TreProX: Innovations in Training and Exchange of Standards for Wood Processing

THE WOOD PROPERTIES OF ALASKA POPLAR

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TreProX
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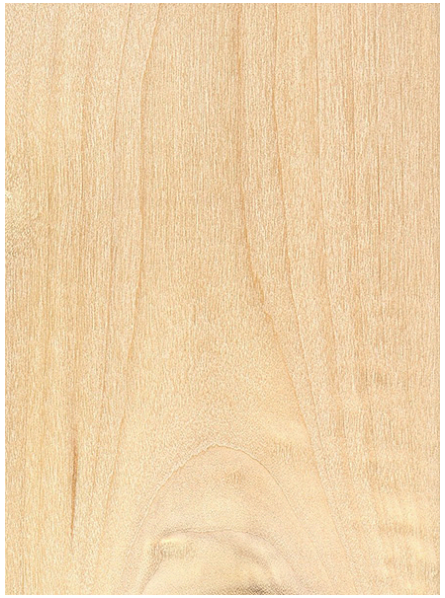
Trétækniráðgjöf slf. Wood Technology
UNIVERSITY OF COPENHAGEN
Linnæus University
Erasmus+

The Wood properties of Alaska poplar (*Populus balsamifera* ssp. *trichocarpa*)

(Viðargæði alaskaaspar)

Black Cottonwood, Western cottonwood, Balsam poplar, Balsam cottonwood



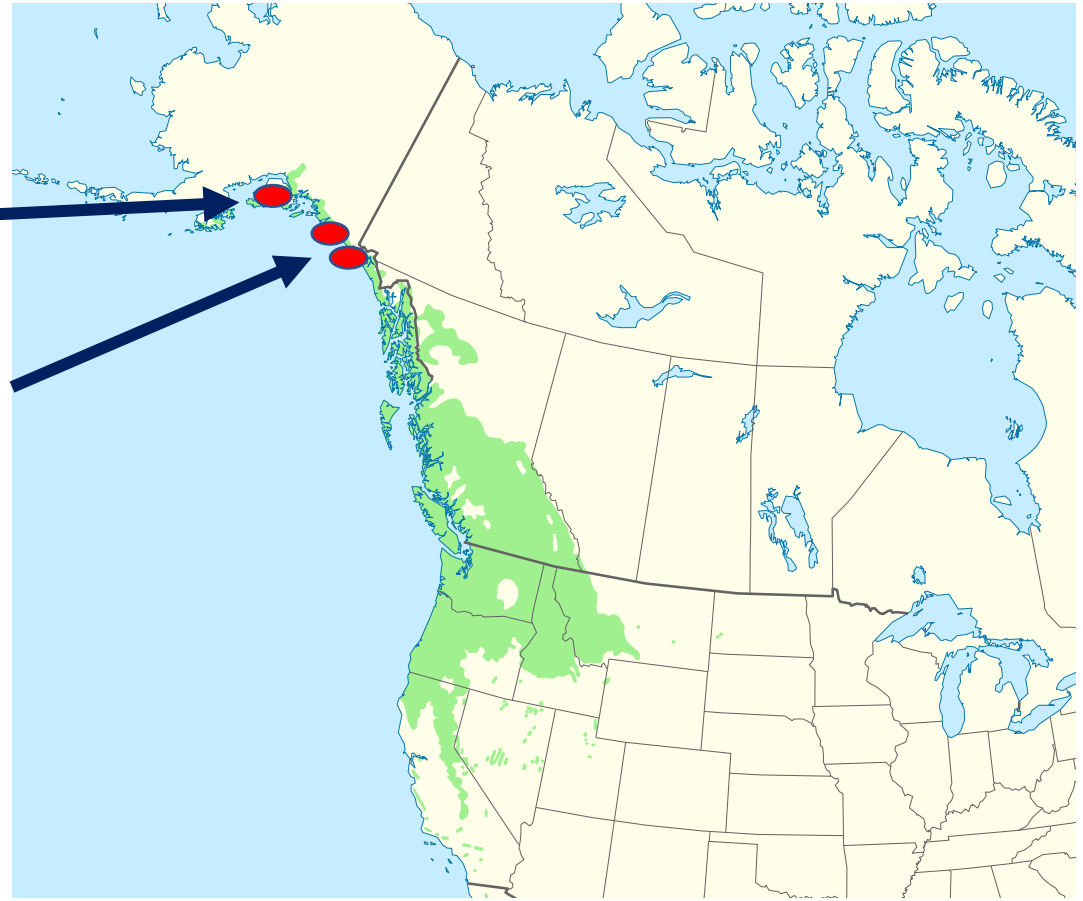
- Alaskan poplar is a large deciduous tree belonging to the willow family (Salicaceae).
- It is one of the largest of some 40 species of *Populus* and is the tallest, fastest-growing hardwood in the western United States.

Black cottonwood in Iceland (Alaska poplar)

Places of origin of poplars (Populus trichocarpa) in South-Alaska

Kenai-peninsula, the first collection, in 1944 (Sensitive to spring frost)

Cordova and **Yakutat** regions are mainly used in Iceland now. Most of them are from a collection in 1963



Populus trichocarpa range map

Cottonwood is a common tree along rivers and streams throughout the West USA

Poplars are the only broadleaved trees that can be used in Icelandic forestry except the native rowan and birch

- They are well suited for breeding programs
- Poplars are fast growing, the fastest growing tree species in Icelandic forestry.
- There is a lot of (marginal) land available for poplar in Iceland
- There is a good market for the products from Alaska poplar, e.g., in industry.

An example of n ongoing breeding program in south Iceland

Breeding in order to obtain clones with:

- increased yield.
- improved resistance against diseases and pests.

Use of poplars in Iceland

- Street trees
- Shelter
- Land reclamation
- Wood production
- Biomass and energy
- Carbon requestration

Wood production

Carbon sequestration

Biomass

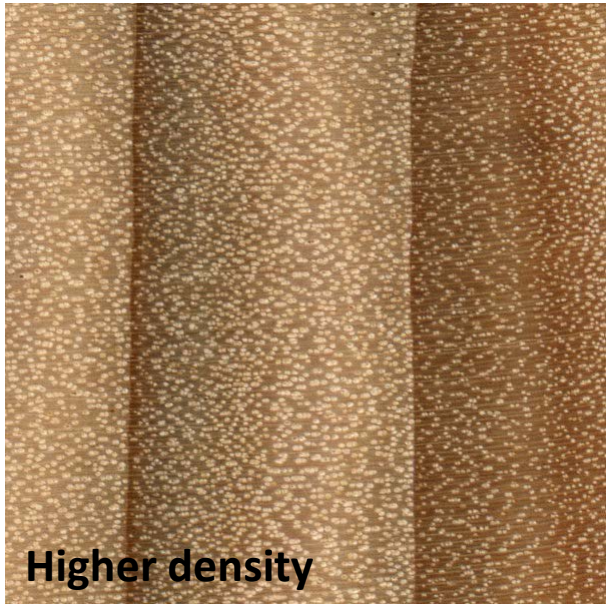
Land reclamation

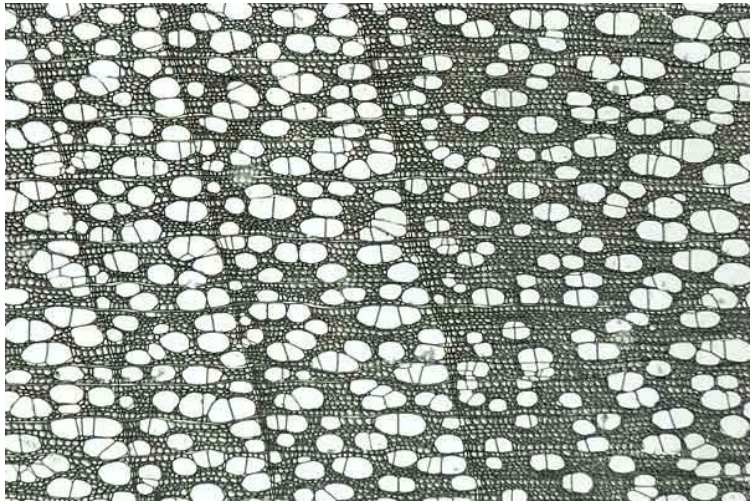
The wood anatomy of Alaskan Poplar

(Viðarfræði Alaskaaspar)

- The wood tends to be a light brown to white , often with a “false” dark brown heartwood (kjarna).
- They all have relatively small pores
- Anatomically, the Alaskan poplar is diffuse porous.

Alaska poplar “false” heartwood





Can we use e.g Alaskan poplar for constructions

For that we need a “quality standard” for Alaskan poplar.
Today there are no existing standards for poplar timber

The first step is to study the following parameters in Alaskan poplar.

- **Basic density** (grunneðlisþyngd):
- **Bending strength (MOR)** (beygjutogþol): is a measure of a wood's strength before rupture (brake).
- **Modulus of elasticity (MOE)** (stífni):is a measure of the stiffness of the wood.

CE

Identification number of FPC certification body

Producer identification
Marking year
FPC certificate number

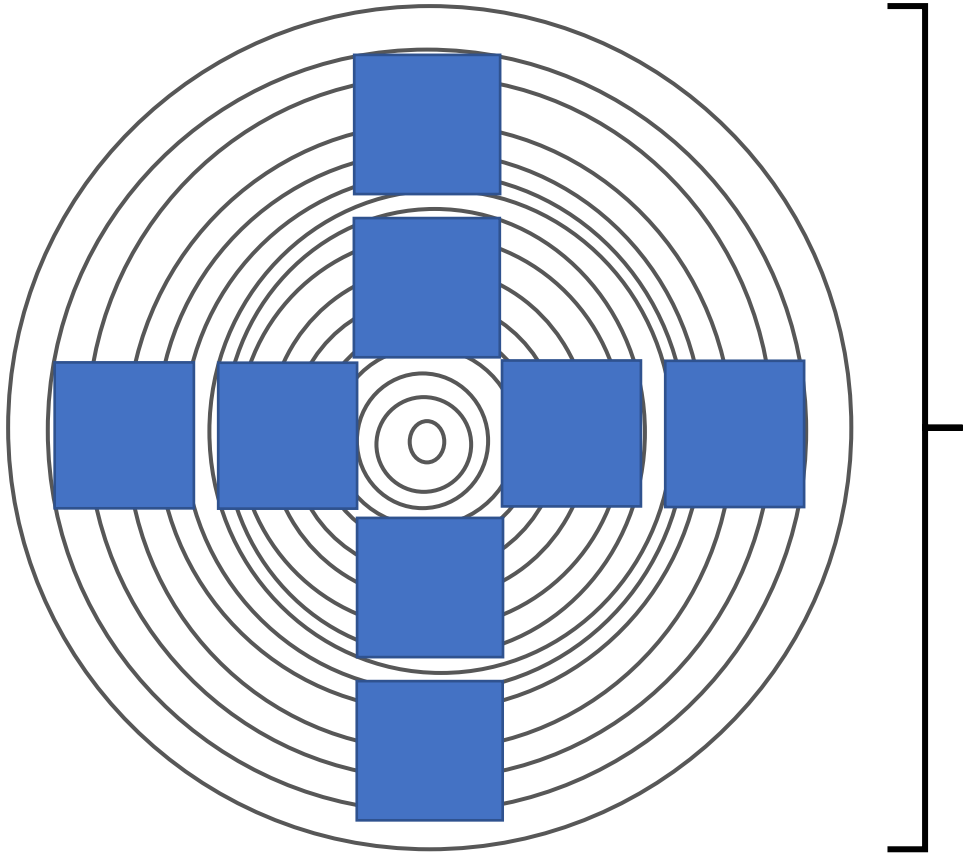
EN 14081-1

Structural timber	
Strength class	C24 (S10)
Species code	Spruce (PCAB)
Grading standard	EN 338 and DIN 4074-1
Reaction to fire	D-s2, d0
Durability class	4

The material that was tested

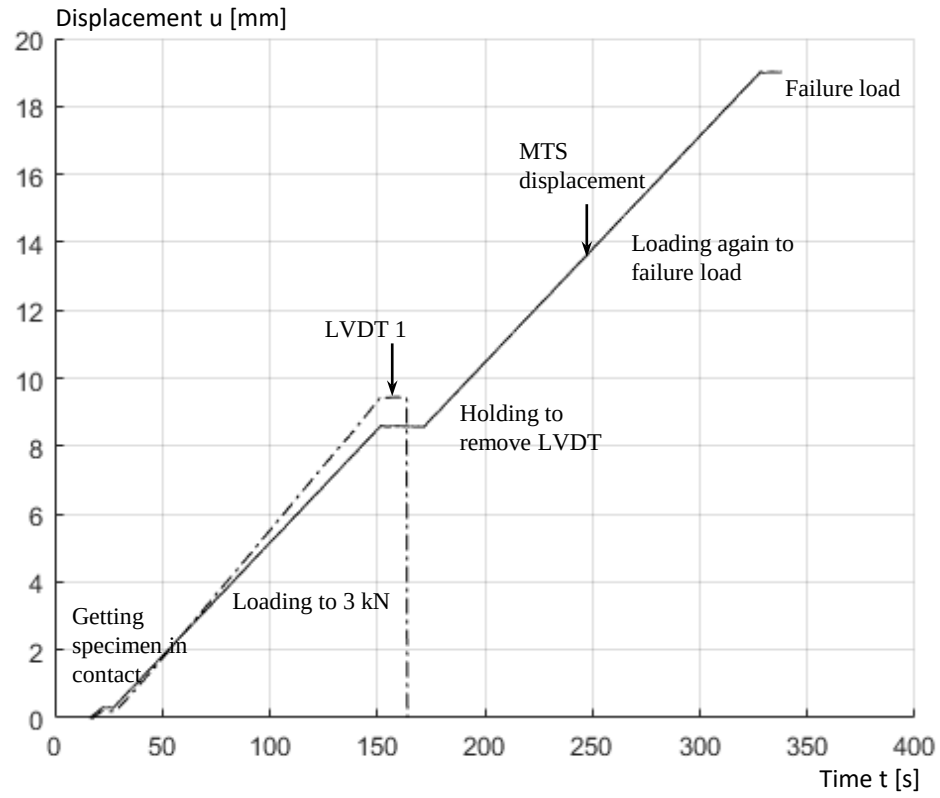
The material was collected and tested according to ISO 3129 and ISO 13061 standards for small clear wood specimens. Tested at Linnaeus University in Sweden and Límtré vírnet ehf.

The size of tested pins is 30*30*400 mm

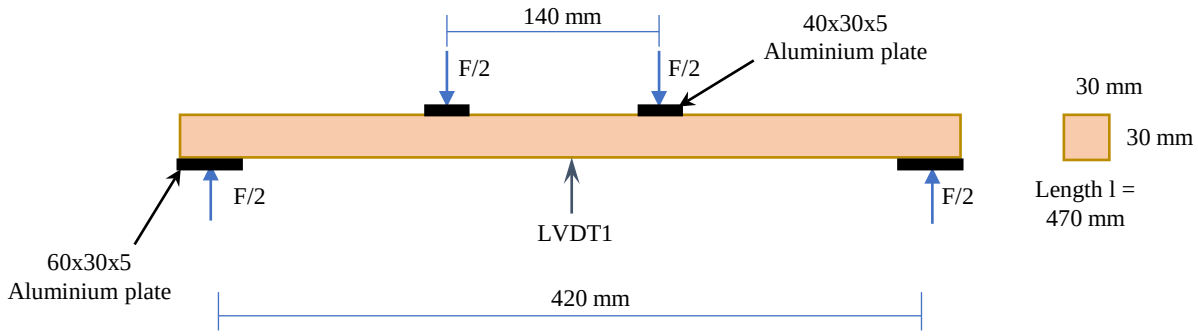


Experiment setup

4 point bending Test



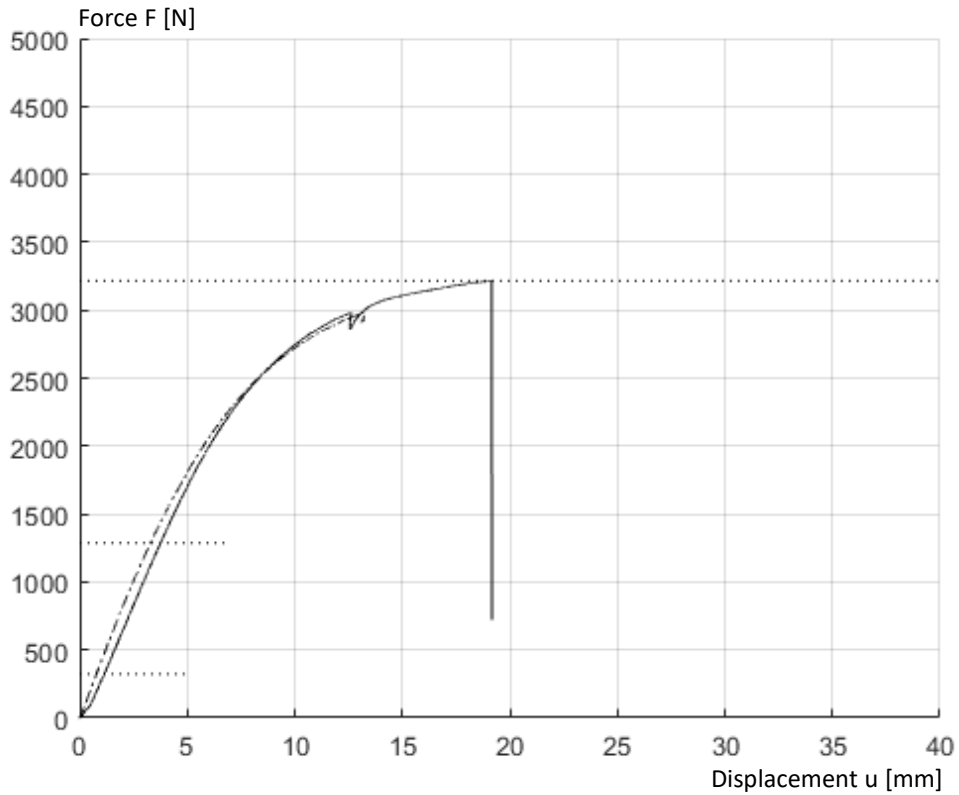
Displacement time curve for load procedure



Experiment setup

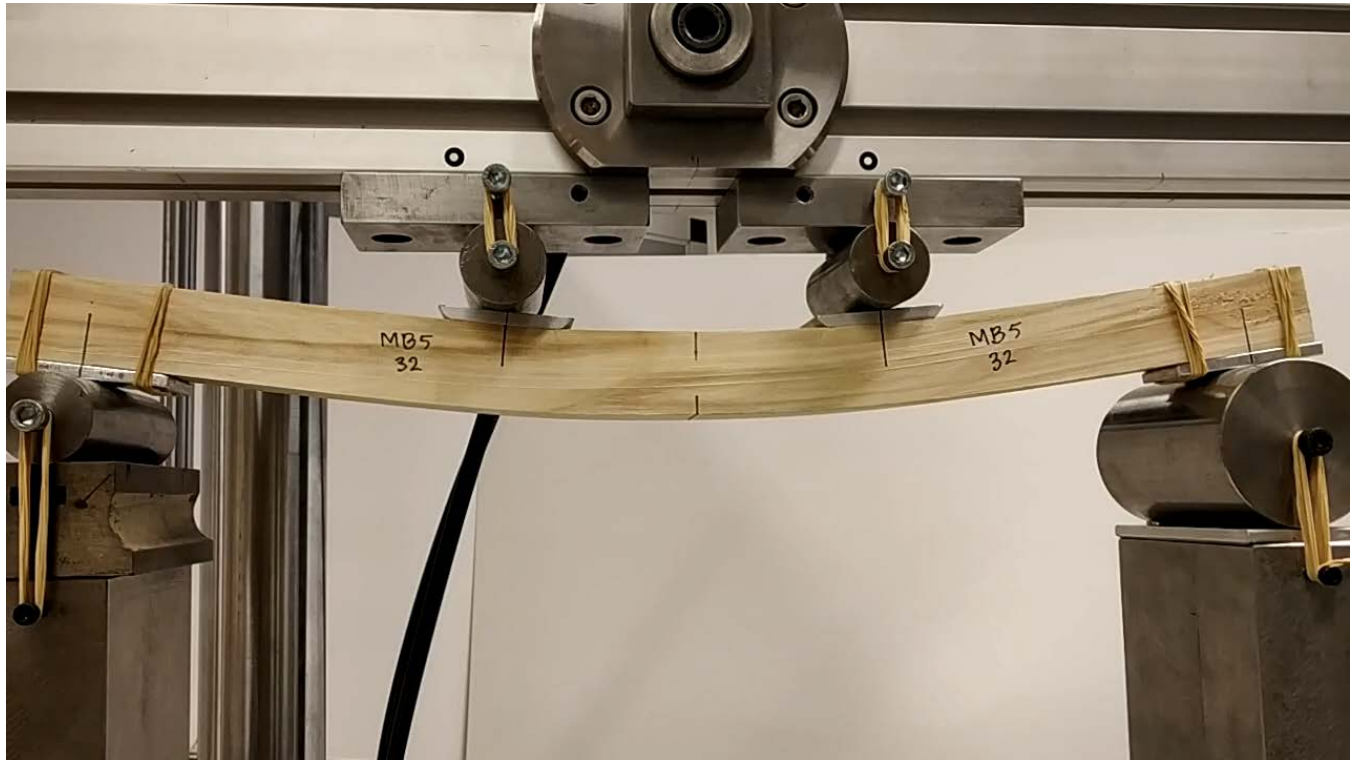
Linnæus University

Sampel video, Alaskan Poplar



Force displacement curve

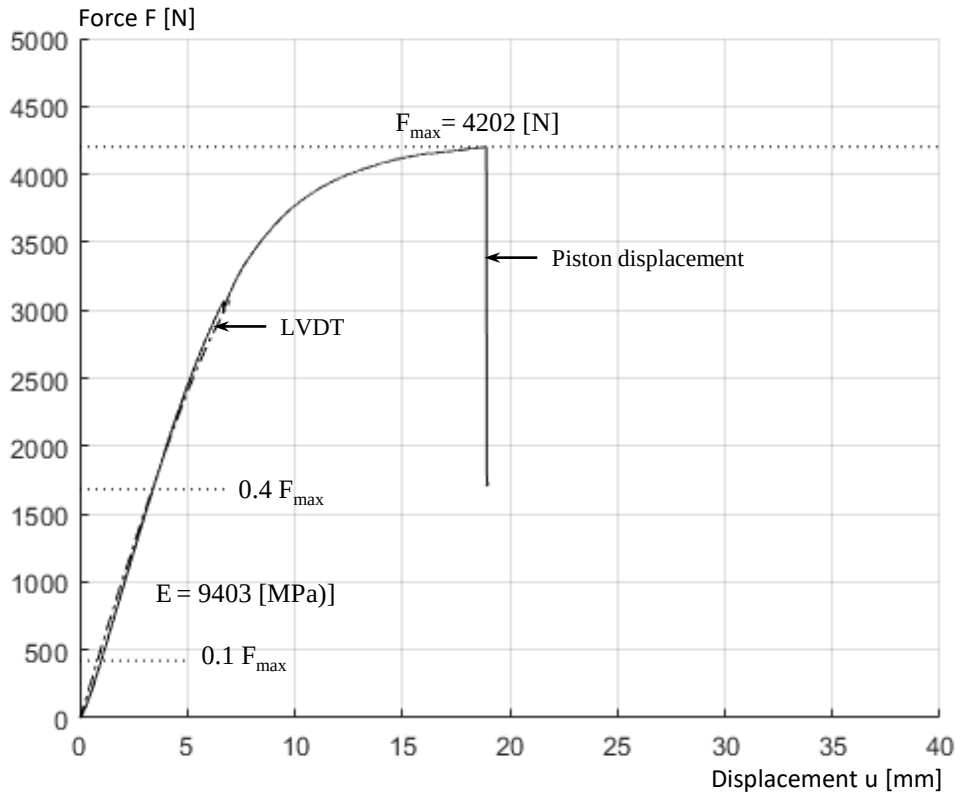
rate of loading 6 mm/min



Linnæus University

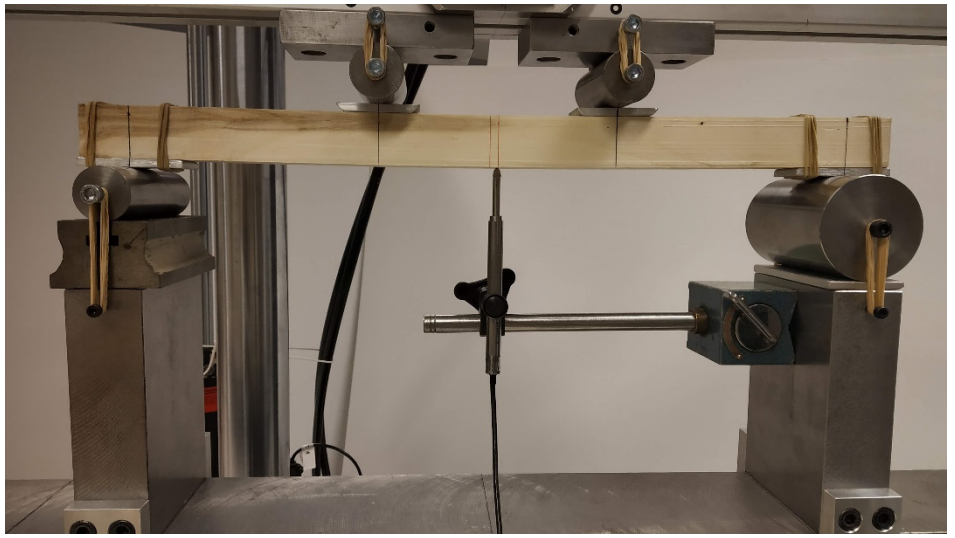
4 point bending Test

Specimen 08, CB9



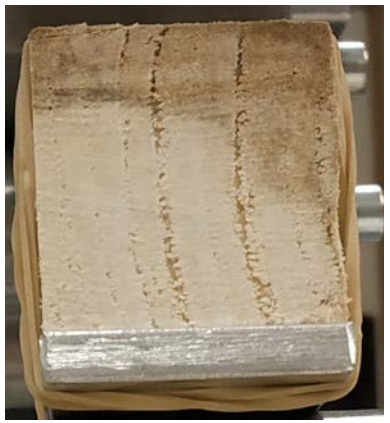
Force displacement curve

rate of loading 5 mm/min

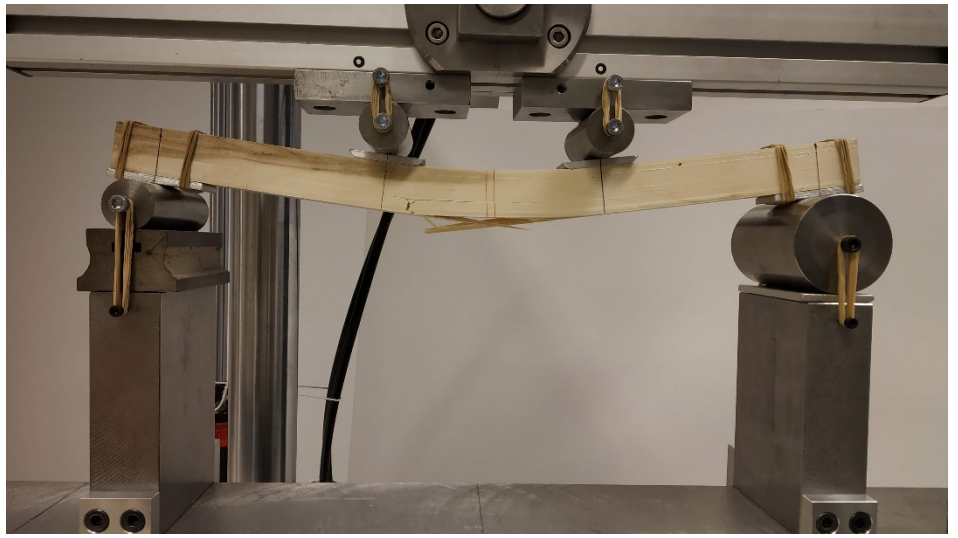


Loading specimen

Cross section A



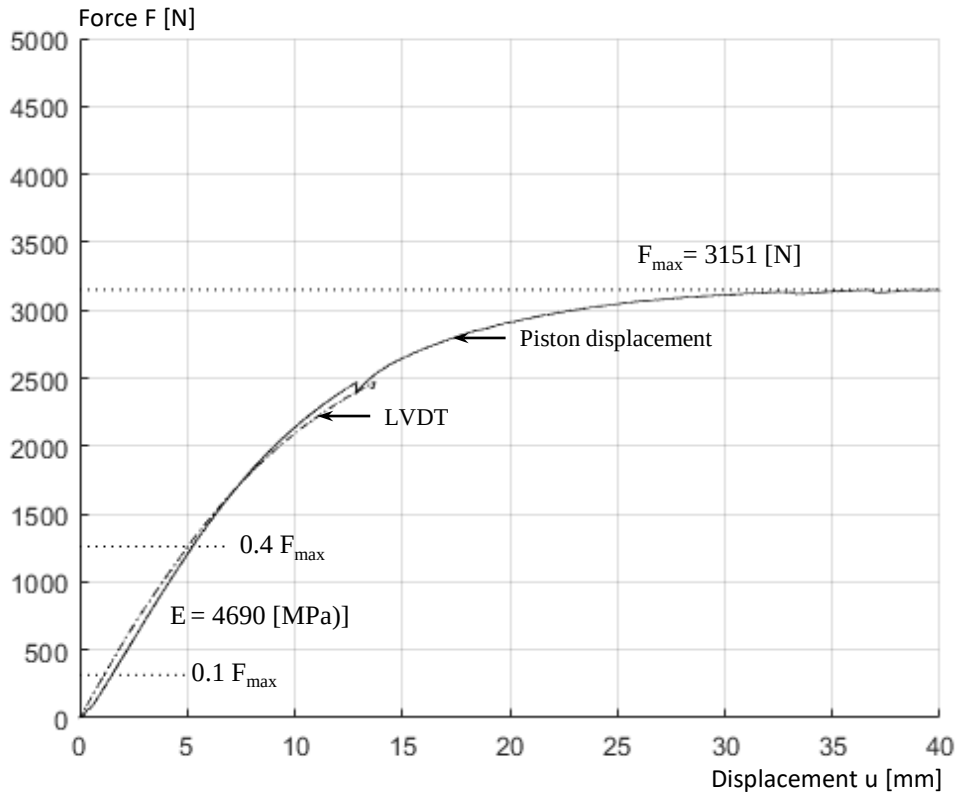
Cross section B



Failure point

Linnæus University

Specimen 19, CA7

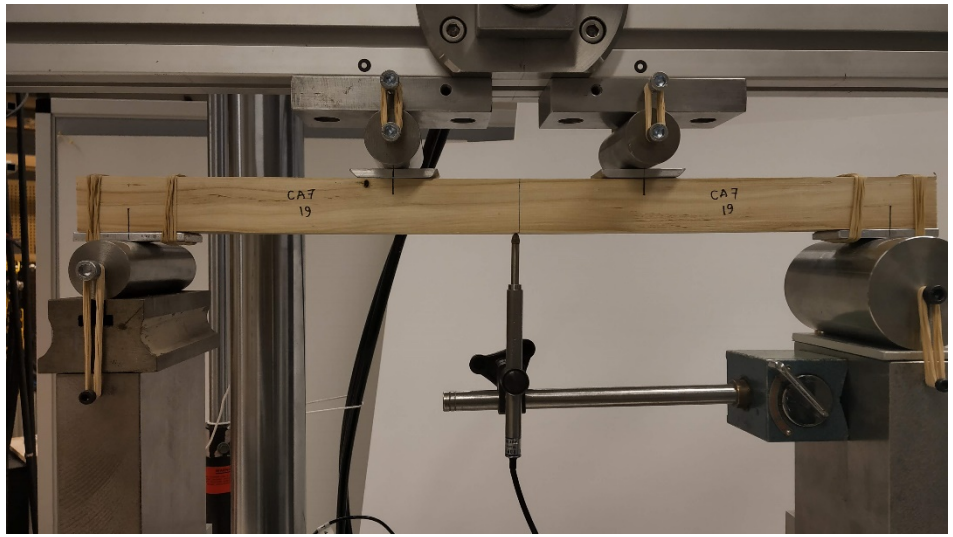


Force displacement curve

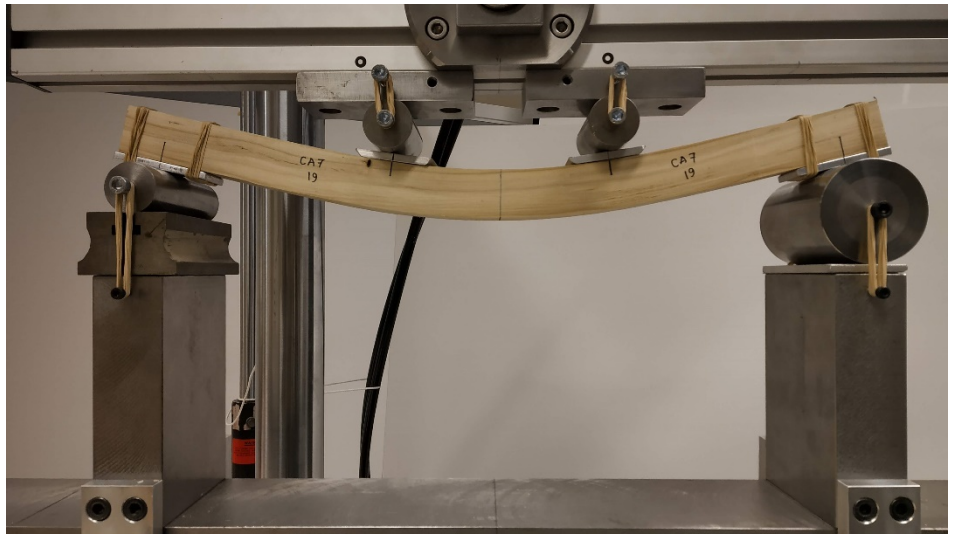
rate of loading 6 mm/min

Cross section A

Cross section B



Loading specimen



Failure point

Linnæus University

Results: Basic density (grunneðlisþyngd):

Location	No	Klónn/kvæmi	Basic density g/cm³	Staðalfrávik	Number of samples
Hallormsstaður	Tré nr 1	Kenai Lake	0,343	0,027	40
Hallormsstaður	Tré nr 2	Kenai Lake	0,346	0,027	25
Hallormsstaður	Tré nr 3	Kenai Lake	0,345	0,023	20
Hallormsstaður	Tré nr 4	Kenai Lake	0,347	0,028	25
Suðurland	Tré nr 1	Iðunn	**0,437**	0,023	9
Suðurland	Tré nr 2	Iðunn	**0,426**	0,025	8
Suðurland	Tré nr 3	Iðunn	**0,432**	0,025	16
Suðurland	Tré nr 1	Espiflöt	0,344	0,019	32
Suðurland	Tré nr 1	Yakutat 14/20	0,292	0,022	59
Suðurland	Tré nr 1	Cordova 10/3	0,340	0,021	5

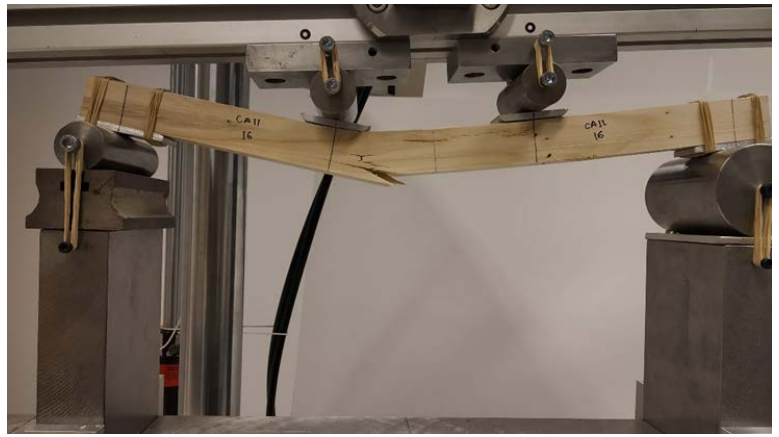
Results: Bending strength (MOR) and Modulus of elasticity (MOE) (stífni)

Location	No	Klónn/kvæmi	Bending strength (MOR) N/mm2	Modulus of elasticity (MOE) N/mm2
Hallormsstaður	Tré nr 1	Kenai Lake	62,51	6064
Hallormsstaður	Tré nr 2	Kenai Lake	65,00	6433
Hallormsstaður	Tré nr 3	Kenai Lake	68,27	5940
Hallormsstaður	Tré nr 4	Kenai Lake	70,12	6204
Suðurland	Tré nr 1	Iðun	**66,58**	5527
Suðurland	Tré nr 2	Iðun	**72,56**	6356
Suðurland	Tré nr 3	Iðun	**72,35**	5937
Suðurland	Tré nr 1	Espiflöt	59,91	4977
Suðurland	Tré nr 1	Yakutat 14/20	**54,39**	5264
Suðurland	Tré nr 1	Cordova 10/3	61,97	5210

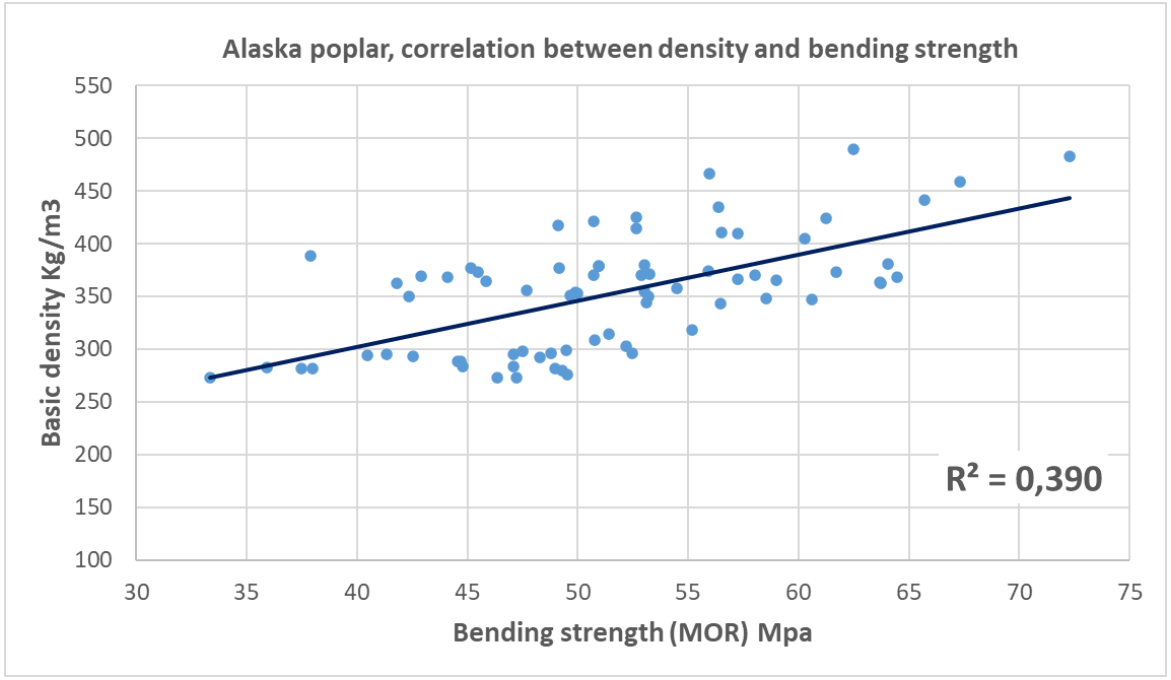
Comparison between species in Icelandic forestry

Tree species	**Bending strength (MOR)** (beygjutogþol)	**Modulus of elasticity (MOE)** (stífni)	**Basic density** (grunneðlisþyngd) Kg/m3
Larix sibirica	92	11697	539
Sitka spruce	74	10444	377
Pinus contorta	71	8278	407
Alaska poplar	**63 (**35-70**)**	**7044 (**3800-9500**)**	**360 (**280-480**)**

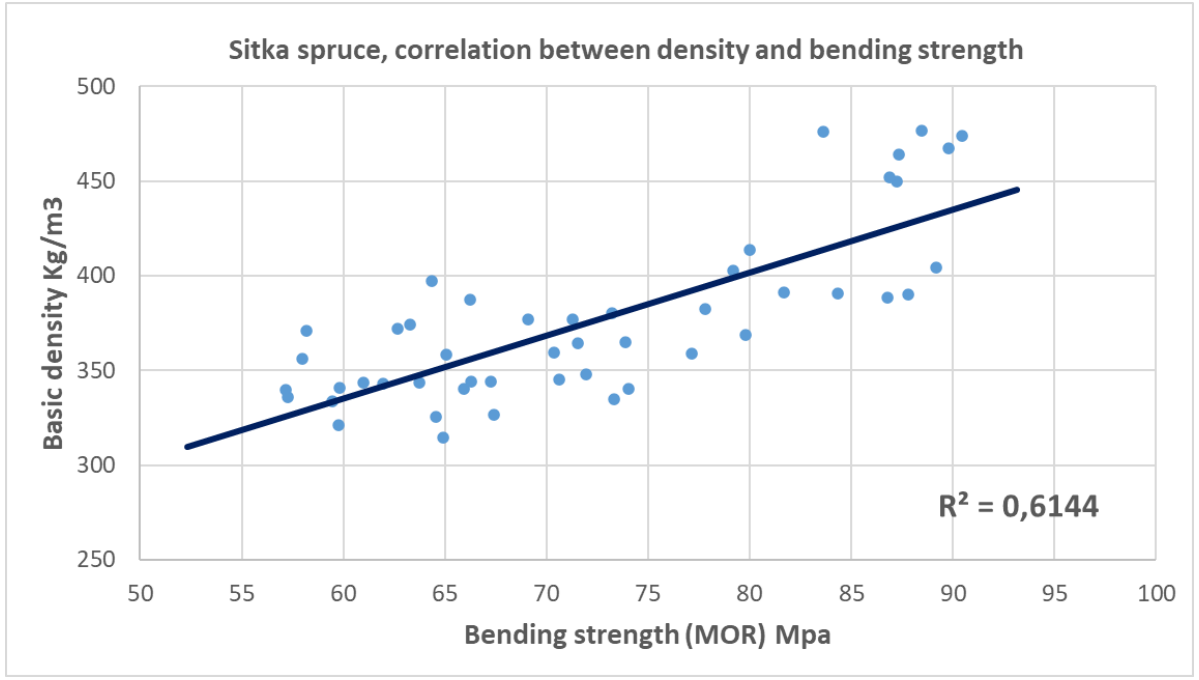
Correlation between **Basic density** (grunneðlisþyngd) and **Bending strength (MOR)** (beygjutogþol)



Alaska poplar



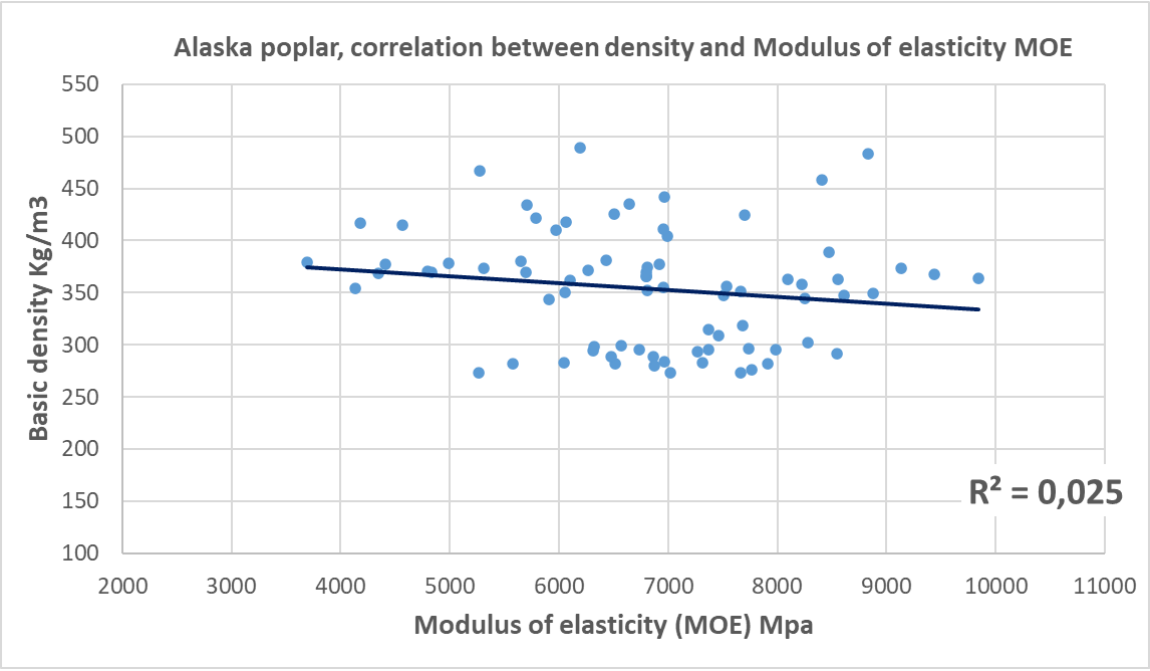
Sitka spruce



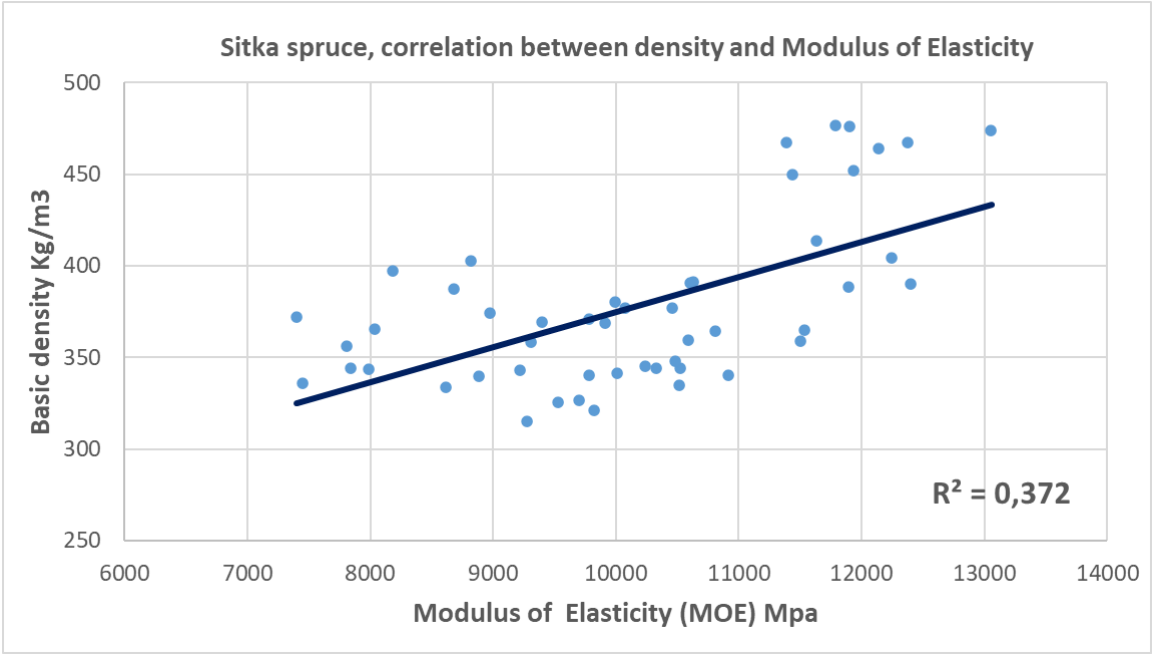
Rather good correlation within both tree species

Correlation between **Basic density** (grunneðlisþyngd), **and Modulus of elasticity (MOE)** (stífni):

Alaska poplar



Sitka spruce



No correlation within Alaska poplar but relatively good correlation for Sitka spruce

Conclusions

- Alaska poplar is the fastest growing tree-species in Icelandic forestry.
- Alaska poplar has relatively low Modulus of elasticity and bending strength values compared to coniferous tree species used in Icelandic forestry.
- The basic density is relatively high and there is a good correlation between bending strength and basic density.
- There is quality difference between clones making it possible to breed for better poplar wood.

According to our results of the Alaska poplar samples to wood can be used as construction timber.

Vallanes East Iceland

A house build nearly entirely form Alaska poplar

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Thanks

Linnæus University

skógræktin
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