



Faculty  
of Forestry  
and Wood  
Technology

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# Selection principles in pioneer stands – from clearing to Dauerwald

Mendel  
University  
in Brno



# Forest future ?

Please tell me...2050.....

?



# ....Forest future



## Middle Age

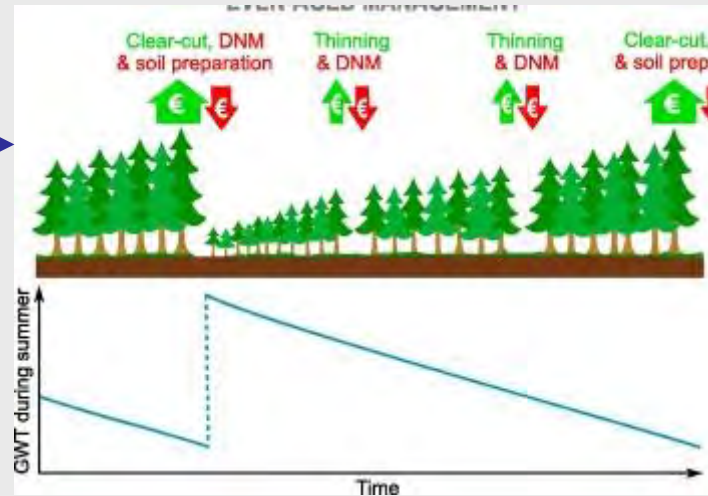
(forest pasture, logging..)...



Source:  
[https://www.google.com/search?q=st%C5%99edov%C4%9Bk%C3%A1+krajina&rlz=1C1GCEA\\_enCZ921CZ921&source=ln...](https://www.google.com/search?q=st%C5%99edov%C4%9Bk%C3%A1+krajina&rlz=1C1GCEA_enCZ921CZ921&source=ln...)

## Industrial time

(even age forestry 18th – 20th century)



Source:  
<https://www.sciencedirect.com/science/article/pii/S0378112718303293#f0010>

Huge deforestation

Calamities....

# Content of the seminar:

- 1) Background; state of art
- 2) Towards future
- 3) Management of pioneer forest
- 4) Selection principles in pioneer stands
- 5) Conclusion

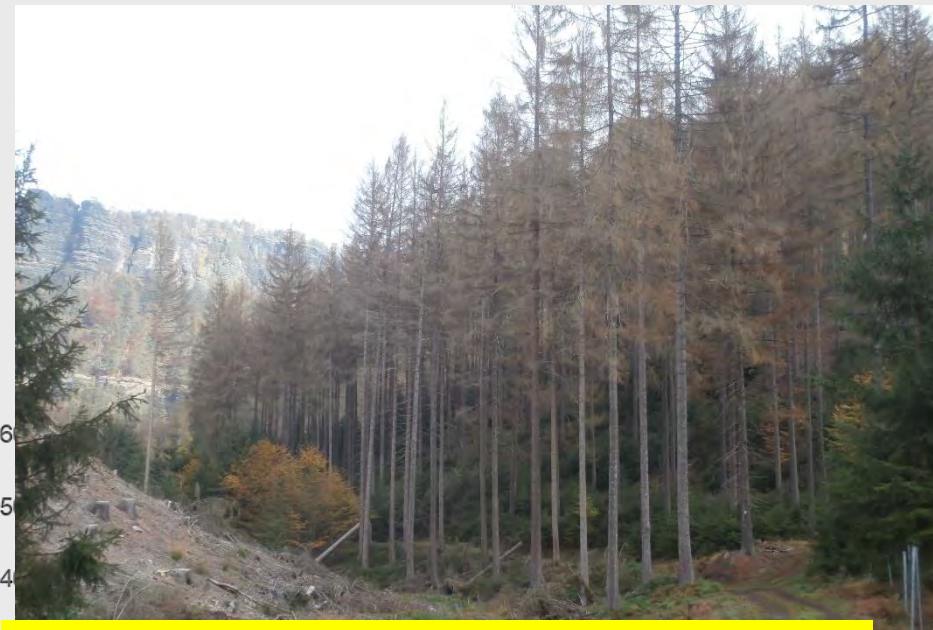
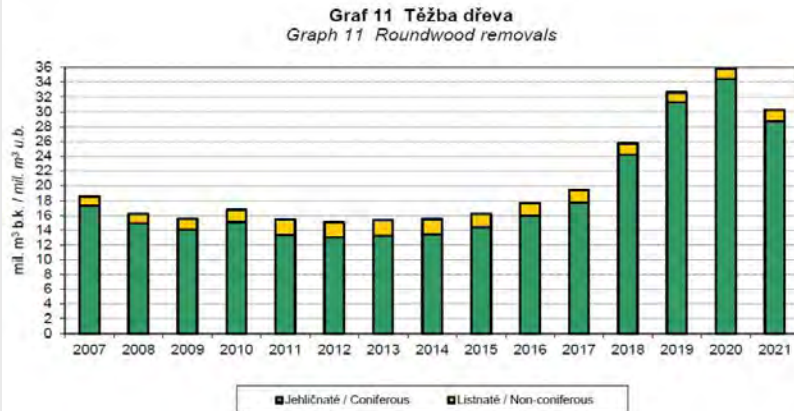




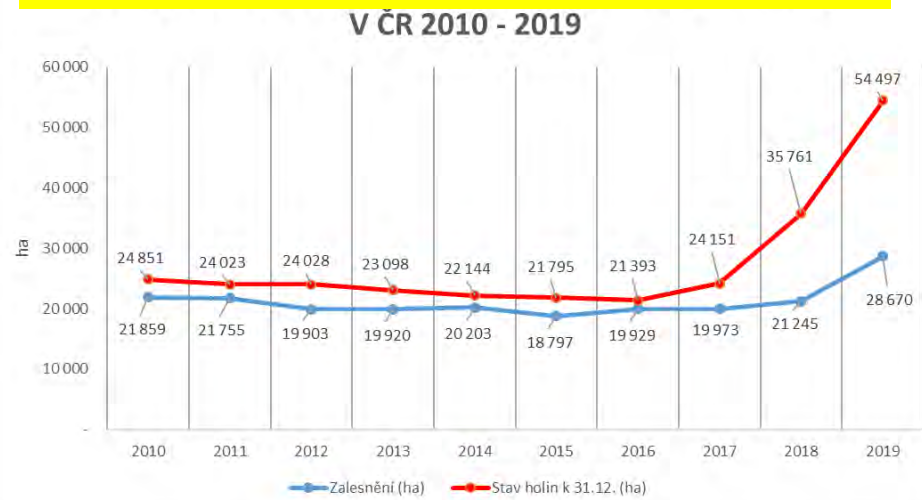
# Present situation:



logging (m<sup>3</sup>)



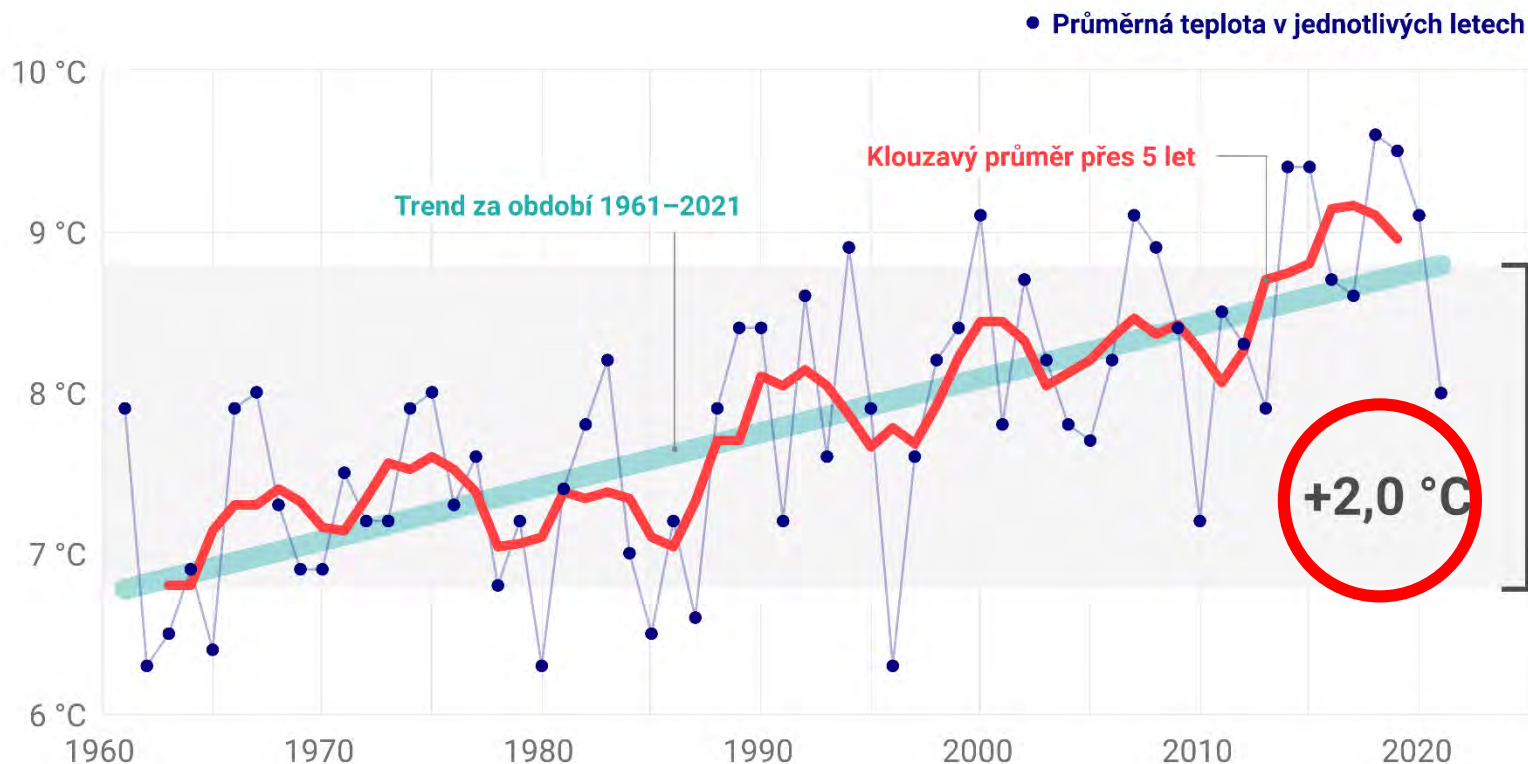
Clearing and artificial reg. (ha)



# Reasons: climate is changing

## Temperature in the Czech rep. (1960 – 2020)

Teplota se od roku 1961 zvýšila o 2,0 °C.





# Reasons: Forestry in industrial time





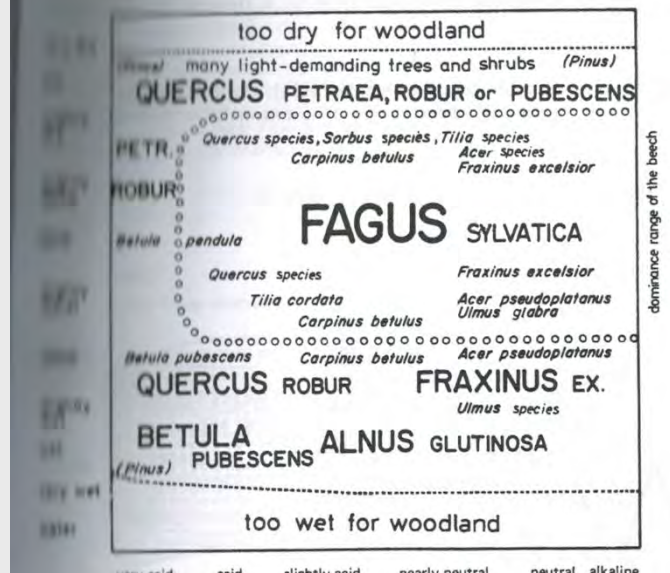
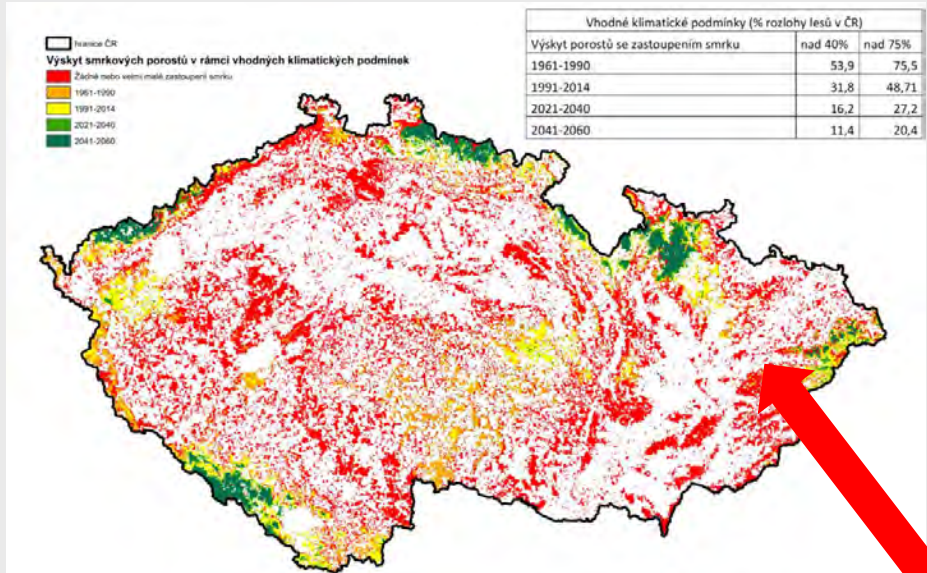
# Reforestation: inertia in nature and in human mind



“George Santayana: Those who do not remember the past are doomed to repeat it.”



# Climatic changes continue...radical change in forest structure



Reduction area suitable for cultivation of spruce and beech

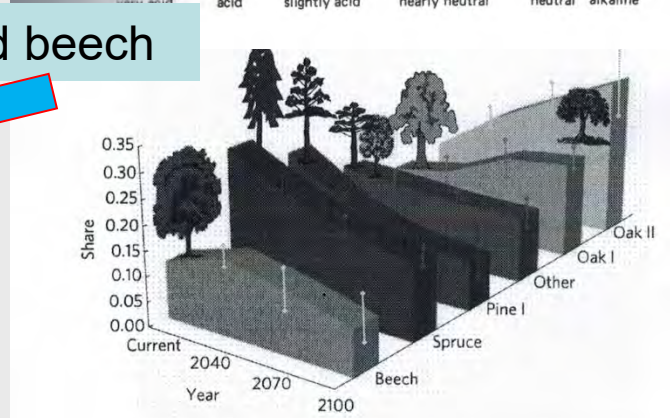
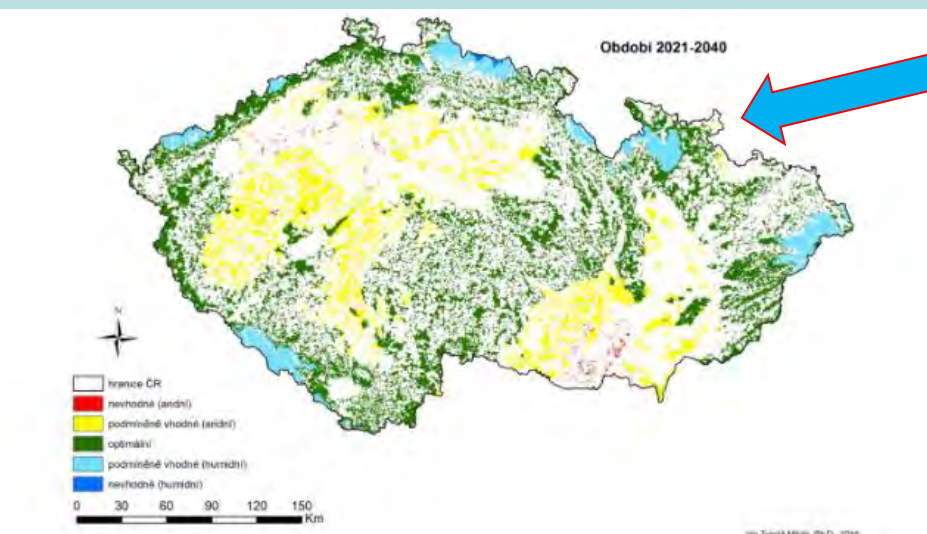
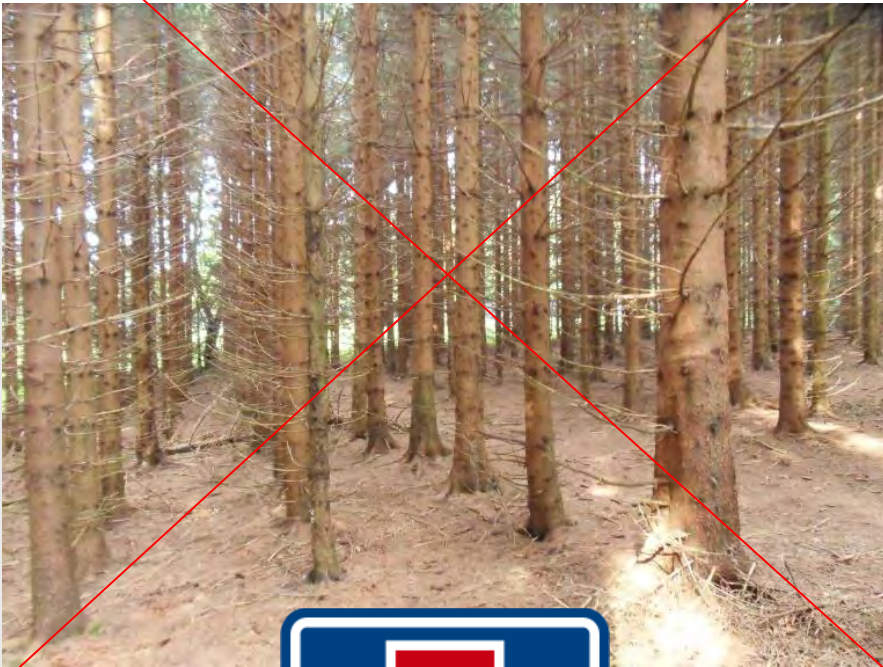
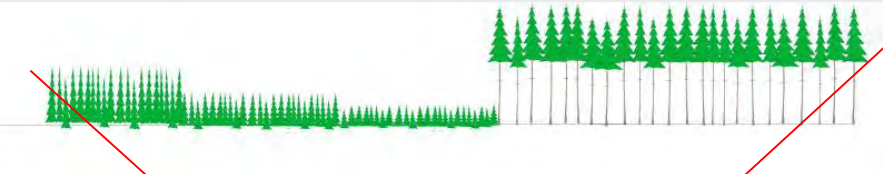


Figure 3 j Development of the share of the area of major tree species in Europe under scenario A1B until 2100. The relative size of the icons approximately corresponds to the relative height of mature trees of the species groups. The tree species group labelled 'Other' includes Pine II, Birch and Other spp. from Figs 1 and 2. The bars reflect the standard

Hanewinkel et al. Climate change may cause severe

Source: Čermák et al. 2016 the economic value of European forestland

# Forestry in unpredictable and uncertain time



- More resistant
- More resilient
- Multifunctional



- More diverse forest



# Forestry (forest) in future

Deeper understanding of biological processes and also precise in management

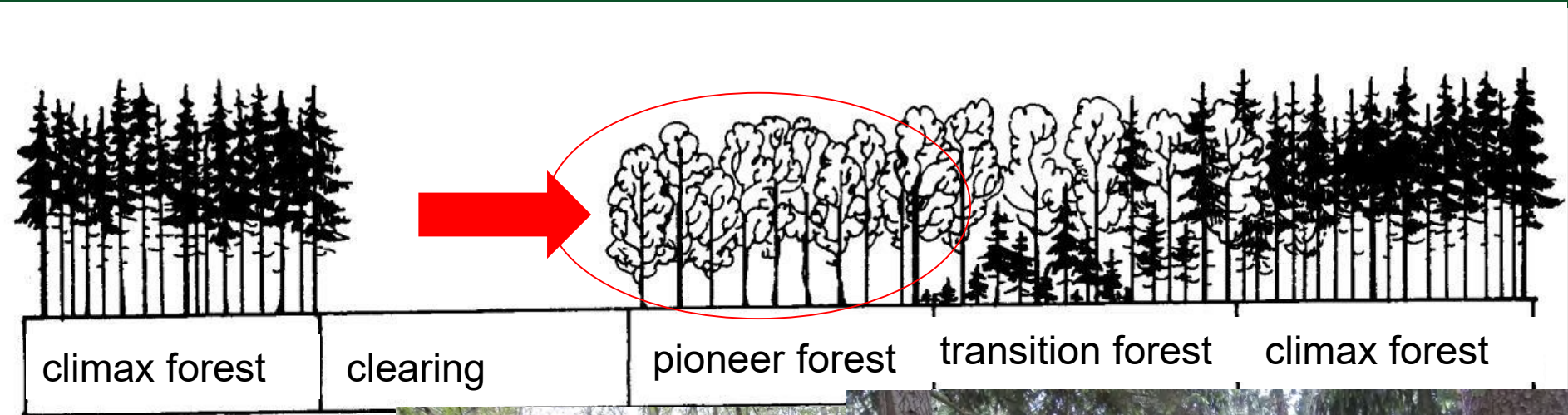
- More nature one

 **Multiage/Dauerwald**



What does mean in clearing?

# Natural process in a forest





# Solution: Pioneer species / Pioneer forest as first steps towards now forest

## Species:

- *Betula sp.*; *Populus sp.*;
- *Alnus sp.*; *Salix sp.*;



- (*Larix sp.*; *Pinus sp.*; *Sorbus aucuparia.*, *Picea abies*)

## Properties:

- Sunlight
- Easy to regenerate
- Tolerant to climatic extremes
- Fast growth
- Short lifespan
- *Short duration of pioneer stands in natural conditions (forest) due to competition of climax species and short lifespan*



# Silviculture of pioneer stands



The same time regeneration of pioneer and climax species



Biomass (energetic utilization) – rotation period 20 years



Release of natural regeneration within pioneer stands



Production of high volume timber of pioneer – rotation period 50 years



**Current situation:**



Combination of treatments: different approaches, rotation period and species composition

**100 years late:**

<u>The same time regeneration</u>	<u>The same time regeneration</u>	<u>Biomass</u>	<u>Biomass</u>
<b>oak</b>	<b>beech</b>	<b>fir</b>	<b>fir</b>
<u>Biomass</u>	<u>Biomass</u>	<u>High volume timber production</u>	<u>High volume timber production</u>
<b>oak</b>	<b>fir</b>	<b>beech</b>	<b>fir</b>

**Current situation:**



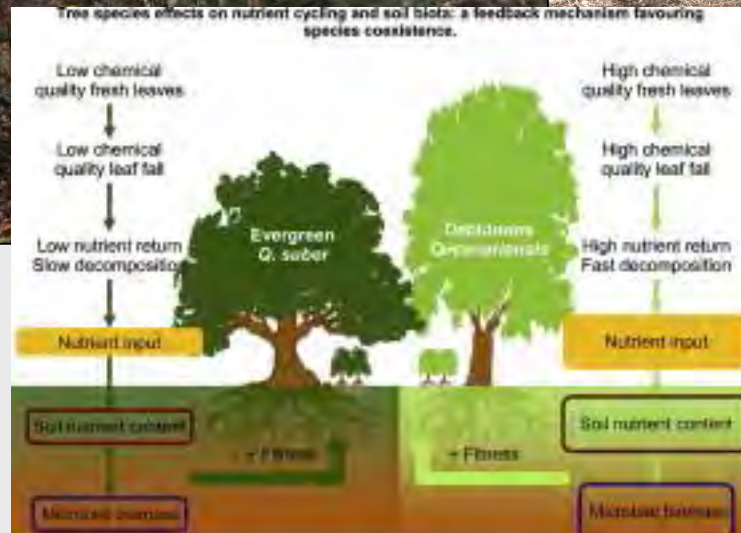
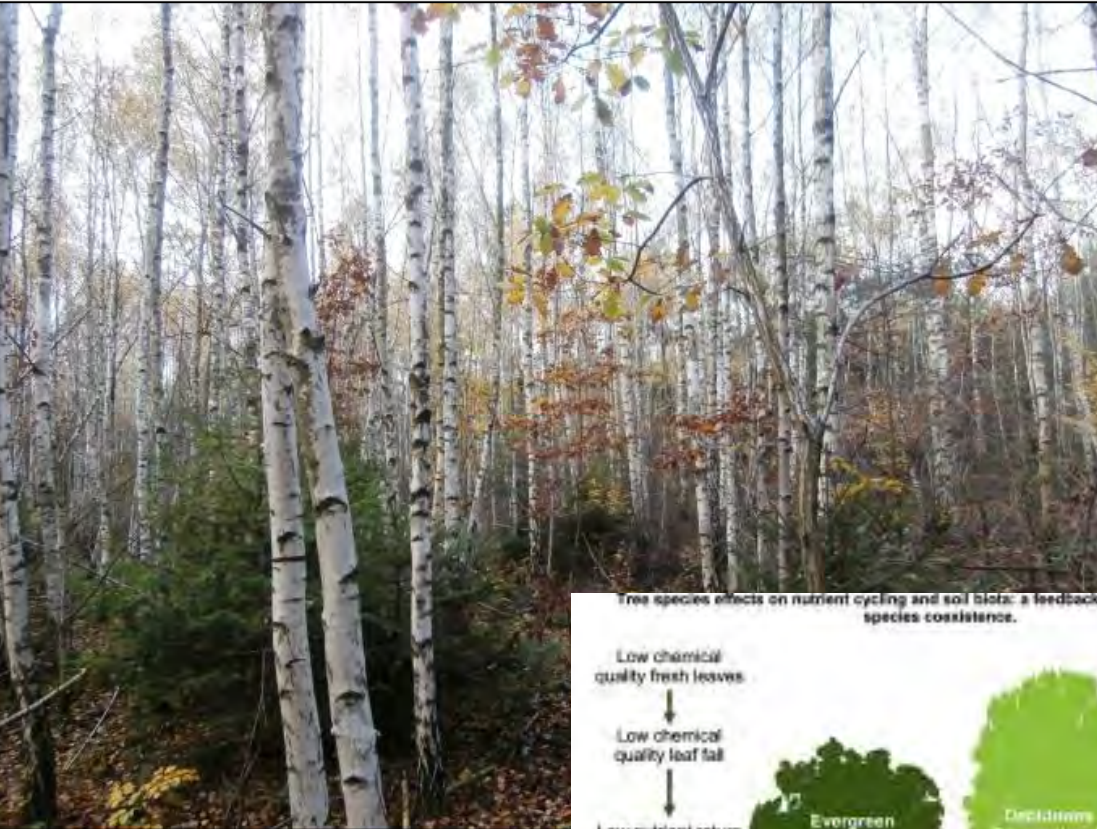
Combination of treatments: different approaches, rotation period and species composition

**100 years late:**

<u>The same time regeneration</u> oak	<u>The same time regeneration</u> beech	<u>Biomass</u> fir	<u>Biomass</u> fir
<u>Biomass</u>	<u>Biomass</u>	<u>High volume timber production</u>	<u>High volume timber production</u>
<u>The same time regeneration</u> oak	<u>The same time regeneration</u> beech	<u>Biomass</u> fir	<u>Biomass</u> fir
<u>Biomass</u> oak	<u>Biomass</u> fir	<u>High volume timber production</u> beech	<u>High volume timber production</u> fir



# Can we go dipper?



Respect to:

- site conditions
- stands structure
- trees
- geul

Source: <https://ars.els-cdn.com/content/image/1-s2.0-S0378112713003344-fx1.jpg>



# Properties of pioneer species:



- Sunlight
- Fast growth
- Short lifespan



**Plantation?**





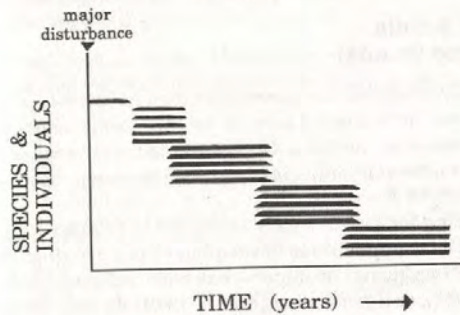
# Structure of pioneer stands:

## Factors:

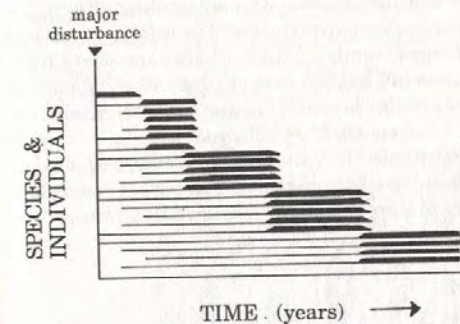
- Structure of mature stands
- Disturbance régime
- Regeneration process



### A. "RELAY FLORISTICS"



### B. "INITIAL FLORISTICS"



## Differences in:

- Densities
- Species composition
- Age
- Spatial distribution



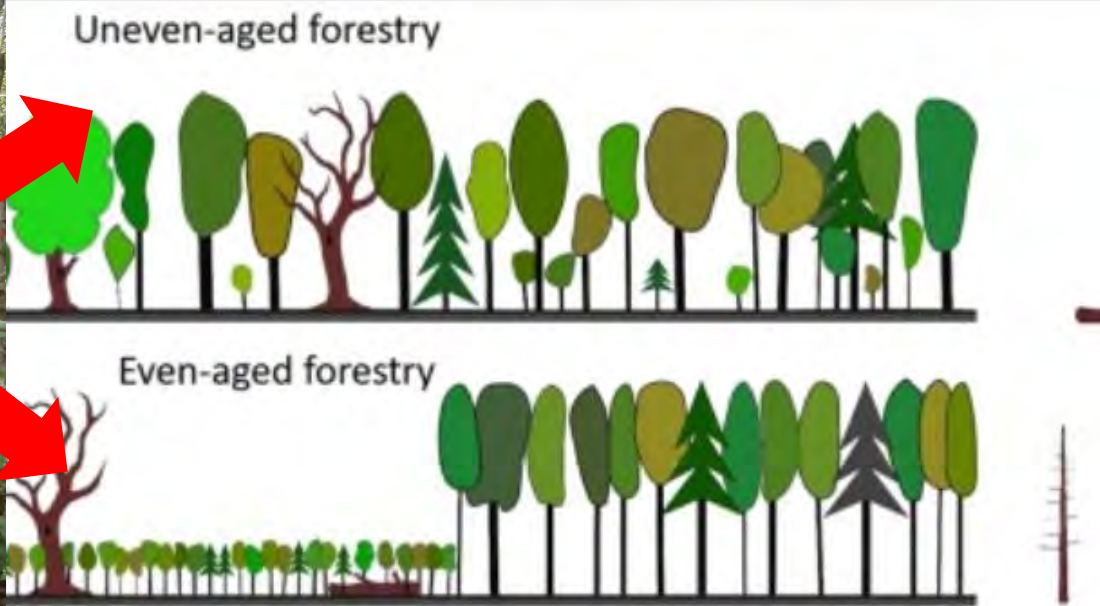
(Source: Oliver, Larson 1990)



# Forester decision:

Pioneer stands

More natural one



Source: <https://link.springer.com/article/10.1007/s13280-019-01190-1>

More schematic one



# Forester decision:

## Pioneer stands

More natural one:

selection principles -

- Improve quality of stands
- Variabilities in thinning regime
- Release admixture species
- Underplanting – cluster, individual (avoid whole area treatments)





# Intensive thinning of best quality trees





# Supporting of admixture species within pioneer stands





# Cluster underplanting





# Conclusion:

Disturbances as a part natural processes  
Calamities – clearing and economic losses  
Change for new forest





# Thank you for your attention



To avoid large economic losses to incorporate more nature into forest management