



# Planejamento do manejo florestal



## **FORSTEINRICHTUNG – what's that?**

**This is instrument who  
ensures a sustainable  
usage of forest!**

**sustainable usage = sustainability**

sustainability



Sylvicultura  
Oeconomica



extreme high  
wood supply  
deficiency

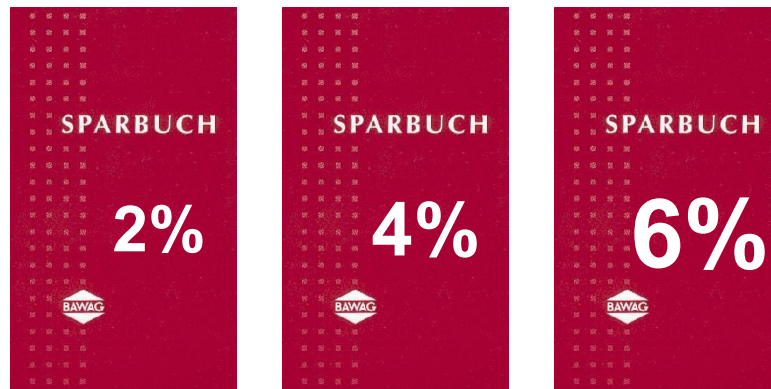


Carlowitz



1713

## Sustainability: living from the interests, saving the resources



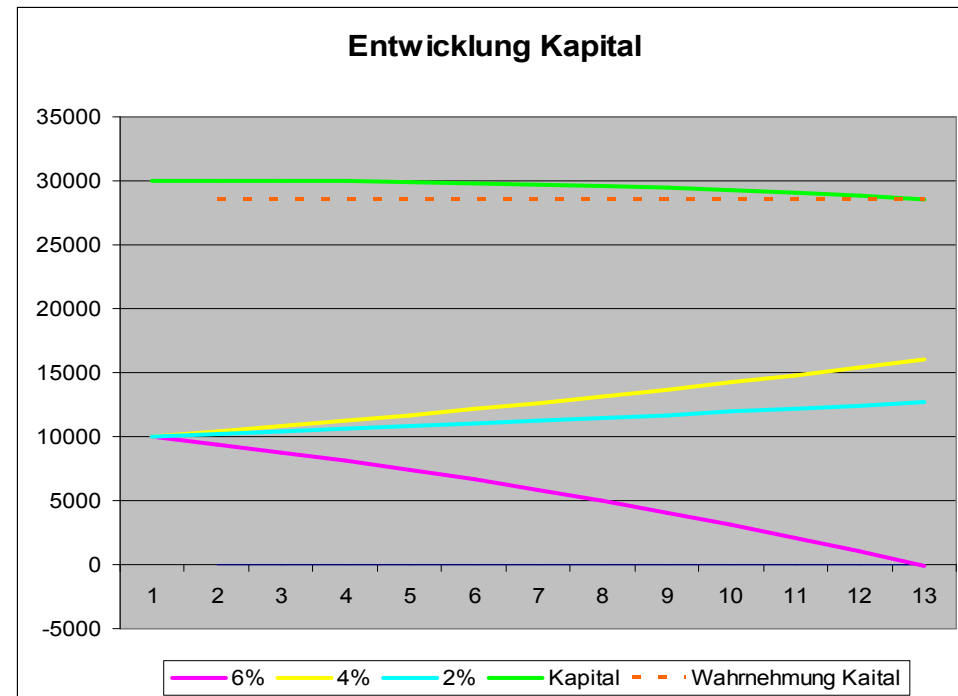
interest:

200 €

400 €

600 €

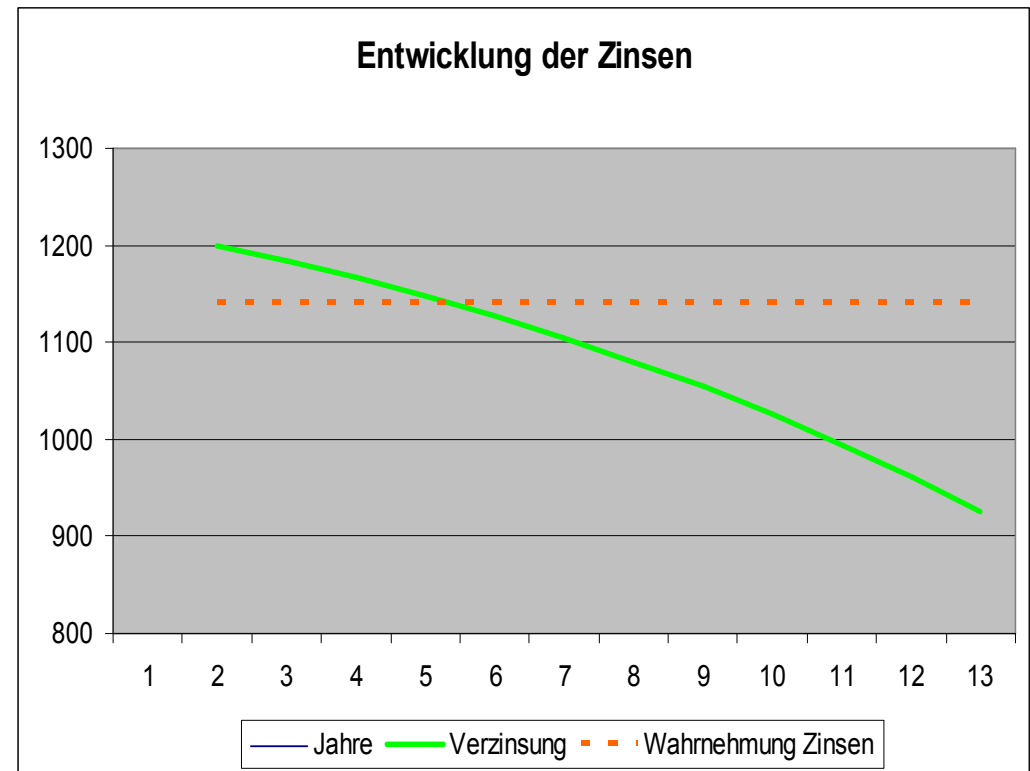
Sum of interests: 1.200 €



→ Changes hard to detect !!

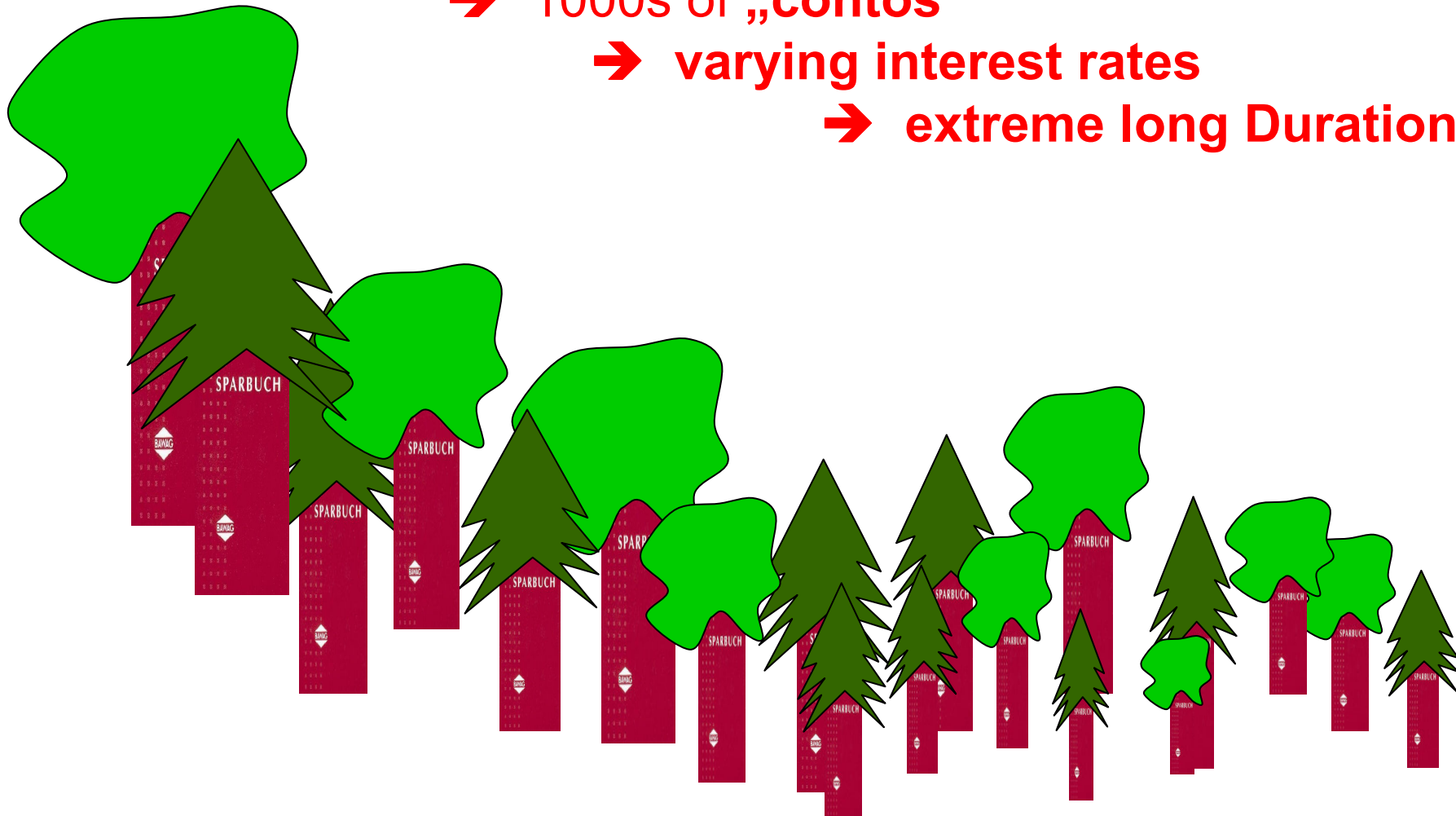
→ strong declining of the interests!!

Earning only from 6%-conto = violation of the sustainability



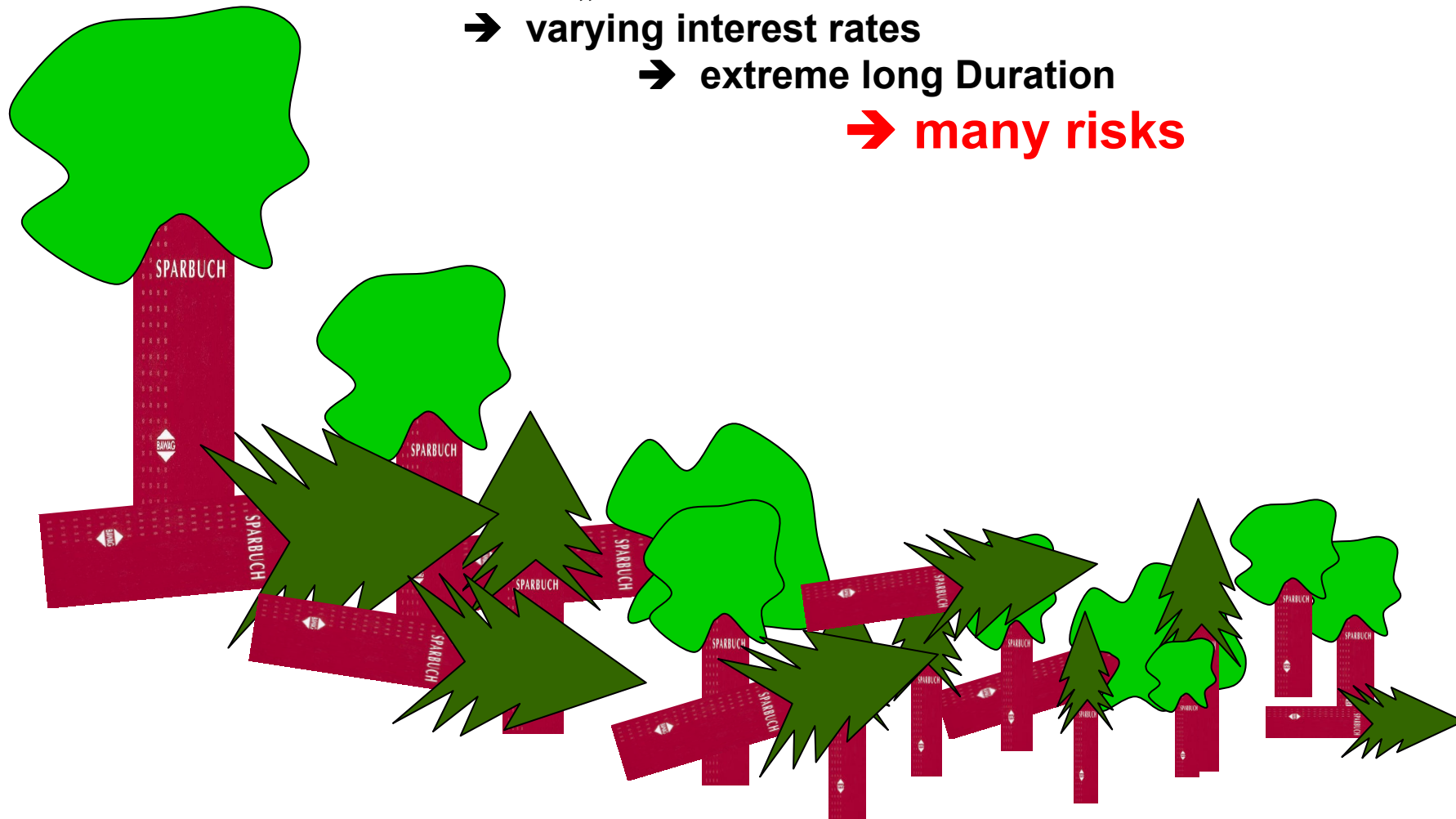
## In the forest

- 1000s of „contos“
- varying interest rates
- extreme long Duration



## In the forest

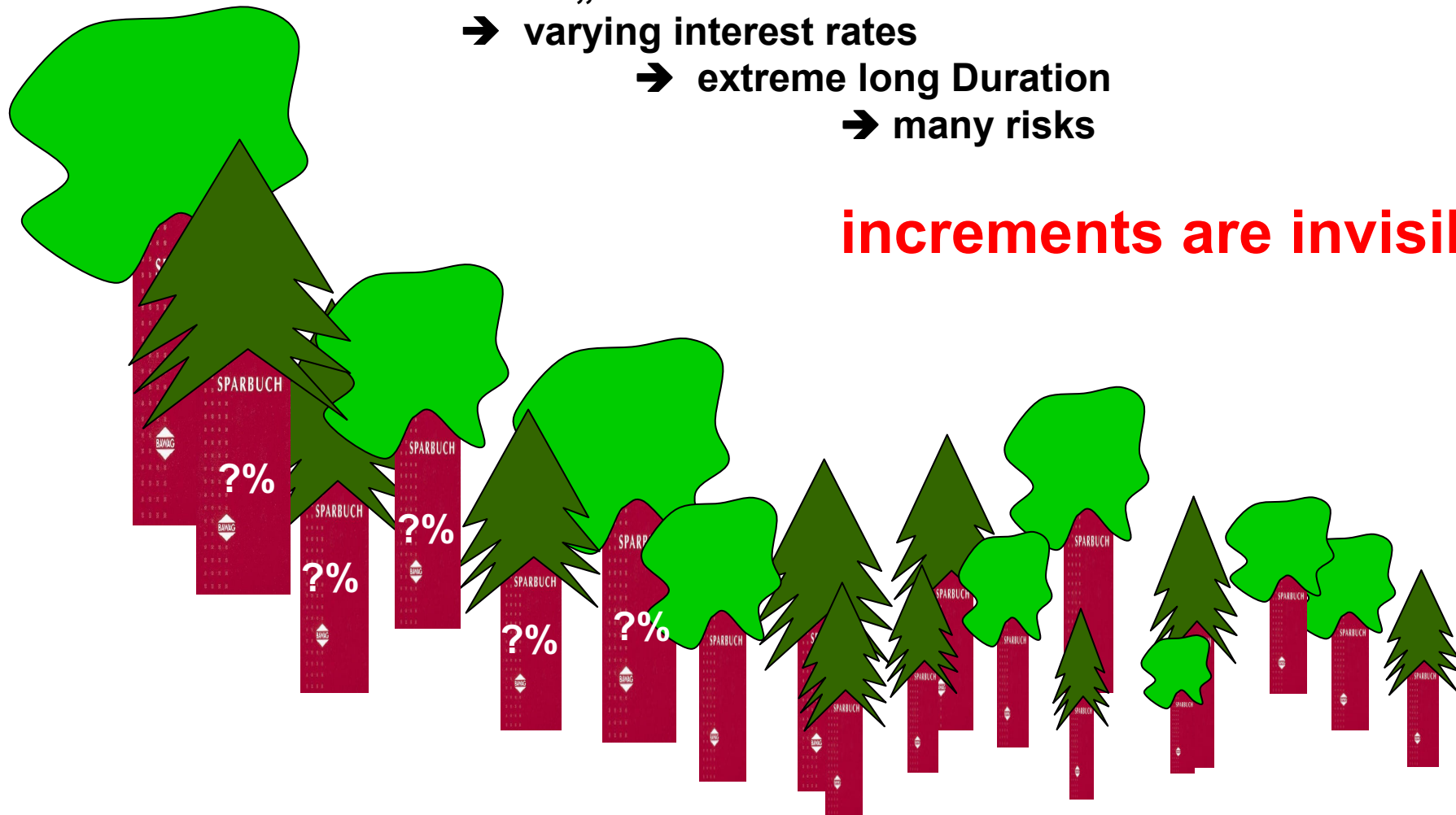
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    - extreme long Duration
      - many risks



## In the forest

- 1000s of „contos“
- varying interest rates
- extreme long Duration
- many risks

**increments are invisible**

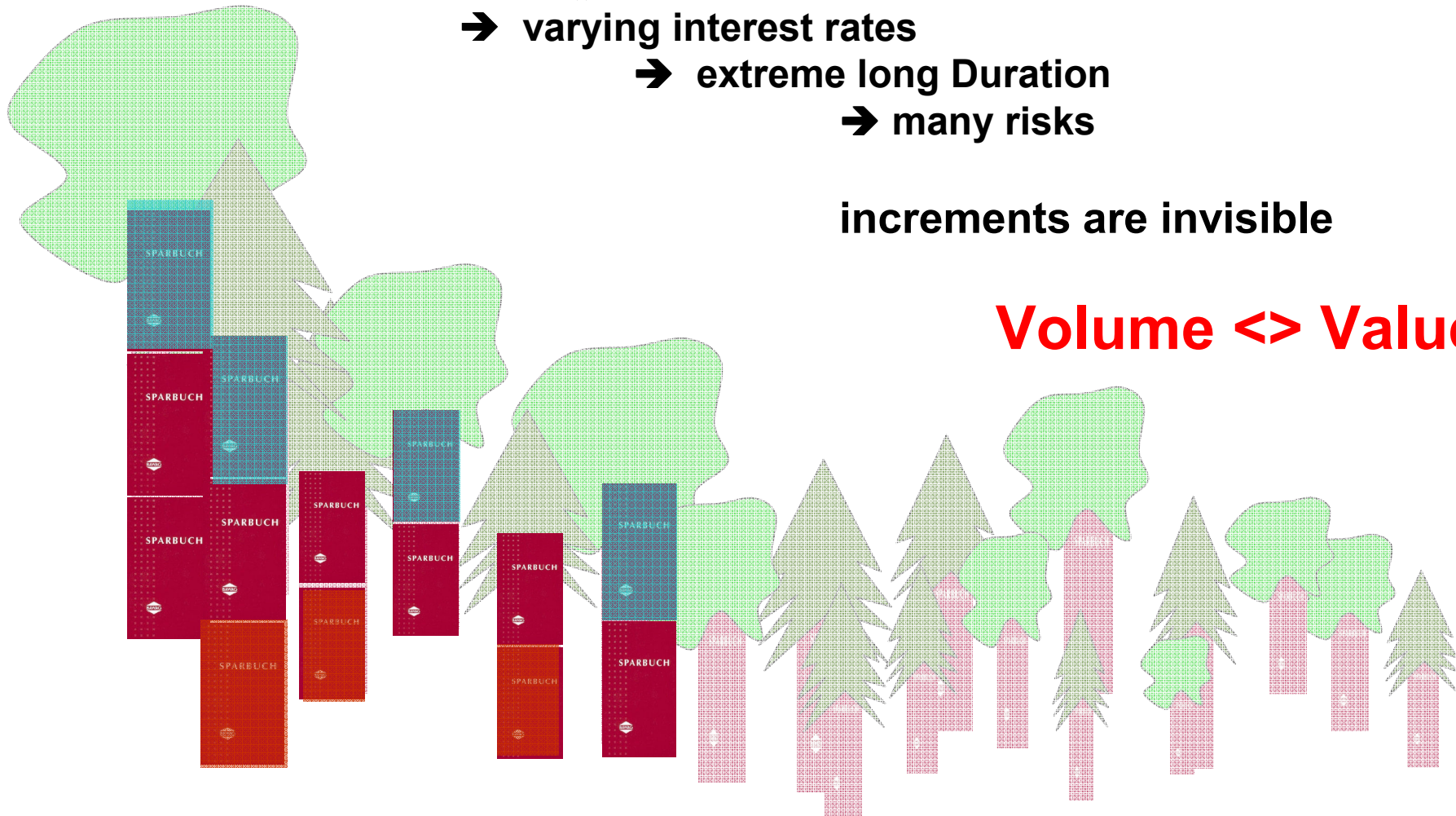


## In the forest

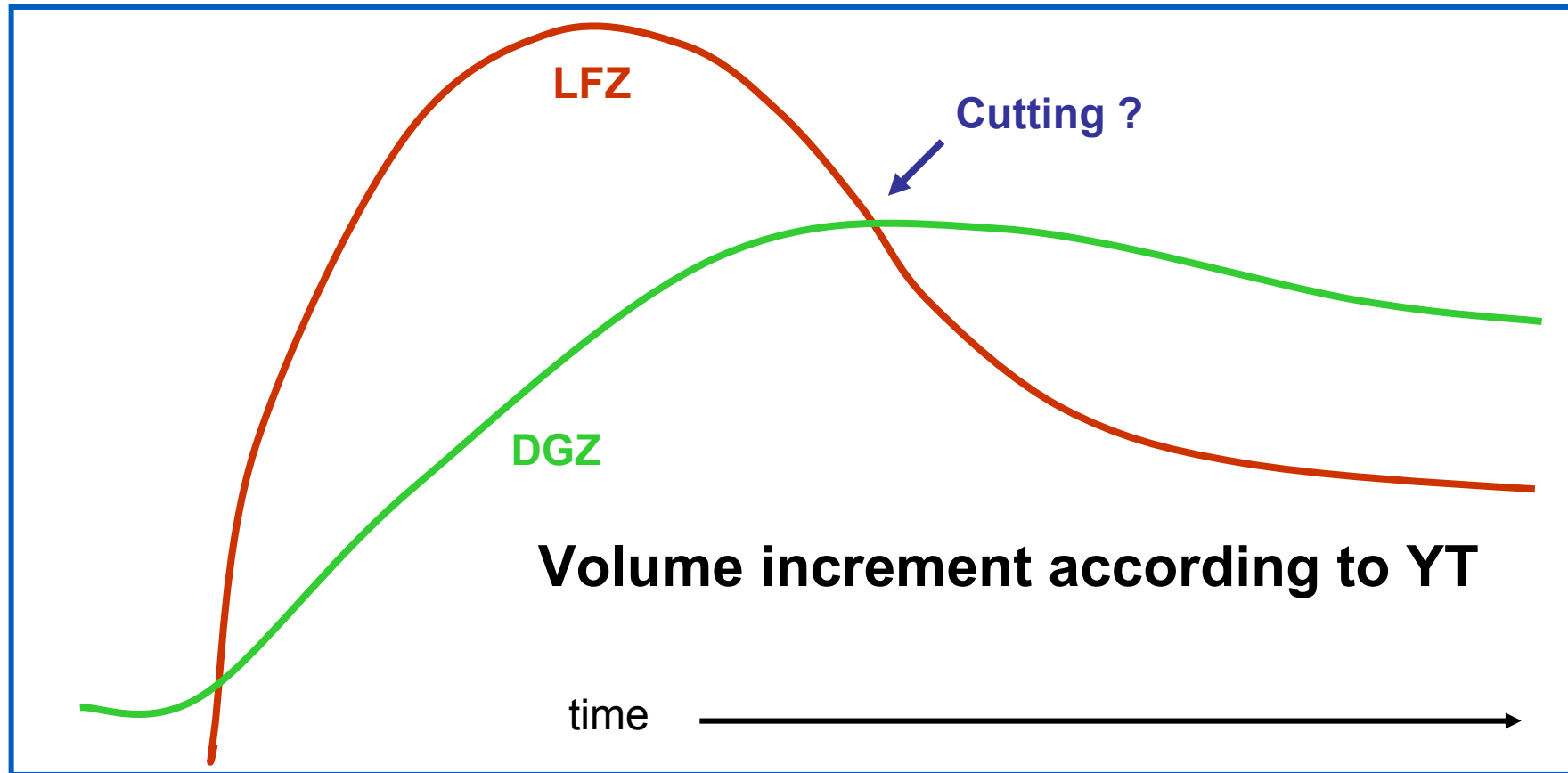
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increments are invisible

**Volume <> Value**

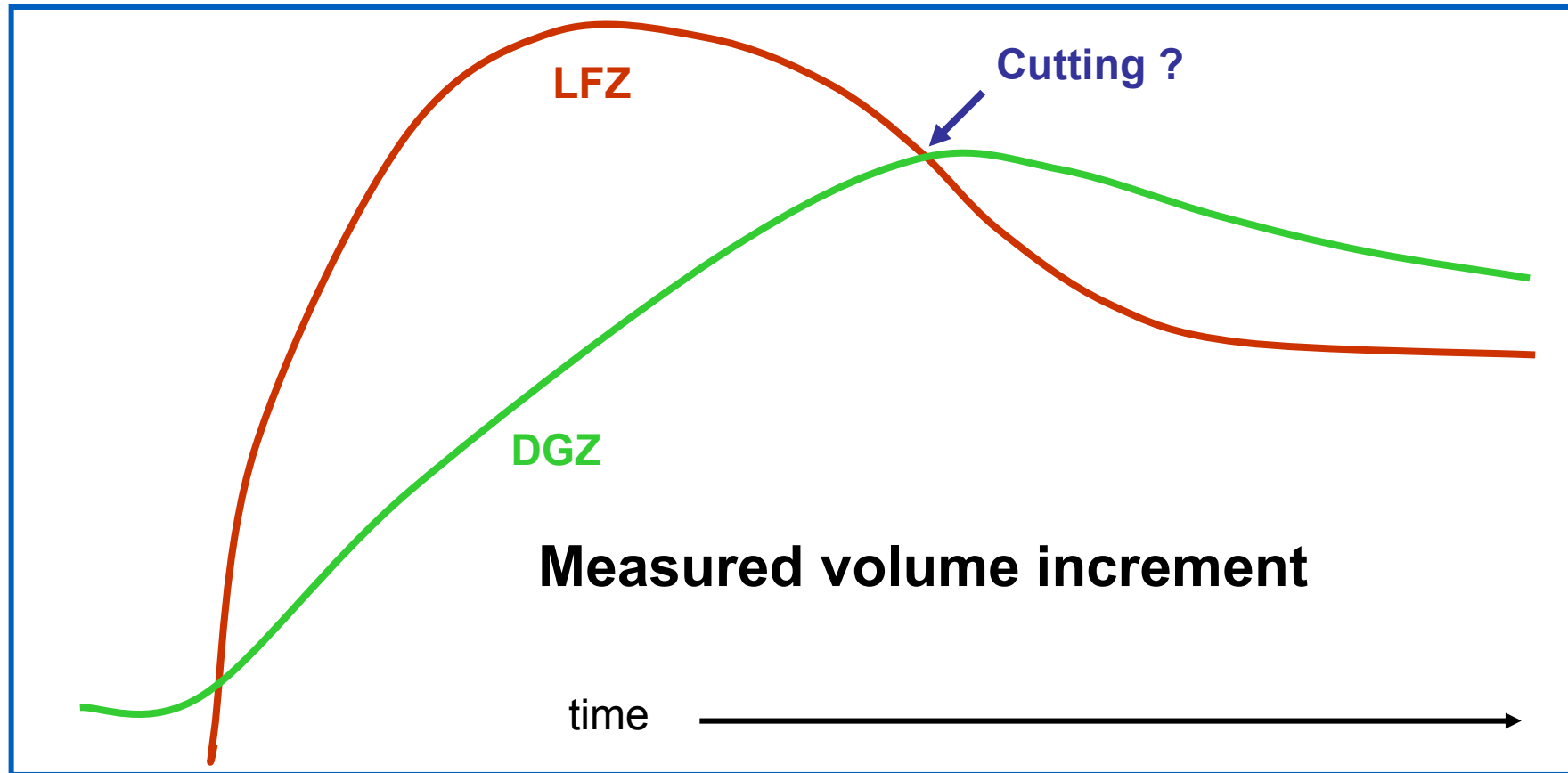


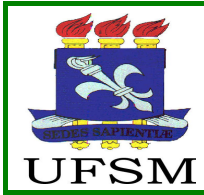




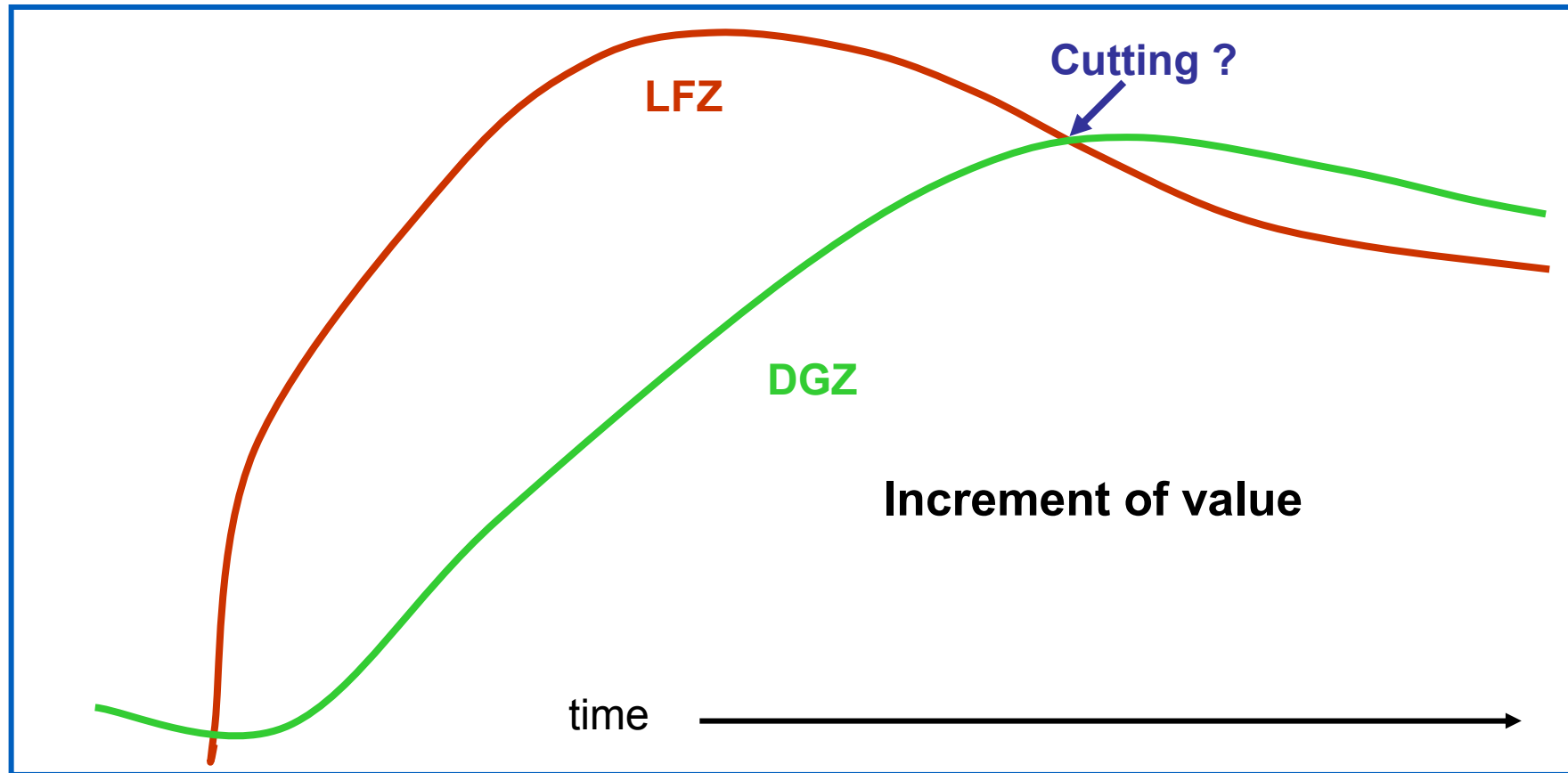


# Planejamento do manejo florestal



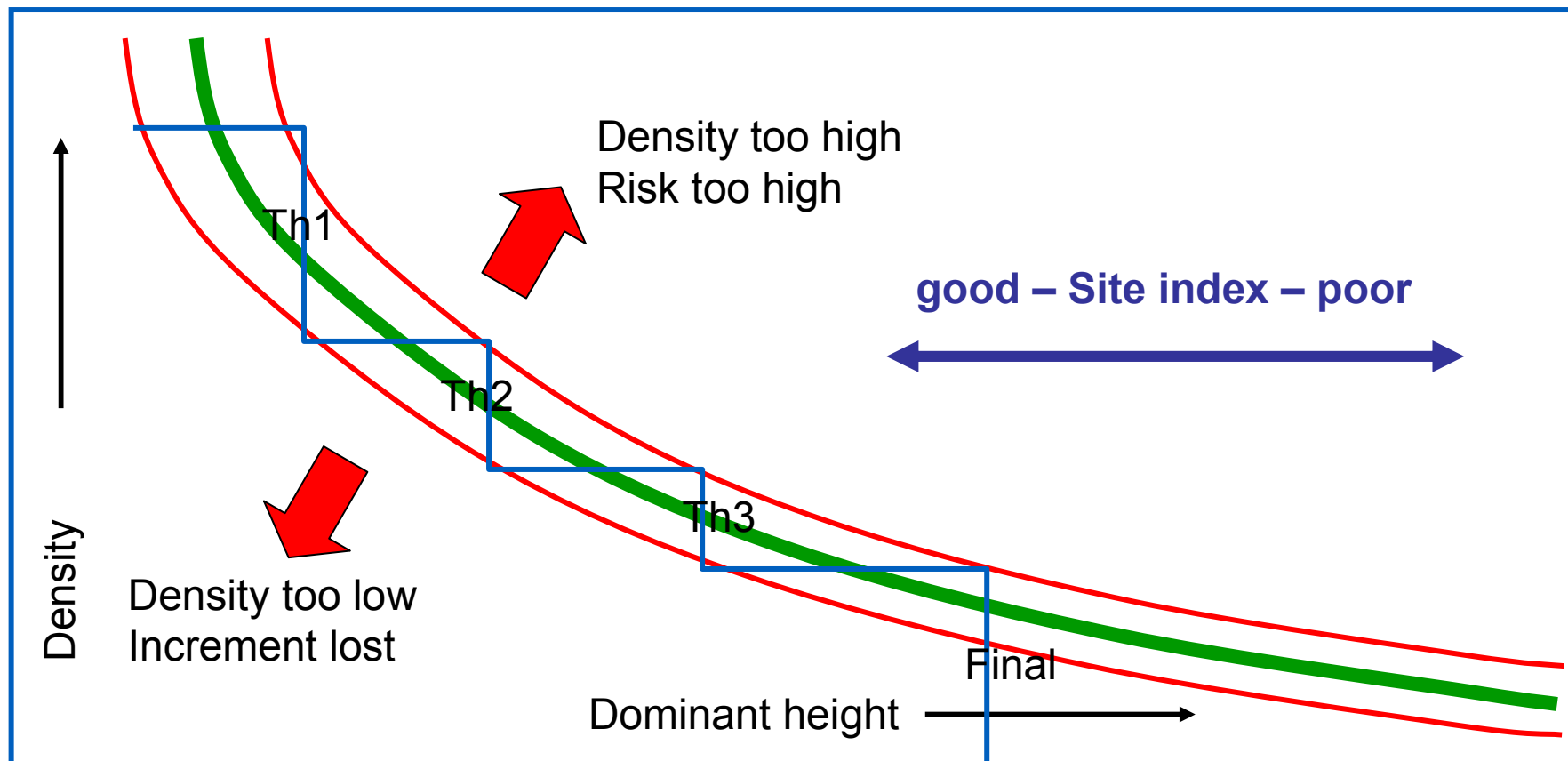


# Planejamento do manejo florestal



## Density-Curve acc. Abetz

Age of thinning ?



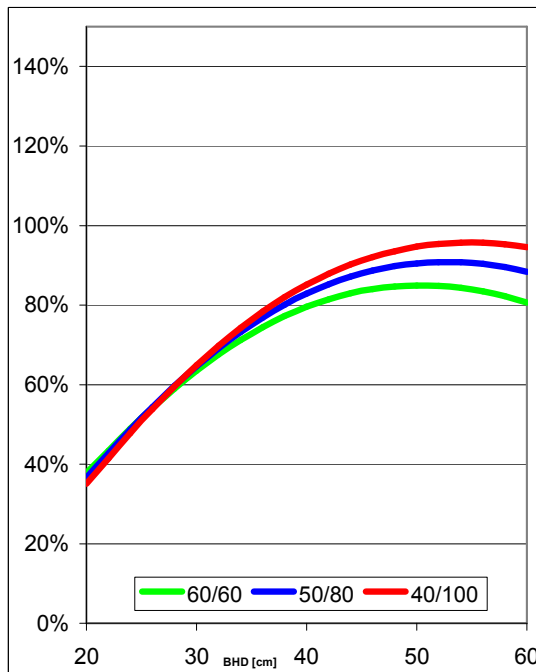


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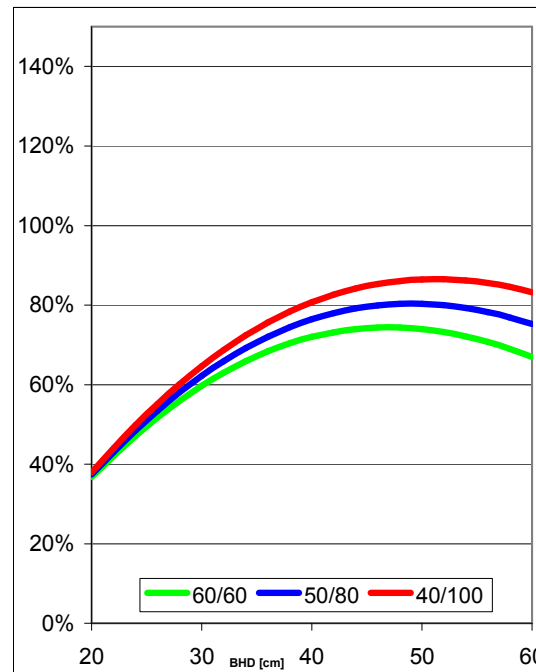


<b>1</b>	<b>Spruce</b>
1	Spruce
2	Larch
3	Pine
4	Black Pine
5	Stone Pine
6	Beech
7	Oak
8	Ash
9	Poplar
1	Fir
1	Douglas
8	Maple

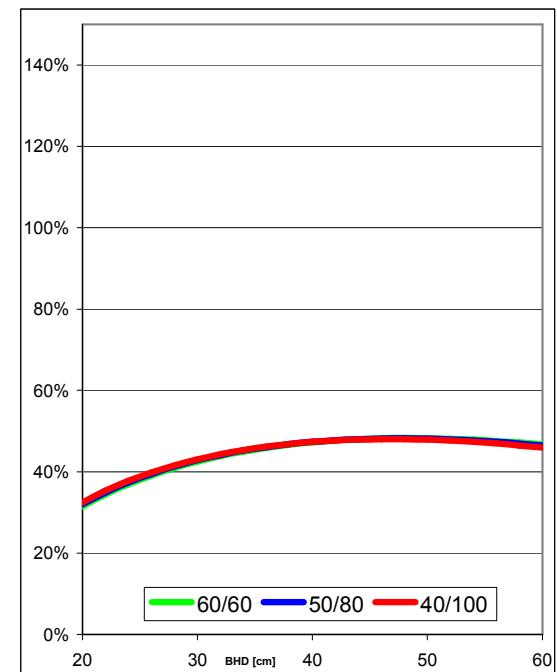
good Quality



medium Quality



poor Quality



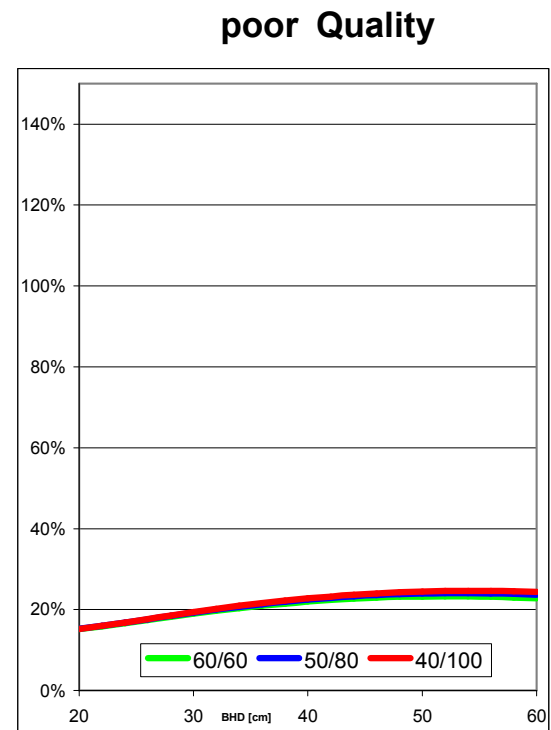
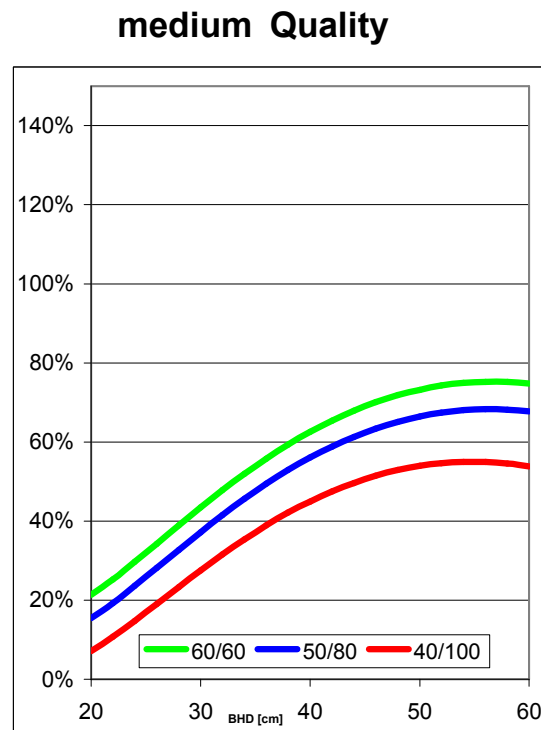
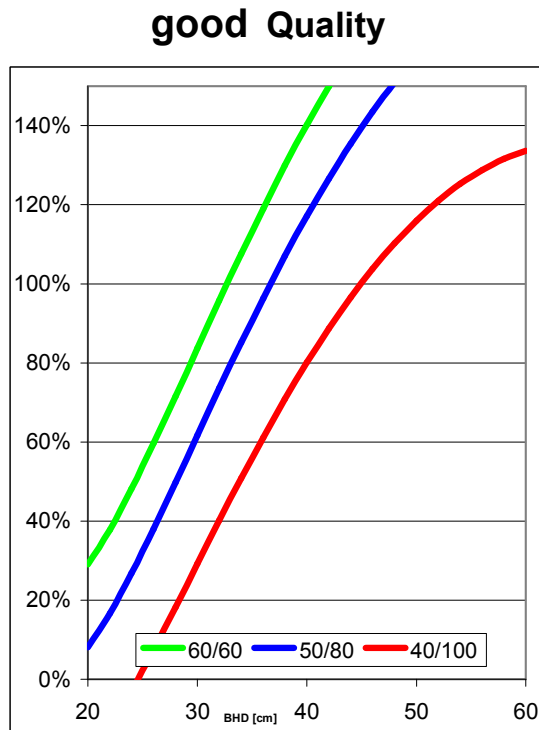
	HD	Crown%
red	100	40
blue	80	50
green	60	60



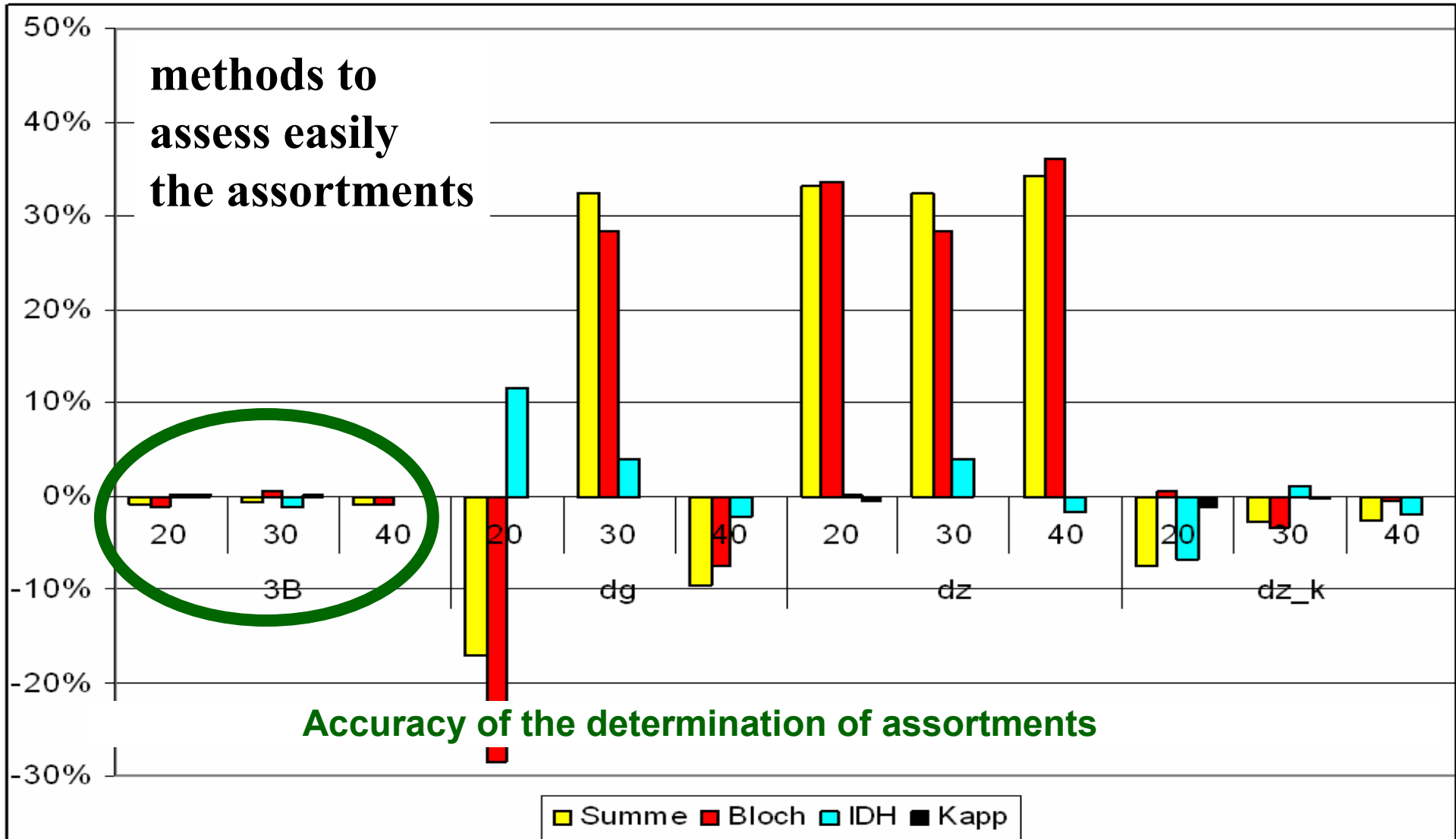
# Planejamento do manejo florestal



7	Oak
1	Spruce
2	Larch
3	Pine
4	Black Pine
5	Stone Pine
6	Beech
7	Oak
8	Ash
9	Poplar
1	Fir
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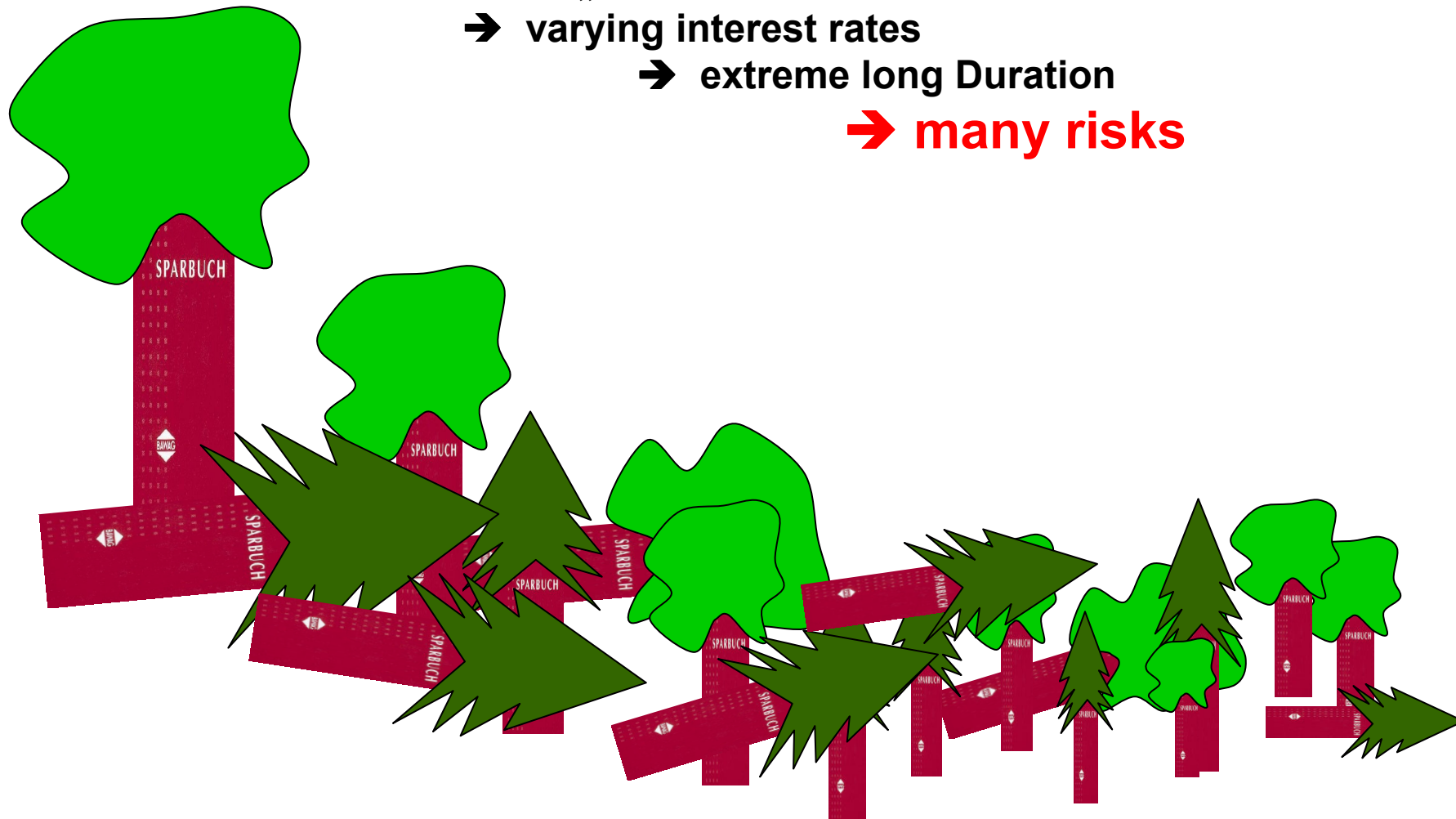


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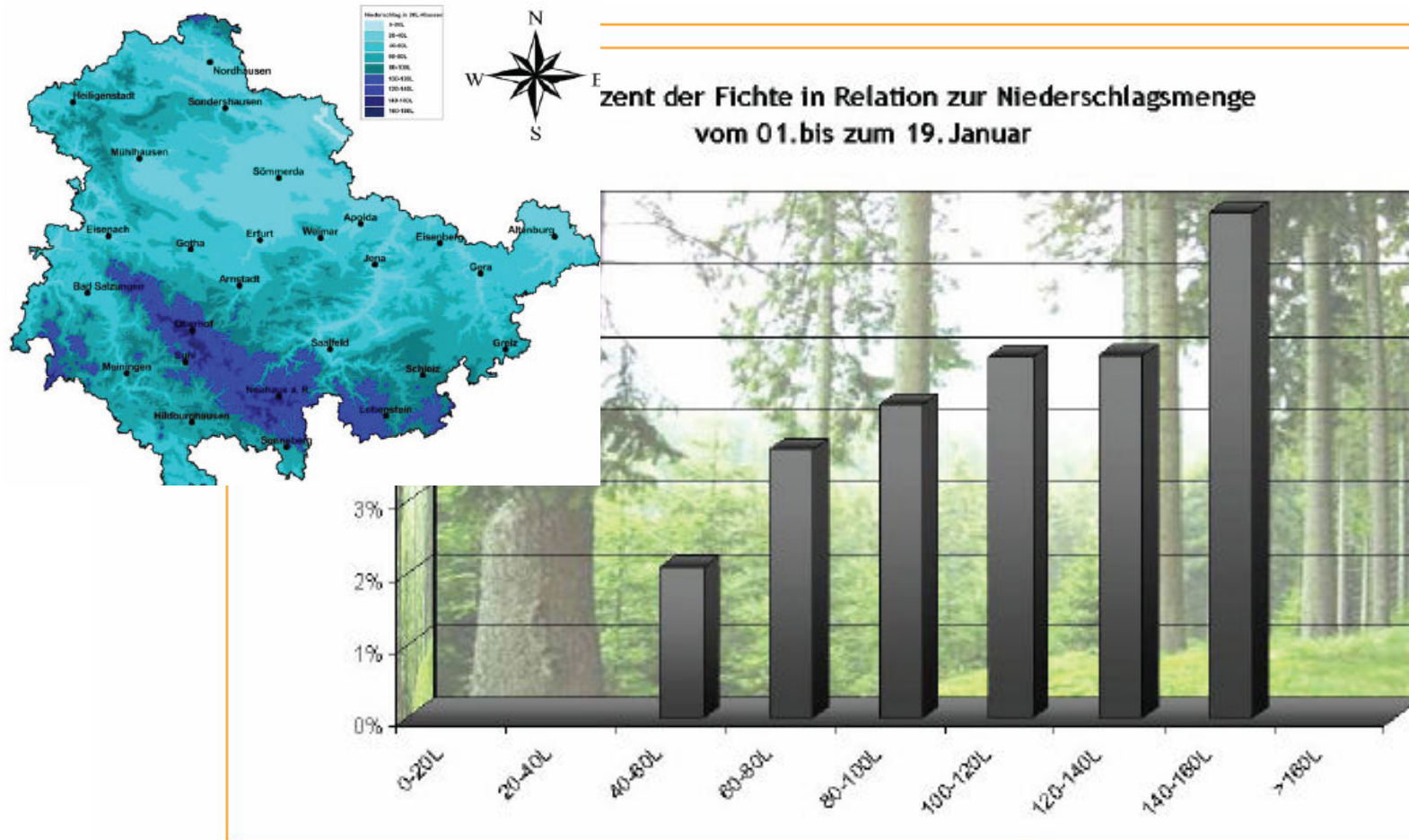


## In the forest

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  - varying interest rates
    - extreme long Duration
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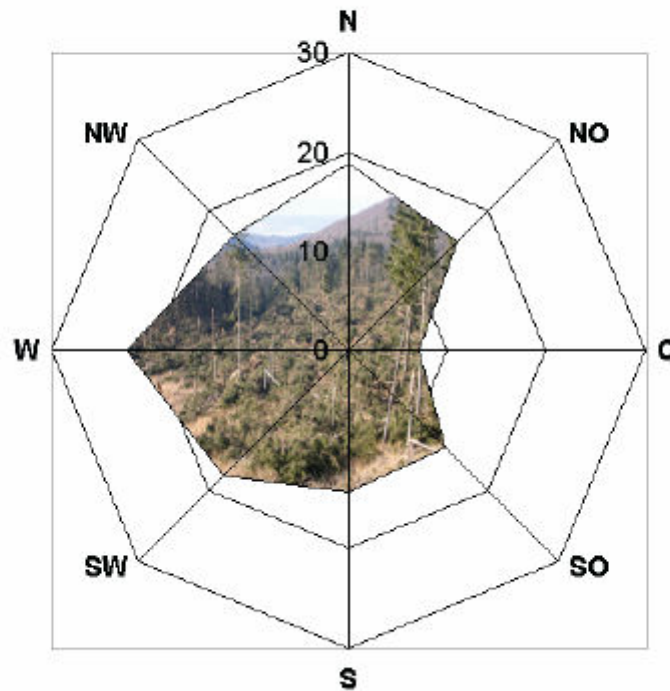




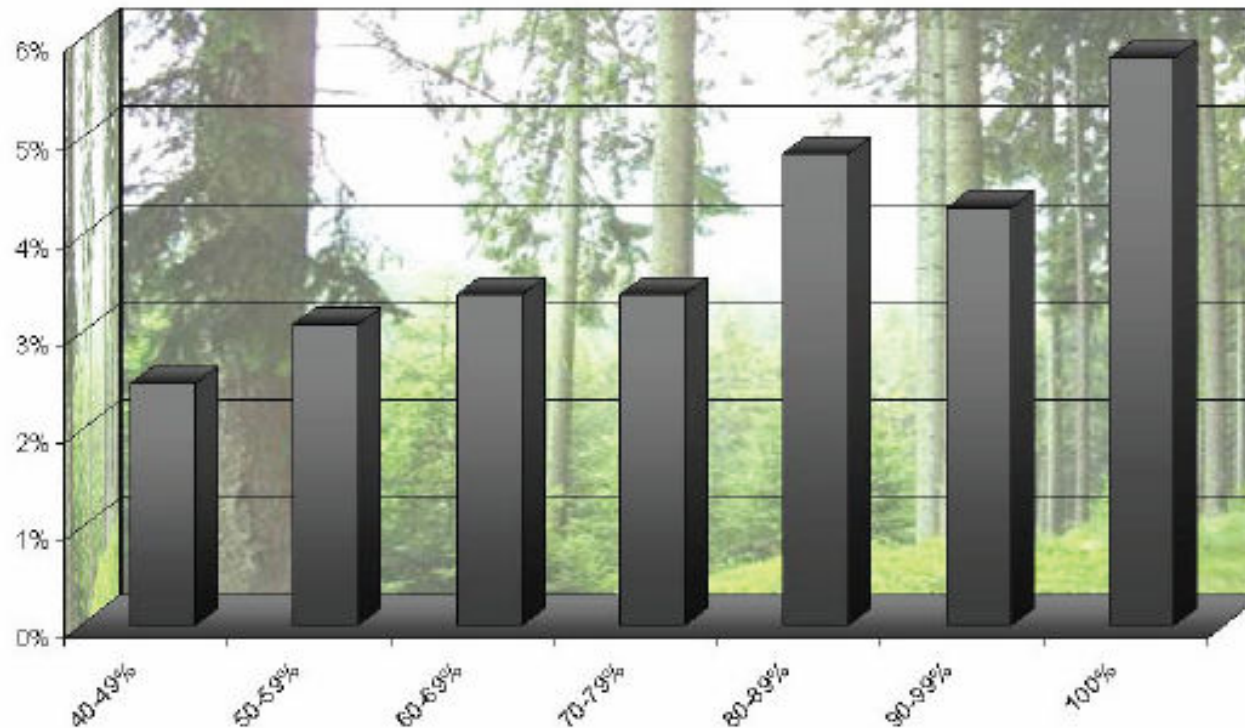


Mit Zunahme der vor und während des Sturmes am Waldboden angekommenen Regenmengen war auch eine Zunahme stark geschädigter Bestände zu verzeichnen.

Schad-Prozent der Fichte in Relation zur Neigungsrichtung [N 60-100L]

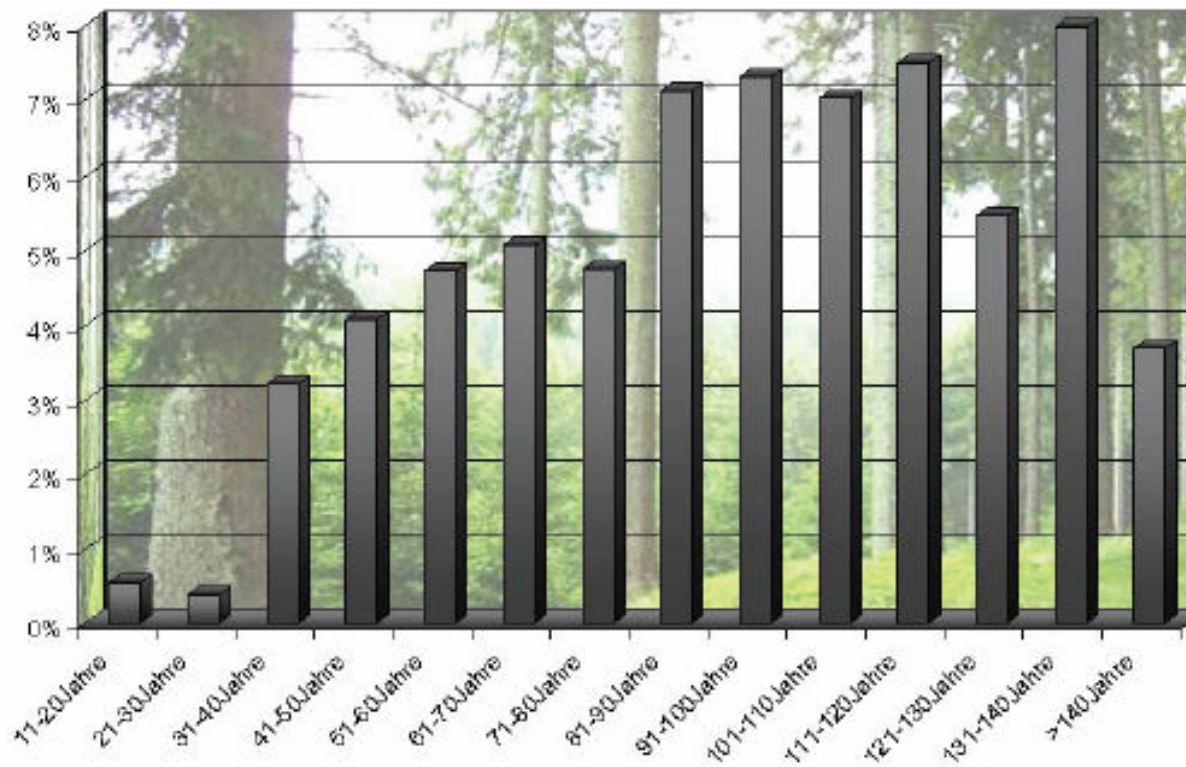


Schad-Prozent der Fichtenbestände in Relation zum Mischungsanteil der Fichte



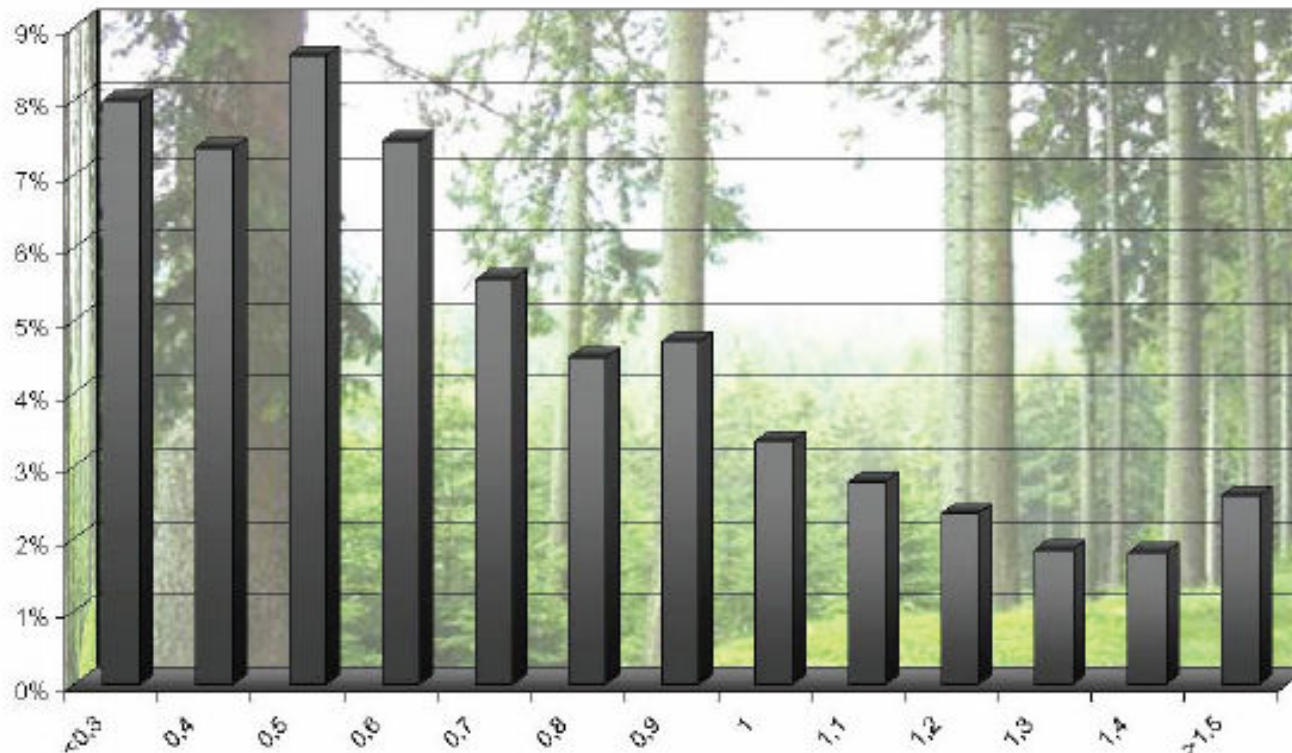
Zunehmende Mischbaumartenanteile führen zu geringeren Schadprozenten.

Schad-Prozent der Fichtenbestände in Relation zum Bestandesalter

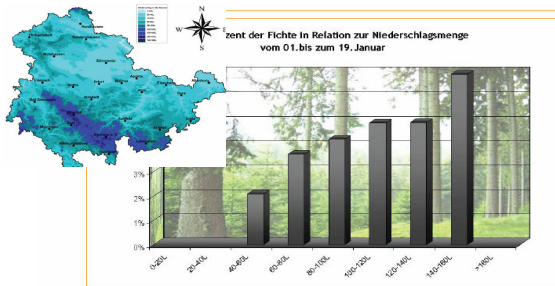


Das Schadprozent in Fichtenbeständen steigt mit zunehmendem Alter an.

Schad-Prozent der Fichtenbestände in Relation zum Bestockungsgrad

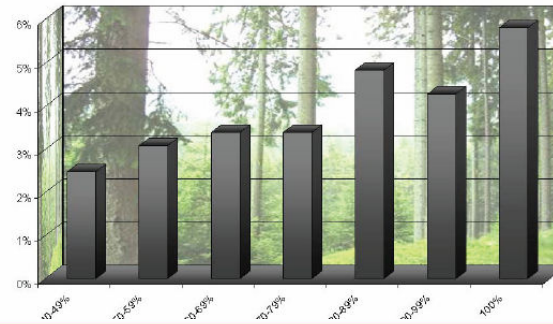


Gering bestockte Bestände der Fichte waren häufiger von Kyrill betroffen.

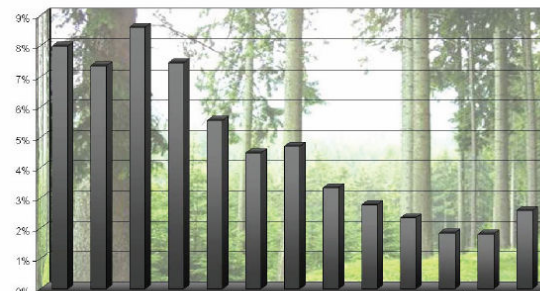


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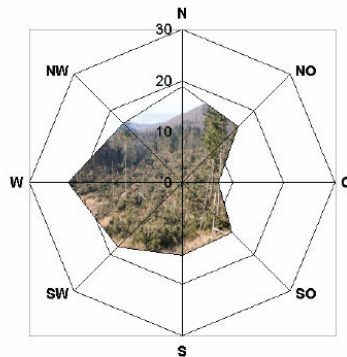
Schad-Grad der Fichtenbestände in Relation zum Mischungsanteil der Fichte



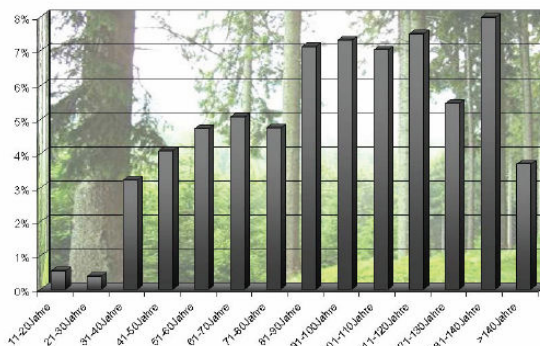
Schad-Grad der Fichtenbestände in Relation zum Bestockungsgrad



Schad-Grad der Fichte in Relation zur Neigungsrichtung [N 60-100L]



**Site conditions we cannot influence them**  
**WE MUST LIVE with %**



**All these things are consequences from our acting or not acting – we can change them !!!**

**Finally all are dependent from the Leaf-Area at storm !!!**

**Less LAI, less damages**

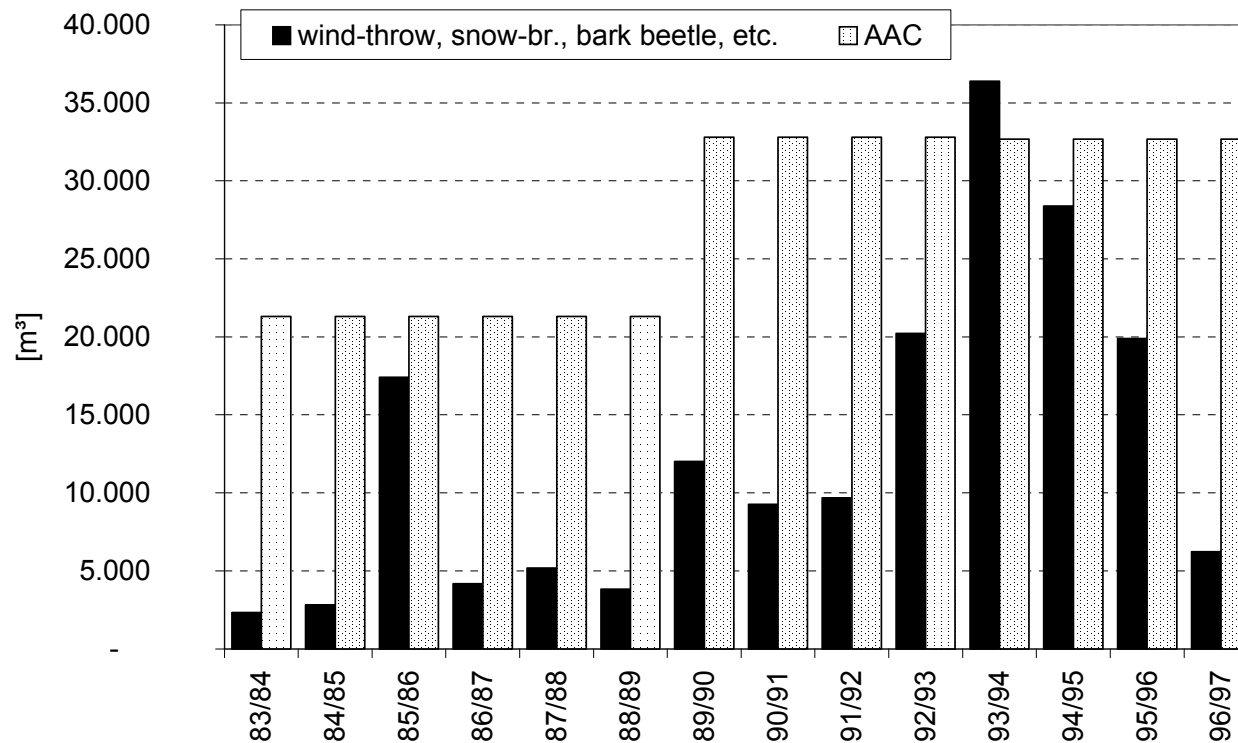
Site conditions we cannot influence them  
**WE MUST LIVE with**



*Situation in many Central European forest enterprises:*

- Secondary monospecific stands of coniferous species
- + high yield
- susceptibility to biotic and abiotic damages

**Problem:** A high percentage of the allowable annual cut is caused by windthrow, snow damage, drought, bark beetles...



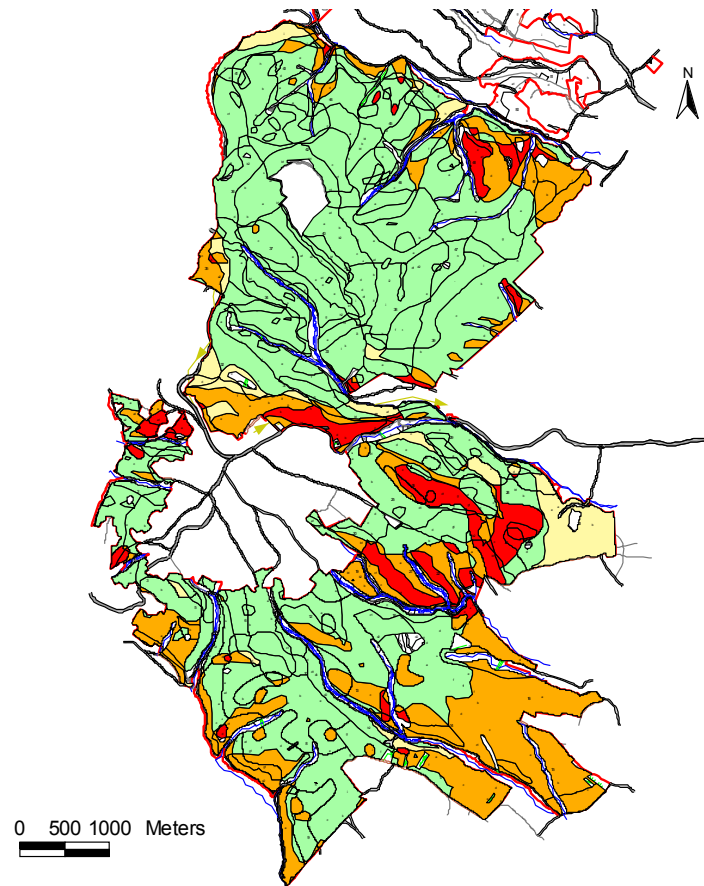
**Target:** to lower the risks by altering management practices based upon a site classification



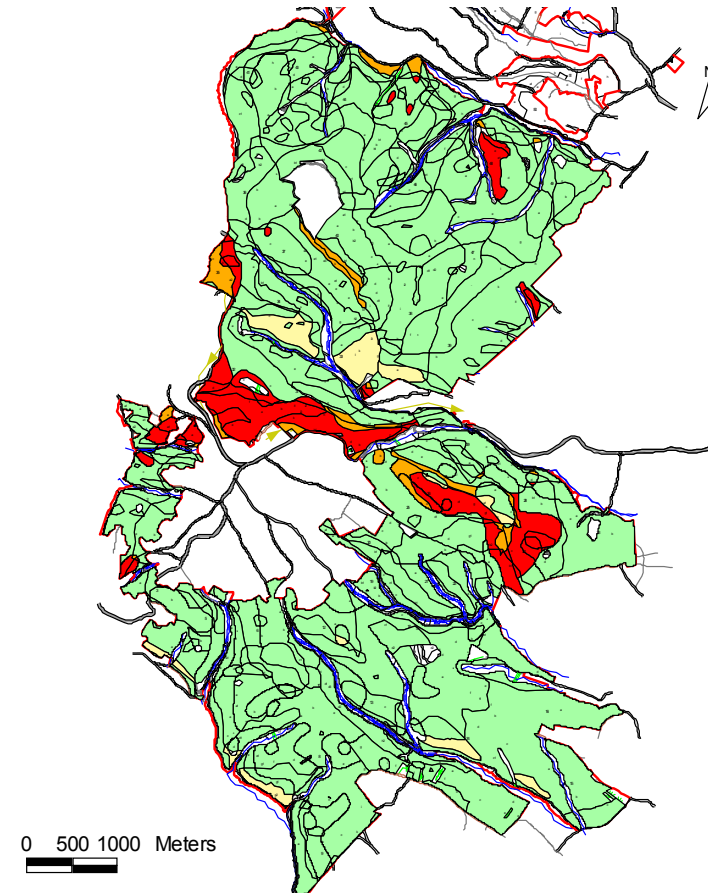
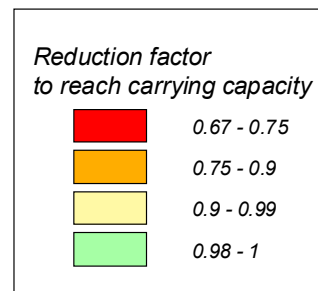
## Response functions:

Variable	dominant height			density: number of trees per hectare			quadratic mean diameter		
	beech	pine	spruce	beech	pine	spruce	beech	pine	spruce
Pot. Radiation		**							
Altitudinal zone				*					
Elevation	**				*		**	**	
Aspect					*				
Slope		**	*						
Curvature	**								
Air temperature			***		*			**	
Pot. ET	*						**		
Precipitation						*			
Climatic water balance				**		*			
Pot. weathering rate		**							
SMR/SNR 1			**						
SMR/SNR 2		**						*	
SMR/SNR 5				**					**
Actual water balance				**					
Days w. water stress				***	***				
Days water stress 5-7					***				
Days w. water stress 92						*			
Days water stress 5-7/92		**		**		*			
Age	***	***	***						*
dominant height				***	***	***	***	***	***
density							***	***	***
r <sup>2</sup>	0.61	0.72	0.57	0.41	0.28	0.40	0.89	0.88	0.90
	Indicator for site index			<i>Influenced by management</i>			Indicator for yield level		

*Example: Critical zones for spruce*



*Example: Critical zones for beech*





# Planejamento do manejo florestal



To satisfy the following requirement:

„Forest managers should be able to minimize risks by taking into account site properties in management schemes“,

the combination of - classical local site classification  
& hydrological simulation models  
& tree growth models from inventory  
& GIS (with precise DEM 50x50m)

constitutes an adequate tool to investigate, to locate and to visualize zones and regions with higher probability of risks

## Conclusions:

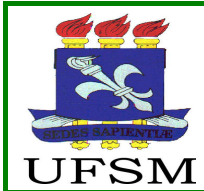
**Sustainability: living from the  
interests, saving the resources**

### To fulfill this we need:

1. good increment models: reliable and easy to  
use 

2. good inventories including quality assessment 

3. good risk models (considering Site and LAI  
control) 



# Planejamento do manejo florestal



Agradeço a sua atenção

