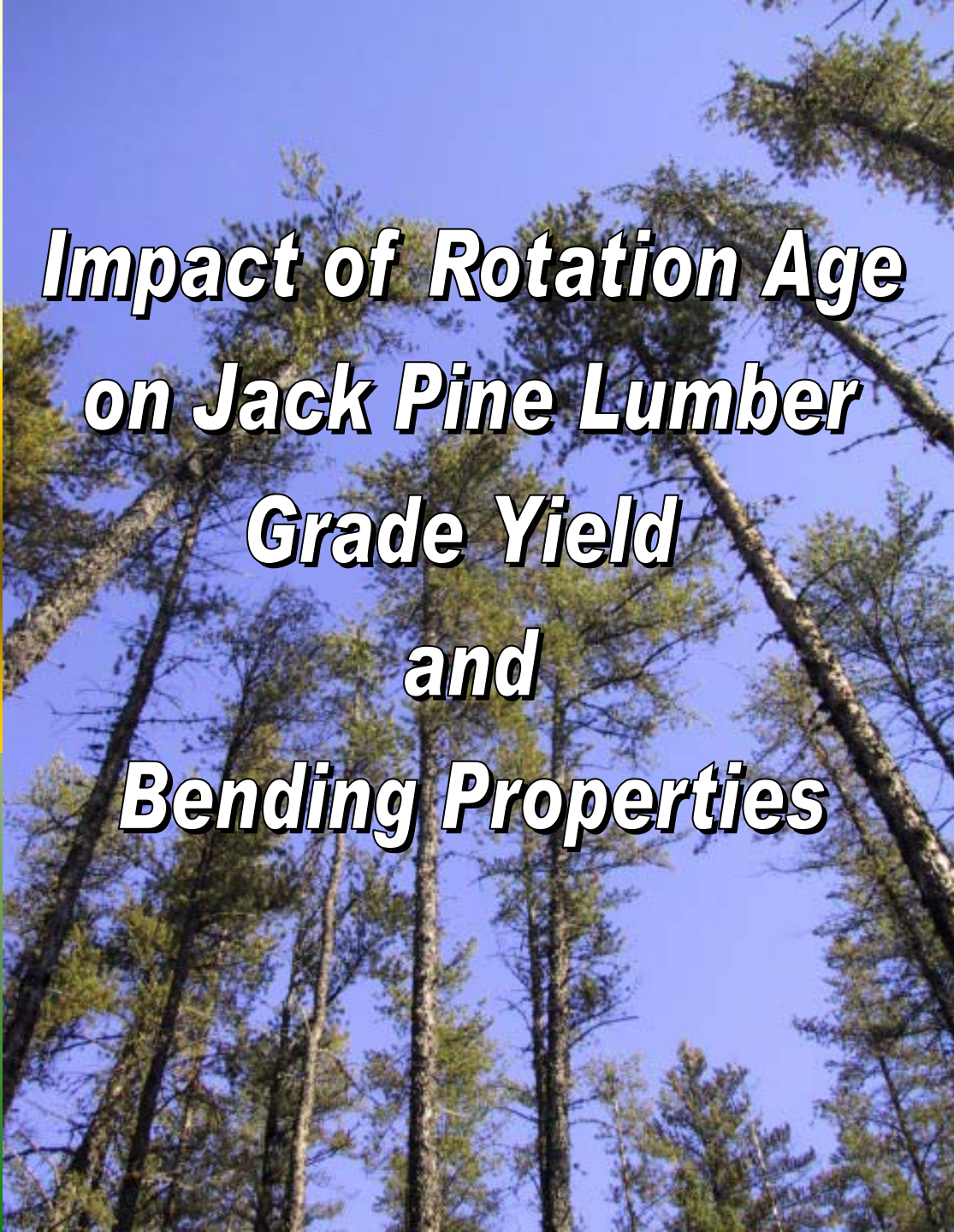




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***Impact of Rotation Age
on Jack Pine Lumber
Grade Yield
and
Bending Properties***



Impact of Rotation Age in Natural Jack Pine Stands

Presentation Outline

- **Background**
- **Materials and Methods**
- **Results**
 - **Stand characteristics and volume**
 - **Visual lumber grade yield**
 - **Lumber strength and stiffness**
- **Conclusions**



Background - Jack Pine

- One of Canada's most important commercial softwood species (lumber & pulp)
- Need better knowledge on how forest management decisions influence lumber and fibre quality
- **Rotation age is one parameter that can help optimize wood utilization.**

Objective



Determine the effect of **rotation age** on
lumber grade,
bending strength and
stiffness for
jack pine

(Pinus banksiana Lamb.)

Three natural jack pine stands selected for the study

- **3 rotation ages: 50, 73, 90 years**
- **Located in Timmins, Ontario**
- **All regenerated after forest fires**
- **Same site class**
- **Unmanaged stands**



50 yrs

73 yrs

90 yrs



Resource Assessment and Utilization

Sampling (142 trees)

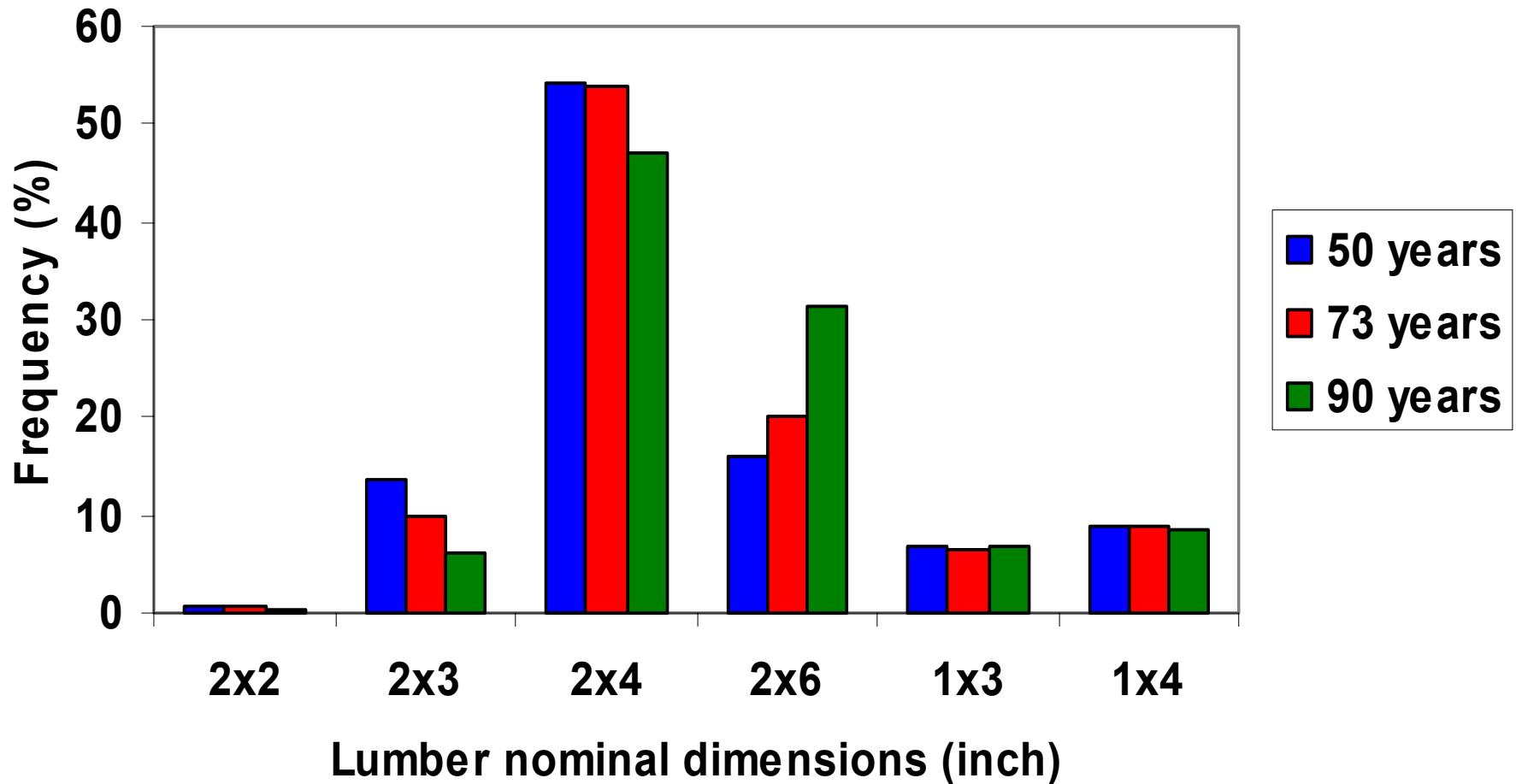
- 6 trees / DBH class / rotation age
- DBH range: 10-30 cm
- Tree height and diameter
- Wood discs



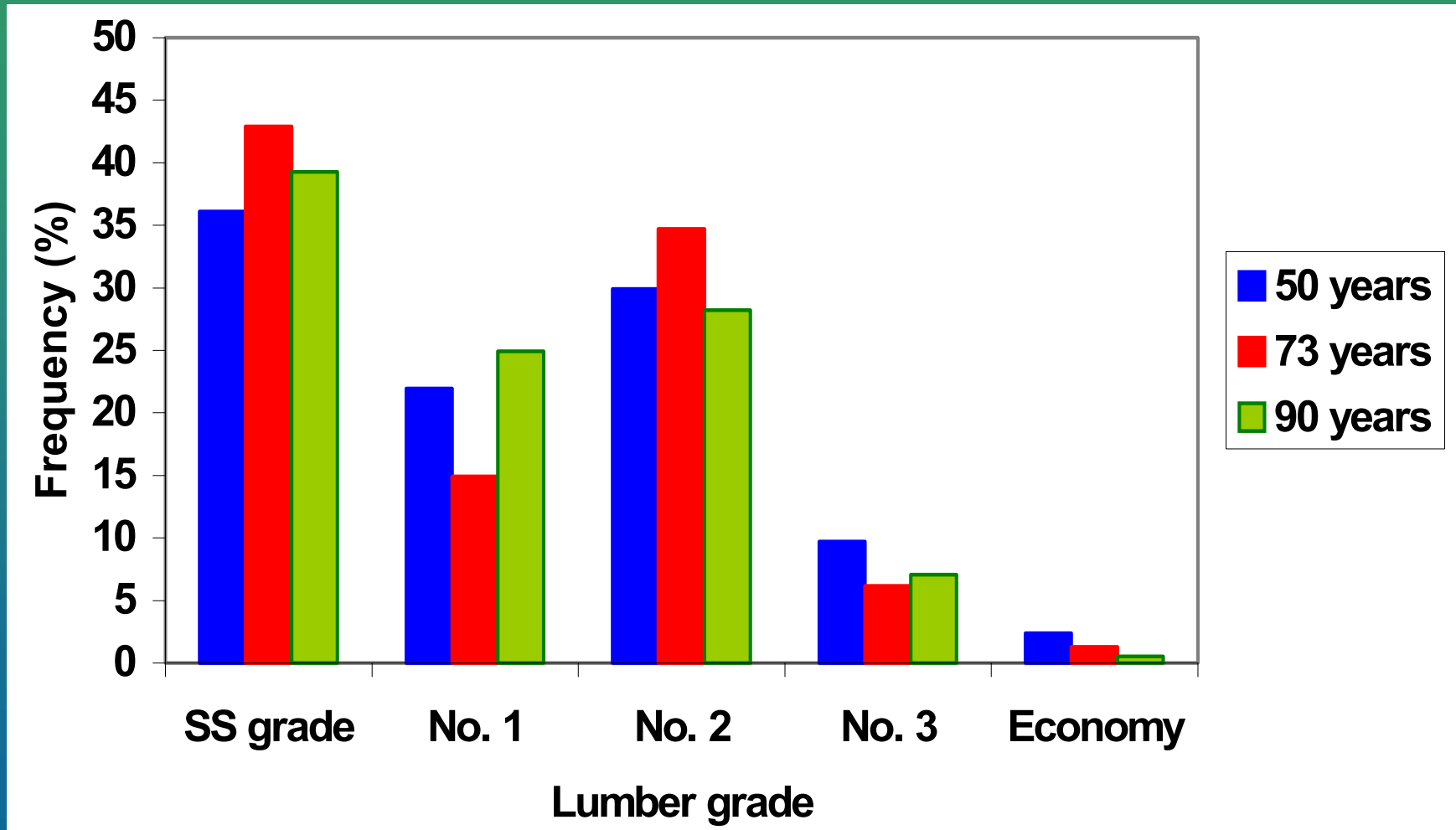
Stand data for the 3 sample stands

	Rotation age (years)		
	50	73	90
No. of trees sampled per stand	44	49	49
Stand density (trees/ha)	1275	1050	725 ↘
Tree mortality in the stand (%)	19	15	34 ↗
Average DBH (cm)	16.7	19.4	22.4 ↗
Stem volume - stand level (dm ³ /tree)	205.7	265.3	397.1 ↗
Total merchantable volume (m³/ha)	262.3	278.5	288.8 ↗
Stand productivity (m³/ha/year)	5.25	3.82	3.21 ↘

Lumber dimension frequency in relation to rotation age



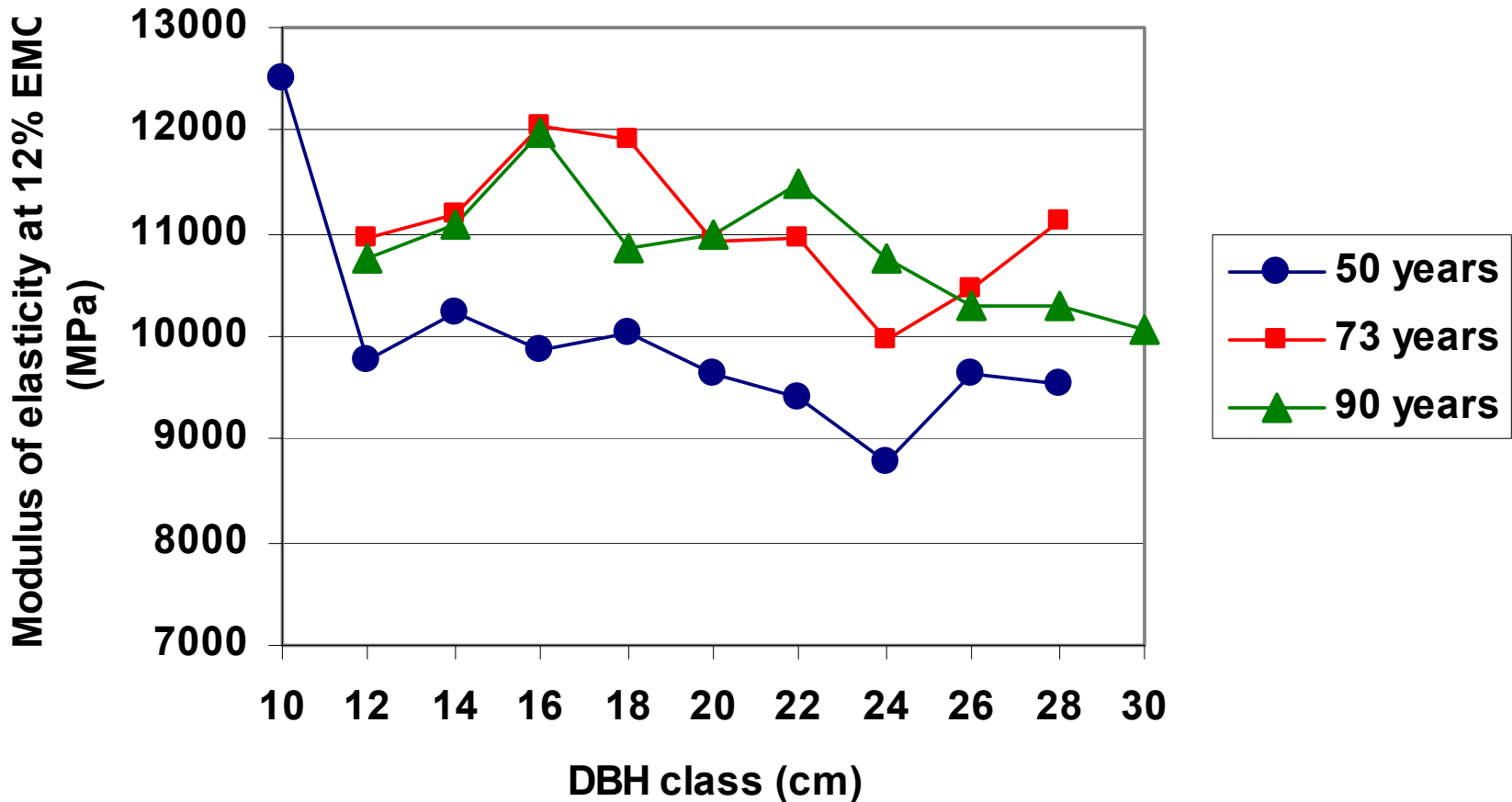
Visual lumber grade yield in relation to rotation age



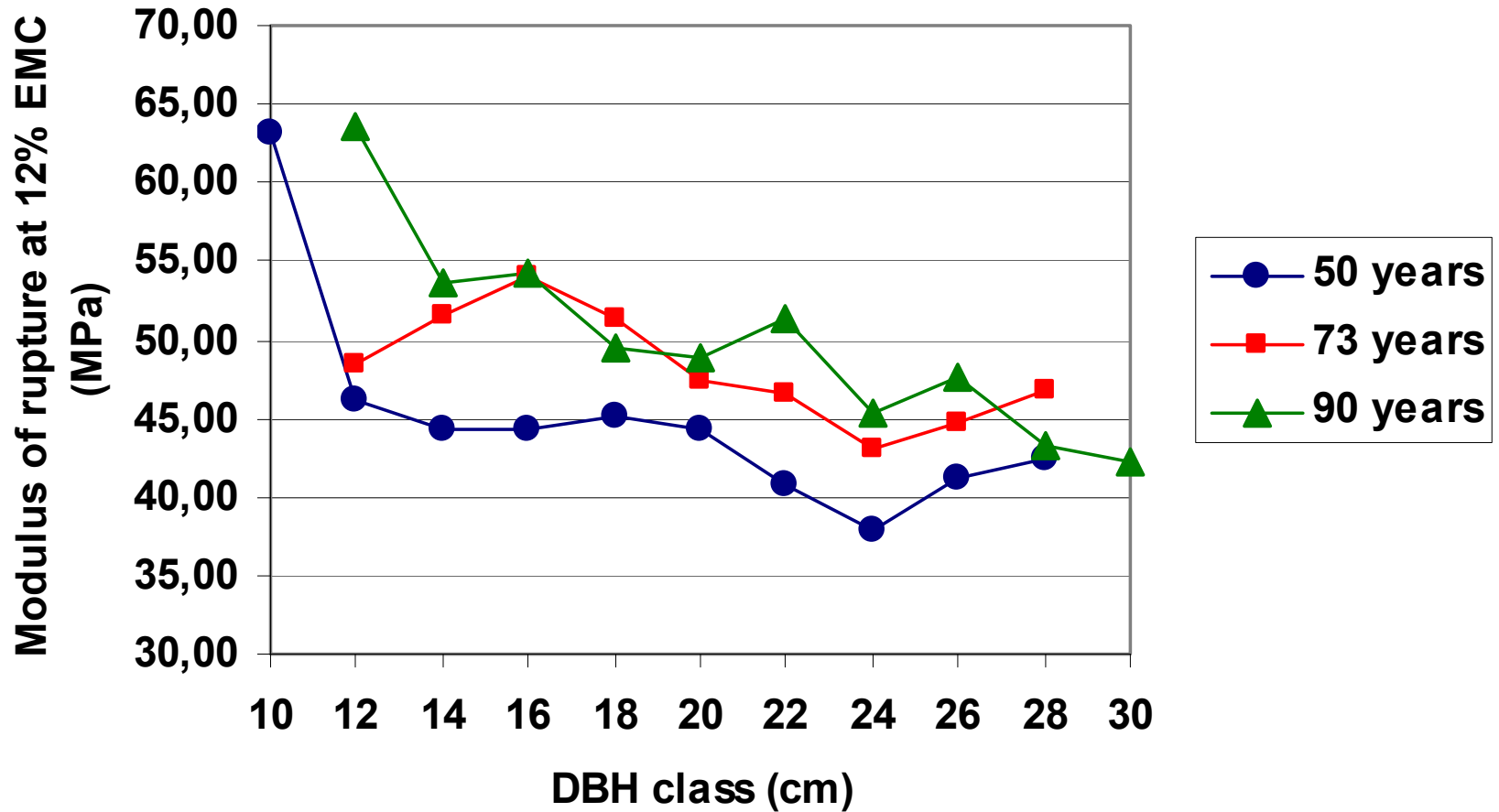
Percentage of lumber downgrade to No. 3 and Economy

Defect	Rotation age (years)		
	50	73	90
Knots	33.3	15.5	31.2
Wane	23.8	39.0	36.7
Decay	0.0	5.2	20.6
Compression wood	14.6	6.3	4.3
Shake	28.3	30.3	6.2
Others	0.0	3.7	1.0
Total	100.0	100.0	100.0

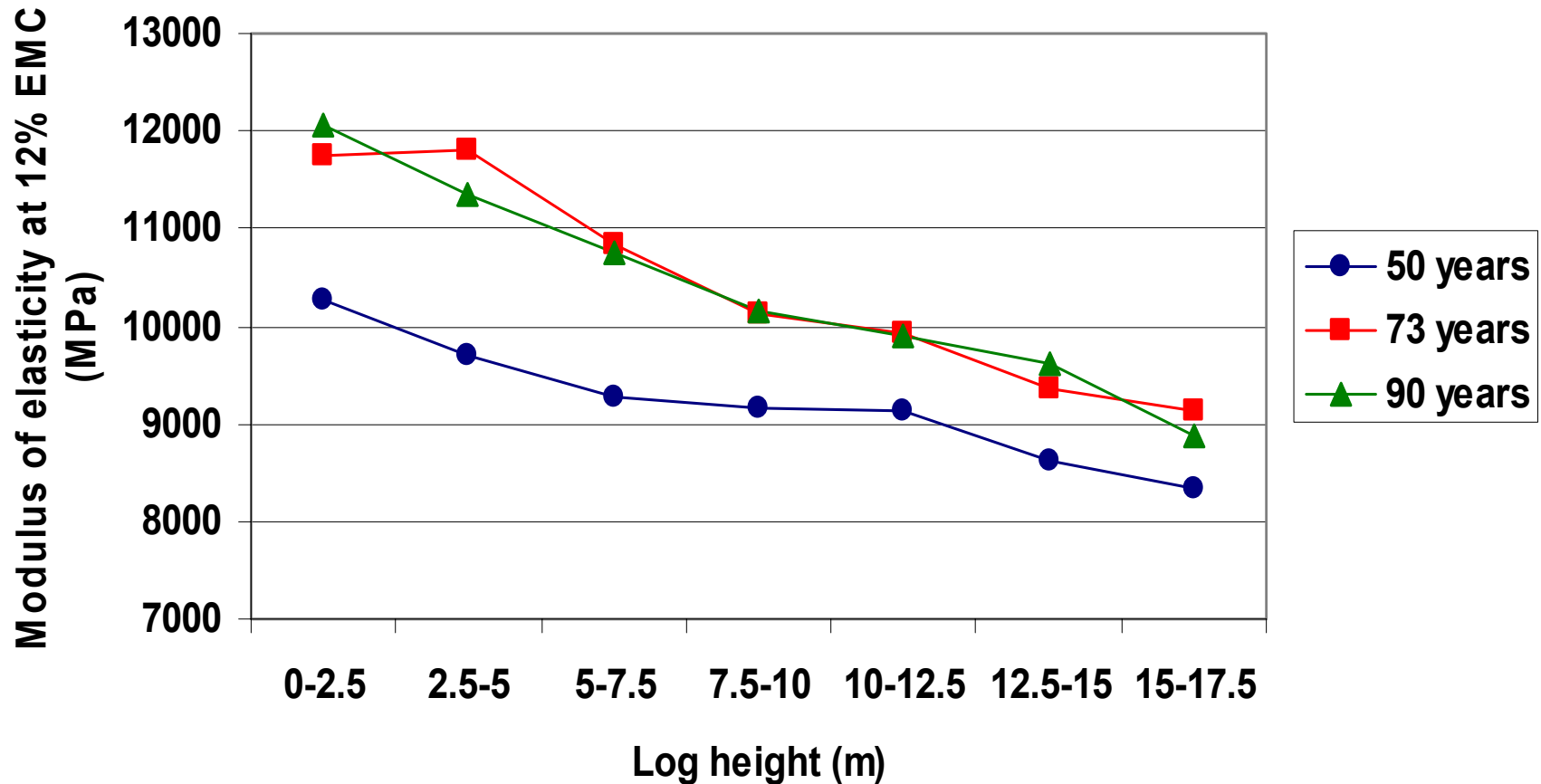
Lumber stiffness (MOE) in relation to DBH class and rotation age



Lumber strength (MOR) in relation to DBH class and rotation age



MOE in relation to log position in the tree and rotation age



% of lumber pieces that satisfy the design code specifications for MOE

Visual grade	Design values used Mean MOE (MPa)	Mean MOE (MPa)			Percentage of lumber pieces which meet the bending stiffness design values (%)		
		Rotation age (years)			Rotation age (years)		
		50	73	90	50	73	90
Select Struct.	10865	10099	11453	11457	26.1	63.8	61.1
No. 1	10044	9135	10167	10007	22.6	50.6	34.6
No. 2	10044	9516	10621	10667	34.7	58.9	60.8
No. 3	9296	8514	10212	9402	27.1	71.8	49.2
Grand total		9316	10613	10382	<u>28.4</u>	<u>60.6</u>	<u>53.5</u>

50-year rotation as compared to 73 and 90 years - Synthesis

- 50-year rotation had the highest stand productivity of 5.25 m³/ha/yr vs 3.82 and 3.21 m³/ha/yr resp.
- **MOR and MOE values were 16% and 19% lower than those of the 2 older stands.**
- Only 28.4% of the pieces tested satisfied the MOE design code specifications, as compared to 60.6% for the 73-yr stand and 53.5% for the 90-yr stand.



Conclusions

- **Rotation age had a significant impact on lumber bending properties.**
- **50 year-old stand produced low-strength lumber (juvenile wood) = too young for harvest.**
- **From the standpoint of wood quality, a moderate rotation age of about 70 years is preferred.**

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