Universität für Bodenkultur Wien
Department für Wald- und Boden-wissens

„Multifunctional forest management and timber production"

UFSM Santa Maria,

23 09 2015

EduardHochbichler

InstitutfürWaldbau, BOKU Wien

Content

- general framework
- multifunctionality
- biodiversity
- balancing of interests
- timber production
- smale scale forestry

Forest management - silviculture

each forest has an owner

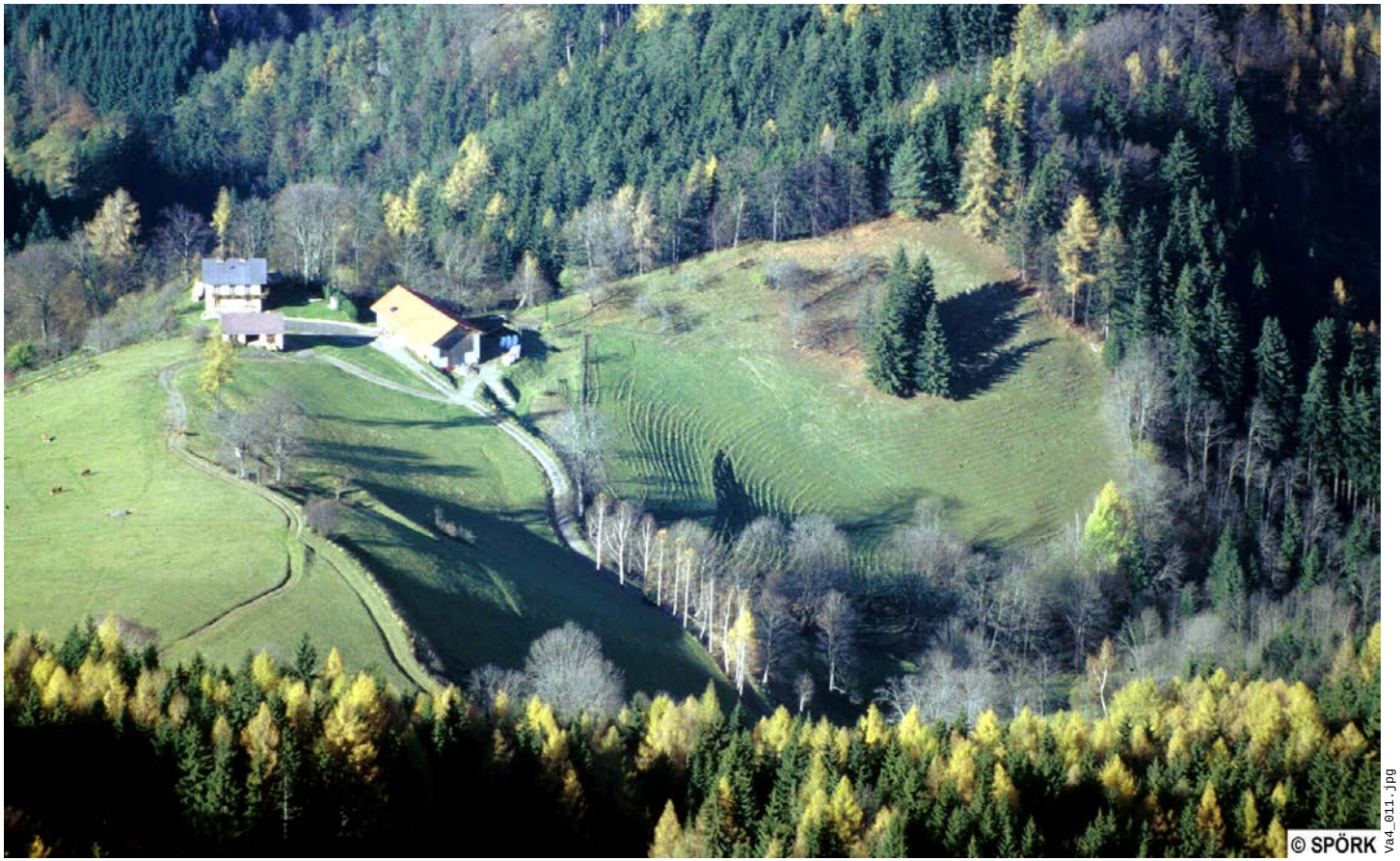
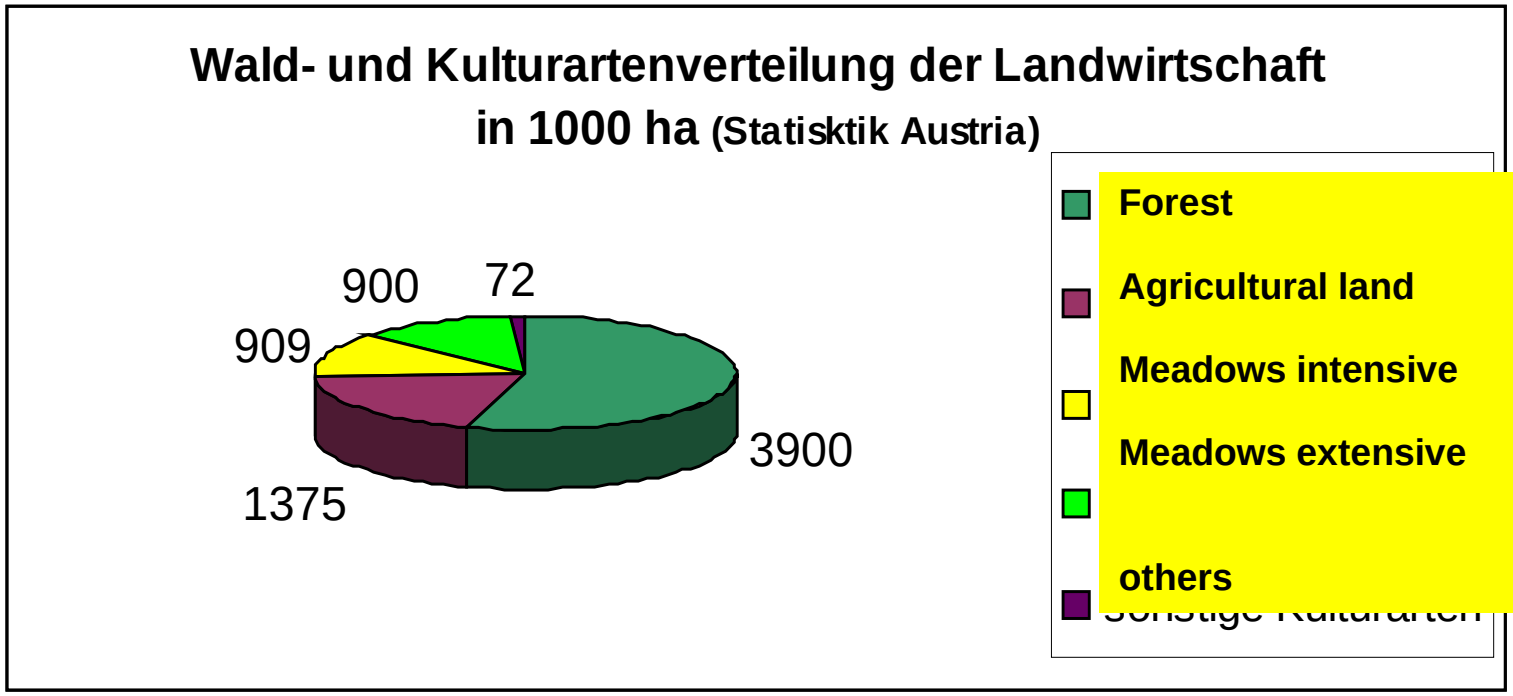


Foto: SPÖRK

(Lexer, Hochbichler, Vacik 2005)

Forested Area in Austria

49 % of the area of Austria is forest land



Forstgesetz 1975,

Forest Act in Austria

Habitat function

habitat for humans, animals and plants

3 pilars: ecology, economy, sozial aspects

sustainable forest management

- Timber production
- Protection function
- Welfare function
- Recreation function

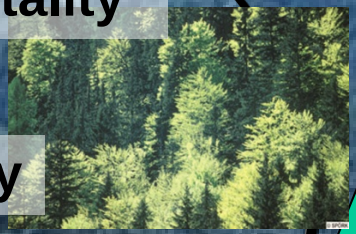
Lexer, Hochbichler, Vacik 2005

Entwicklung des Nachhaltigkeitsbegriffs

Sustainable forest mangement

production

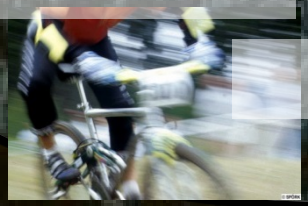
vitality



Carbon turnover

biodiversity

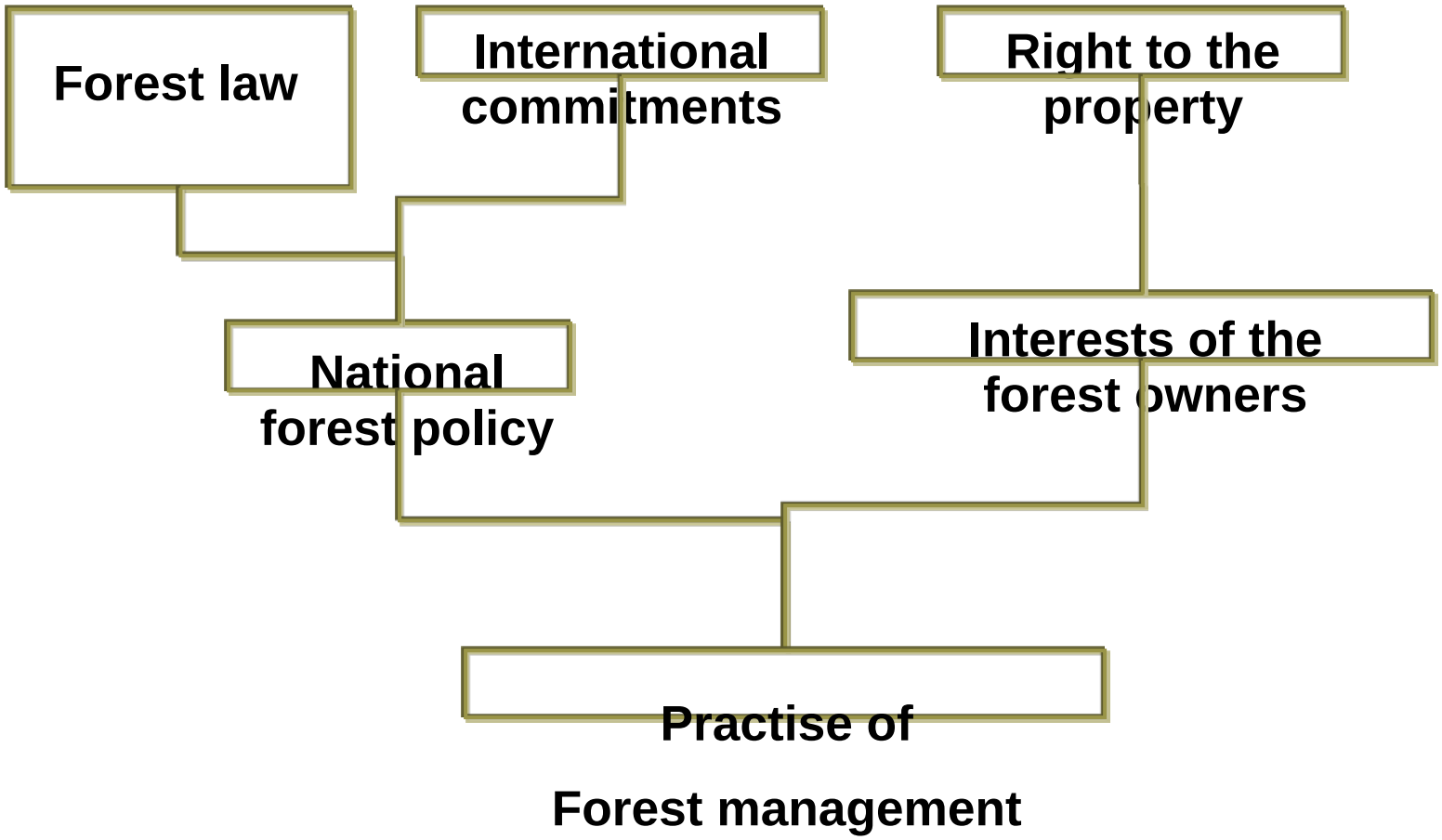
Protection function



Socio-culture

(Lexer, Hochbichler, Vacik 2005

Legal frames & interests of the owner



(Lexer, Hochbichler, Vacik 2005)

Multiple purpose forest management - Mulitfunctionality

Segregation:

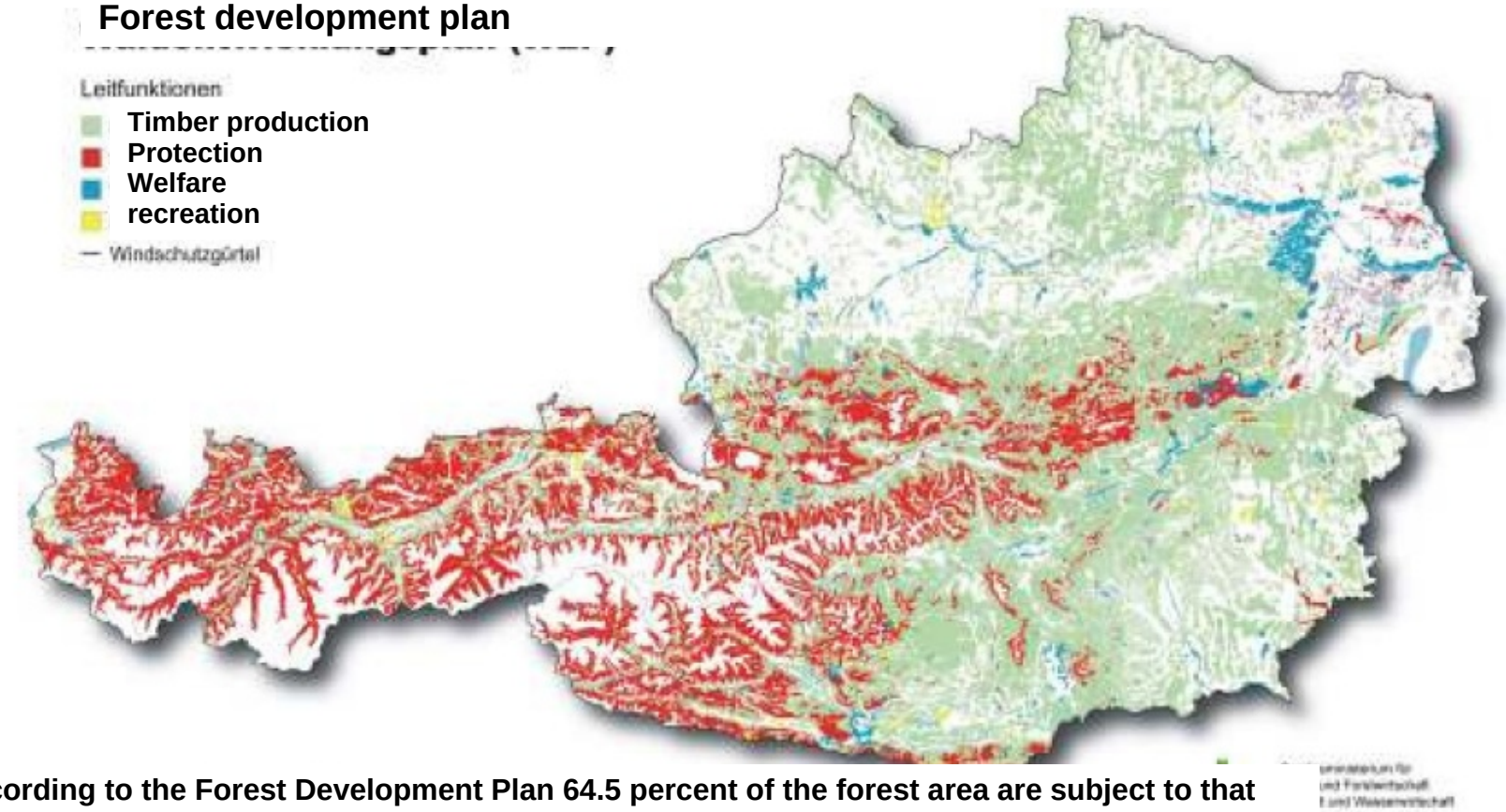
Spatial separation (of different landuse acitivities) due to different demands (targets)

Multifunctionality (Integration):

Integration of different demands (targets) at stand level

(Lexer, Hochbichler, Vacik 2005)

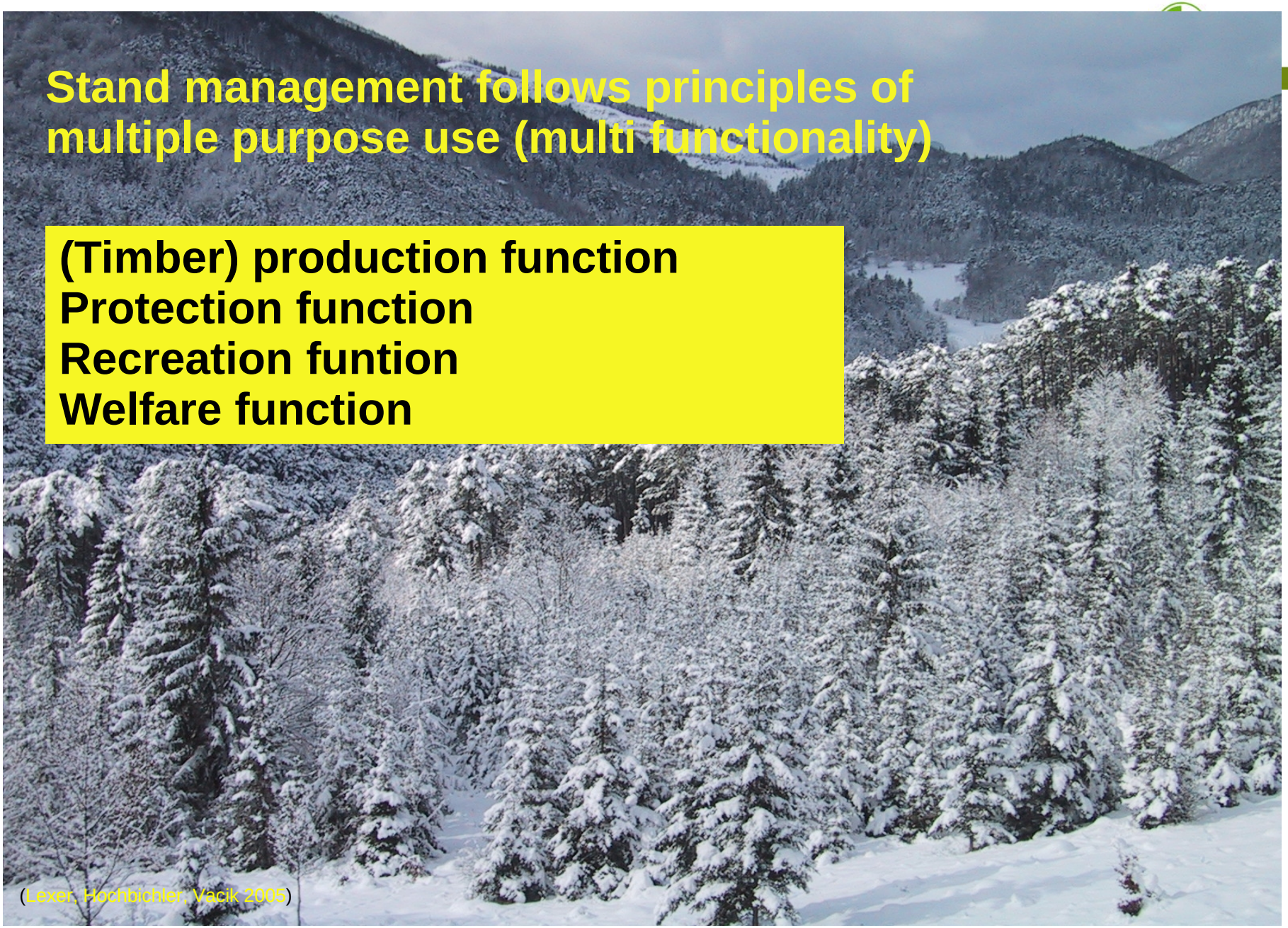
Forest landuse planning



According to the Forest Development Plan 64.5 percent of the forest area are subject to that economic function. Especially in mountainous regions the protective effect of forests (30.7 percent) is playing an important role to protect areas for living and economic activity. Forests also serve people's well-being (3.6 percent) and, of course, recreation (1.1 percent). Also the protective effect against the wind must not be forgot.

Stand management follows principles of multiple purpose use (multi functionality)

(Timber) production function
Protection function
Recreation funtion
Welfare function



(Lexer, Hochbichler, Vacik 2005)

Timber Products

SPÖRK ewo 10/99

Saw timber and industrial wood

Fire/energy wood

Foto: Spinka 2008)

Timber of high value

Potentials of success for forest managment

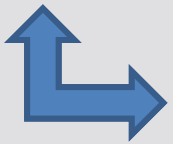
Adaptive forest management

adaptive forest management ->

level: tree - stand - landscape

*[diversity]

site conditions -



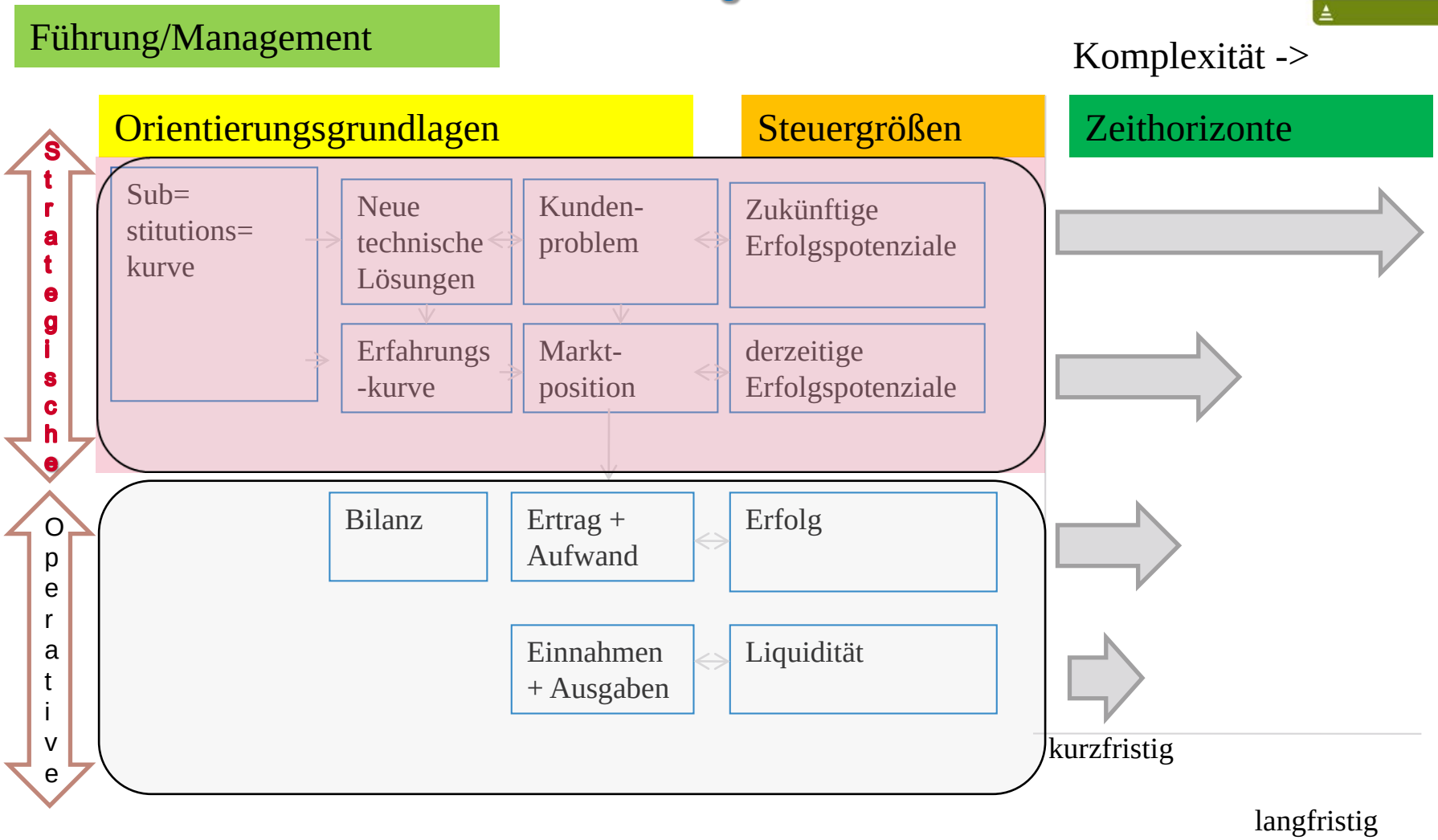
climate - future

objectives - principles	site	climate
Maintanance and improvement of genetic diversity		
genetic diversity		
tree species diversity		
structure diversity (texture, layering, dead wood)	●	●
stability	●	●
stand diversity		
self organisation (natural regeneration)		
sustainable biomass removal		

objectives - principles	site	climate
tree species choice and stand management will be decided with regrardto ecological basics and desired forest ecosystem services		
tree species mixture and structured stands will reduce economic risks		

(Köck und Hochbichler 2014)

Potenzial of success for forest management

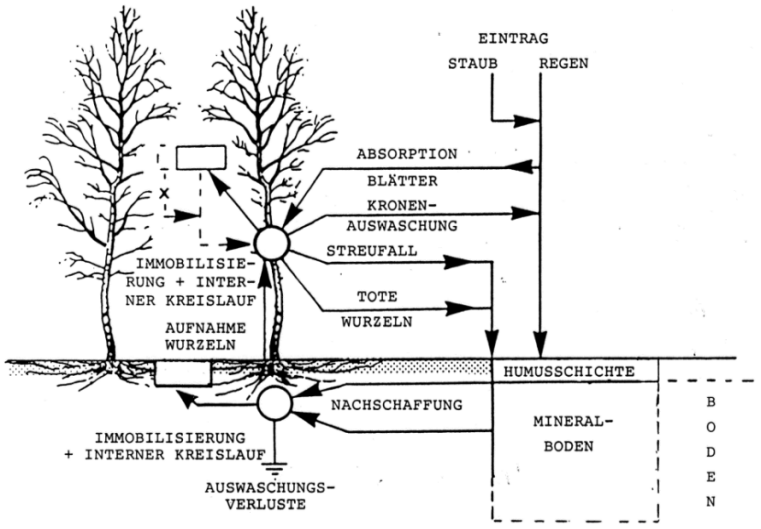


Aufgabenbereiche der Unternehmensführung mit ihren Steuerungsgrößen und der zunehmenden Komplexität der jeweiligen Orientierungsgrundlagen **(Gälweiler 2005)**

level of biological diversity (Wilson 1995)

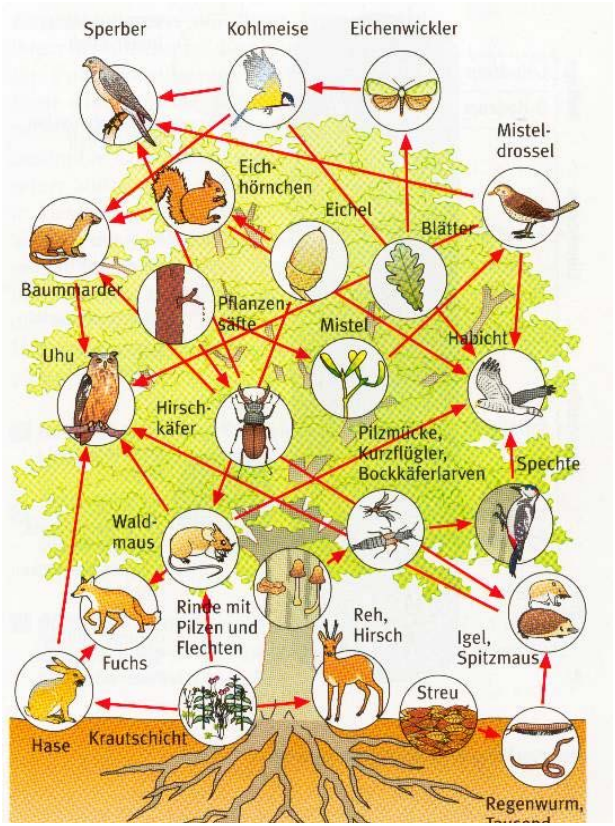
- **gene**
  - **organism**
    - **species**
      - **gild**
        - **biocoenosis**
          - **ecosystem**

DER NÄHRSTOFFHAUSHALT VON WALDBESTÄNDEN WIRD DURCH INNERE UND ÄUSSERE KREISLÄUFE UND DURCH DIE NACHSCHAFFUNG AUS DEN VERWITTERUNGS- UND/ODER AKKUMULATIONSVORGÄNGEN (DEPOSITIONEN) GESTEUERT



SCHEMA DES NÄHRSTOFFHAUSHALTES DES WALDES. RECHTECKE SYMBOLISIEREN BEREICHE DER AKKUMULATION, KREISE BEREICHE HOHER MOBILITÄT.

Quelle: (1984) MILLER, H.G.; Nutrient cycles in birchwoods. Proceedings of the Royal Society of Edinburgh, 85B, 83-96.



http://www.wotys.de/aufbau_eines_waldoekosystems.htm

(bio) diversity on landscape level

- ecosystems
  - habitate…….
    - forest stands

timber products

SPÖRK ewo 10/99

timber of high value

- Quality criteria
  - minimum length:> 2,80 (3,0m) * x [> 0,5m]
  - branchless stem volume: > 1/3 of diameter
  - mean diamter of the log: > (50) 60 cm [>40cm]

Silvicultural systems

for artificial/natural regeneration

(nach Thomasius 1996)

---

shelter wood cutting
strip cutting
gap/group cutting
clear cutting

Silvicultural systems

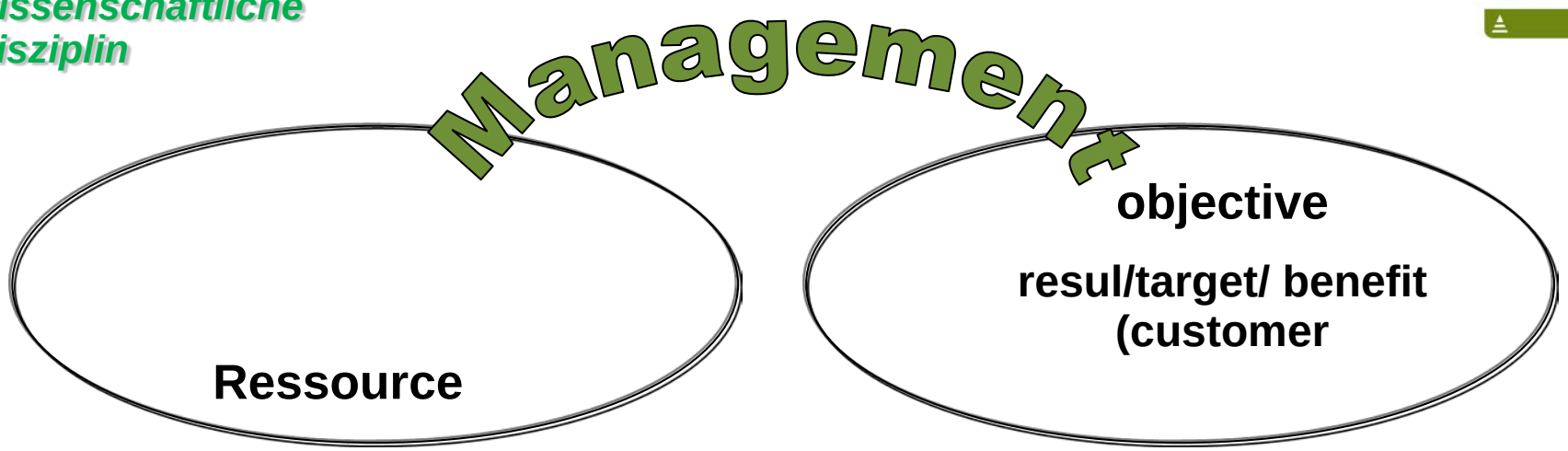
clear cut free system –

continuous cover forest mangment

-> light demand of tree species

Lichtbaumarten Lä-(Zi) (group selction system)
IntermediärbaumartenEi-Hb (coppice with standards)
SchattbaumartenFi-Ta-Bu (single tree selection system)

(nach Thomasius 1996)



Resources

wood

carbon

biodiversity

water

Benefit

Timber (saw timber, firewood

Carbon storage

Maintanace of diversity

Drinking water

(Hochbichler 2008, nach Malik 2006)

Forest resource management/ forst management

Balancing different interests

(LVA – Hochbichler, Lexer, Vacik)

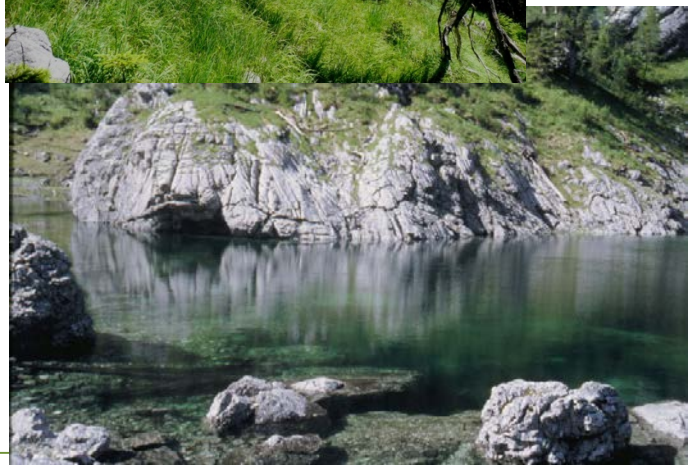
- **Analysing different interests („Stakeholder“)**

(Umweltanalyse – Betrieb)

(Erwartungen vs. Nutzen)(Müller-Stewens und Lechner 2005)

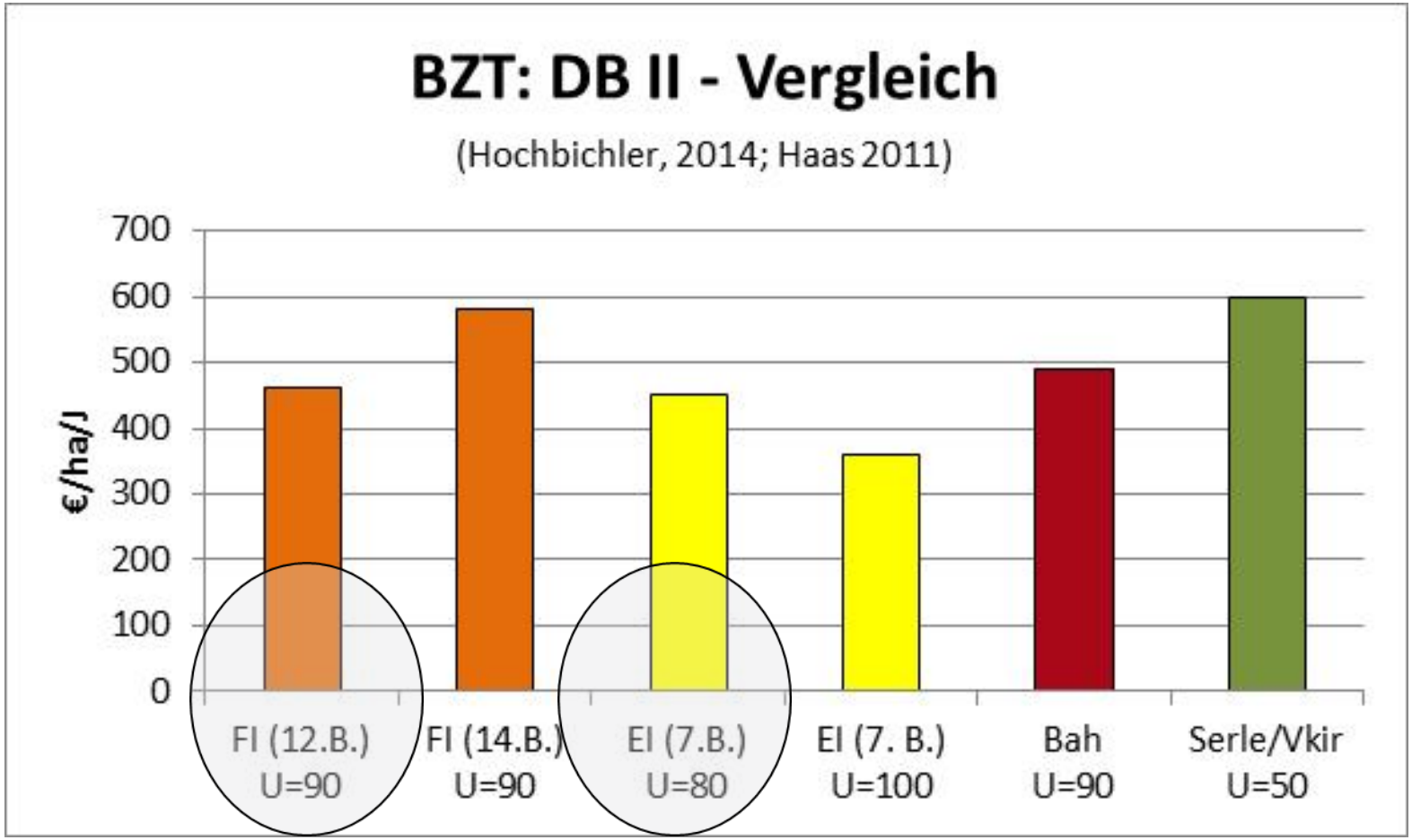
- **Methods/procedure**

(cost-utility anaylsis, mulit criteria prcedures,..)



Decision making: tree species choice

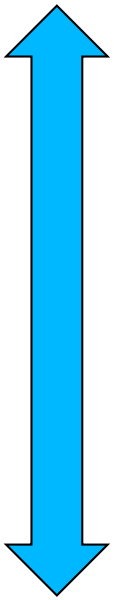
Economic aspects



Calculation of contribution margin of different stand types

biodiversity

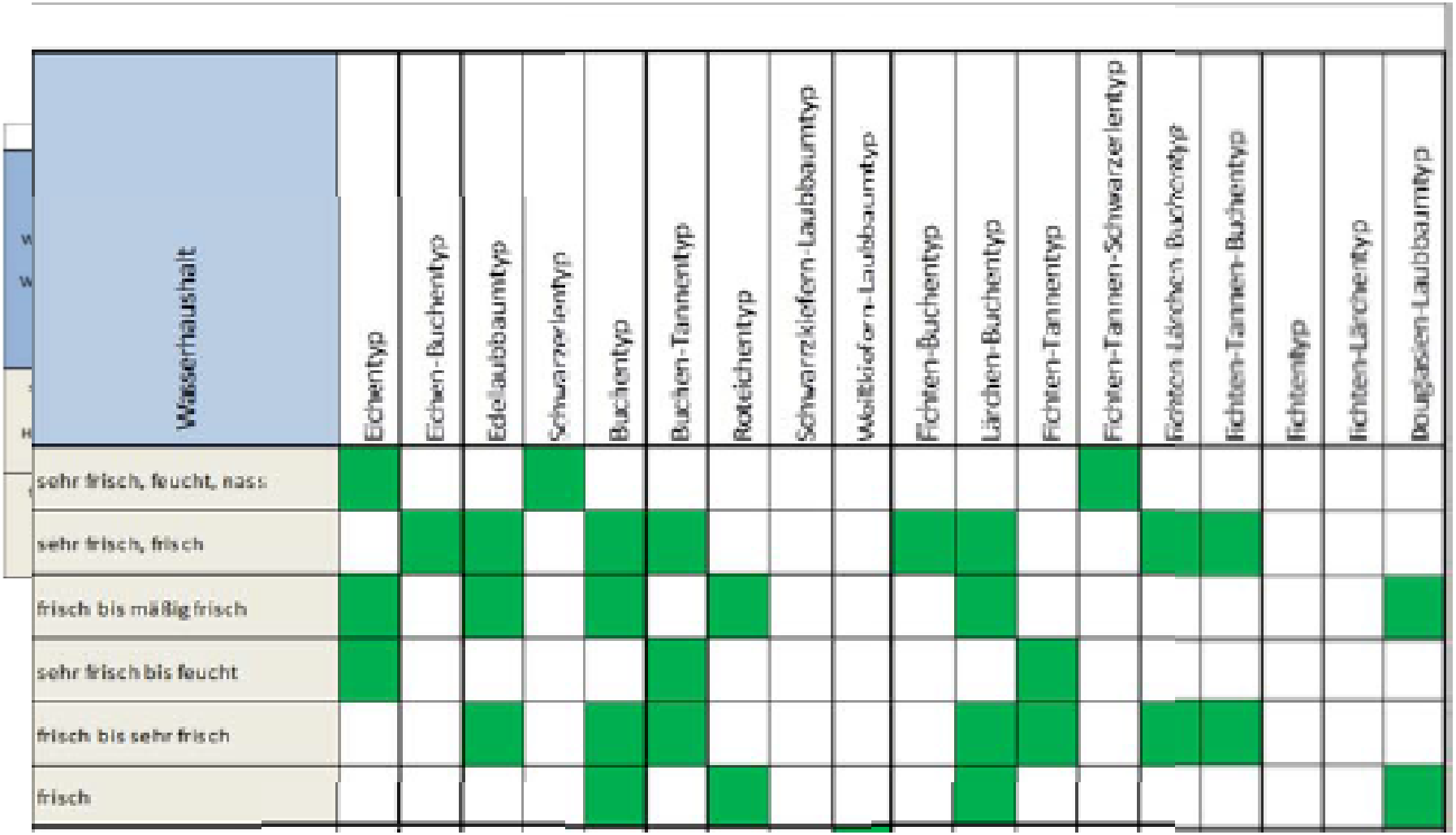
objectives - principles	site	climate
genetic diversity		
tree species diversity		
structure diversity (texture, layering,		
stability		
stand diversity		
self organisation		
harvesting intensity		



objectives of the forest owner

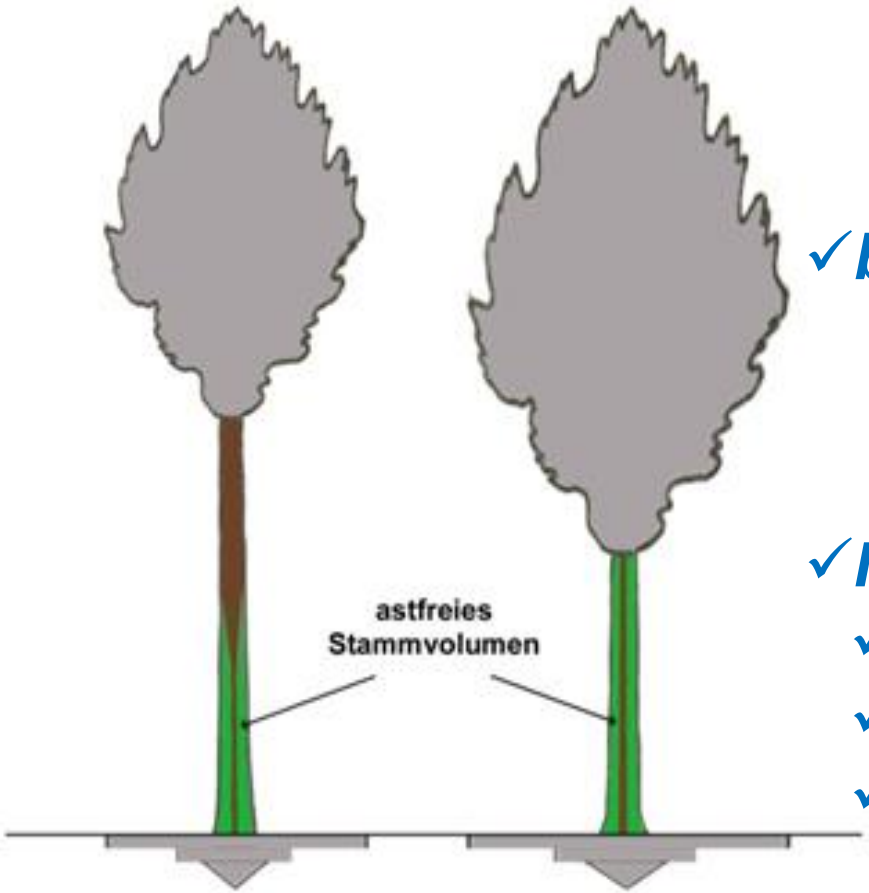
-> timber production

Decision making: tree species, goal stand type



f.e. guidelines for the forest management in lower Austria

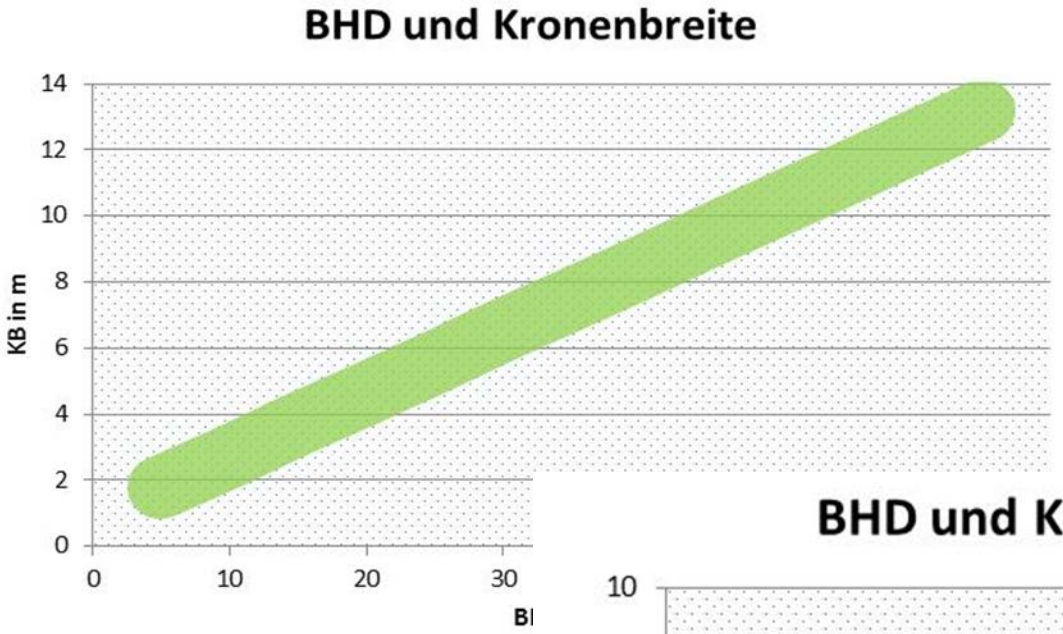
single tree oriented management



- ✓ ***based on***
  - ✓ ***experience/knowledge***
- ✓ ***Independent of***
  - ✓ ***silvicultural system***
  - ✓ ***stand size***
  - ✓ ***enterprise size***

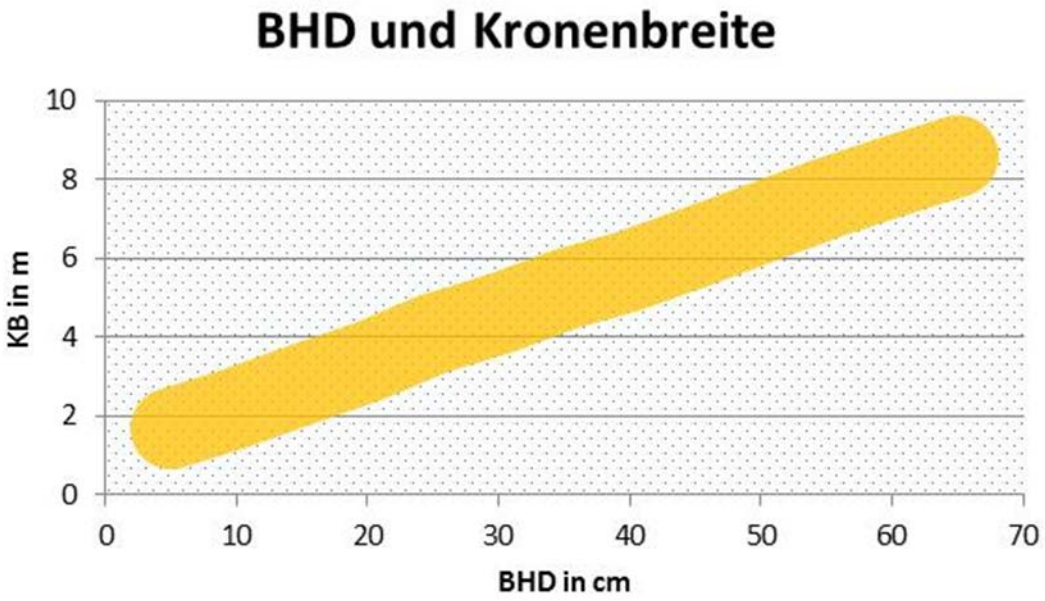
single tree oriented management

correlation between dbh (age) and crown width



deciduous trees

coniferous trees



Baumart	Ziel-Bhd (cm)	Kronen-breite (m)	Anzahl bei 100 % UB (N/ha)	Ziel-Überschirmung	
				Ziel-UB (%)	Anzahl bei Ziel-UB (N/ha)
Eiche, Berg-, Spitzahorn, Esche, Vogelkirsche, Wildbirne, Flatter-, Bergulme, Roteiche	*60 +*	*12 (10 – 14)*	*85*	*80*	*70 (60 – 80)*
Buche	*60 +*	*10 (8 – 12)*	*100*	*90*	*90 (80 – 100)*
Elsbeere, Speierling, Wal-, Schwarznuss, Pappel	*50*	*10 (9 – 11)*	*110*	*80*	*90 (80 – 100)*
Birke, Schwarzerle, Robinie	*40*	*9 (8 – 10)*	*160*	*90*	*140 (130 – 150*

tree species -> target diameter -> crown width -> cover percentage

- > plus tree number

single tree oriented management

(Hochbichler, Bauer, Peter, 2013)

single tree oriented management

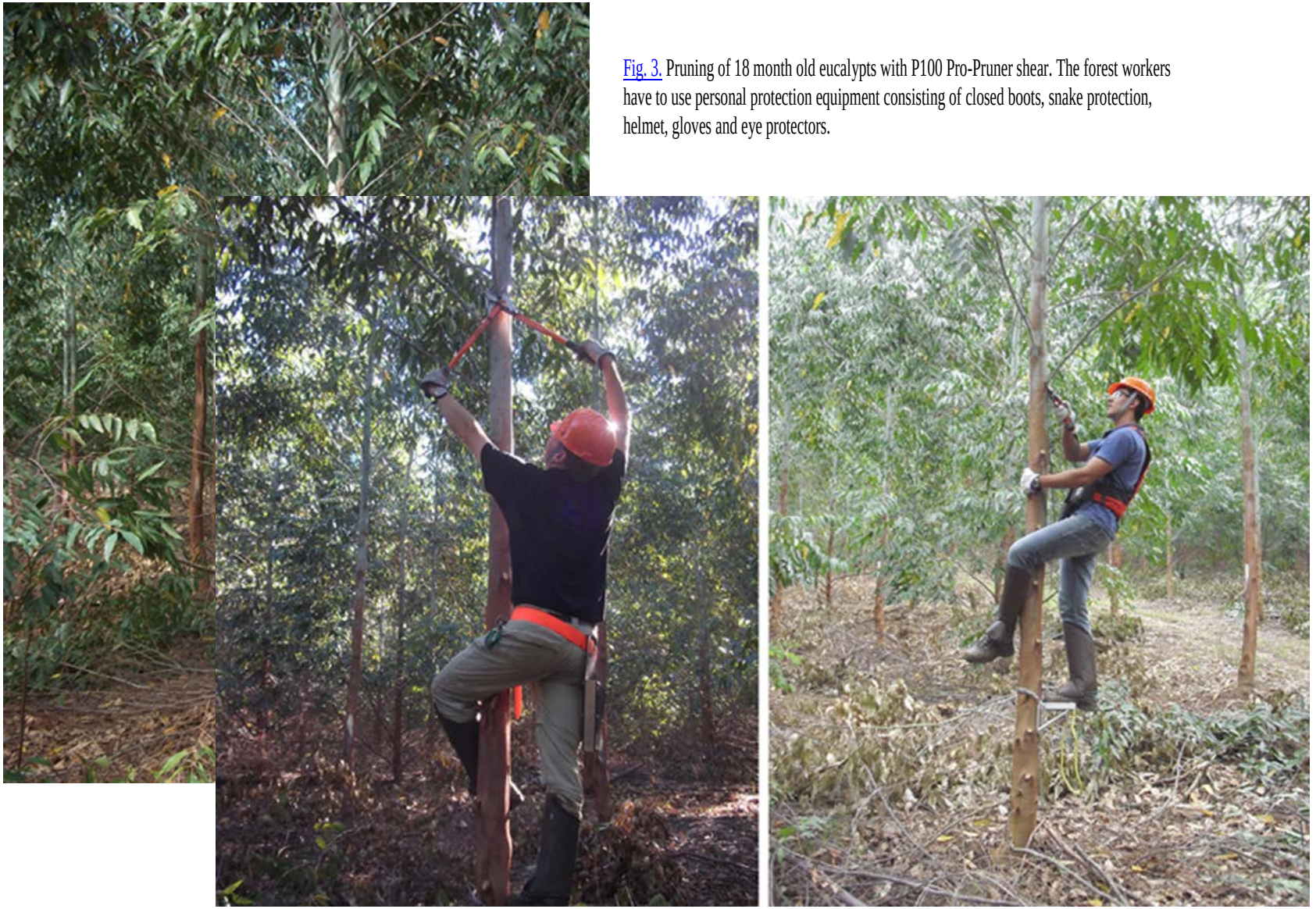
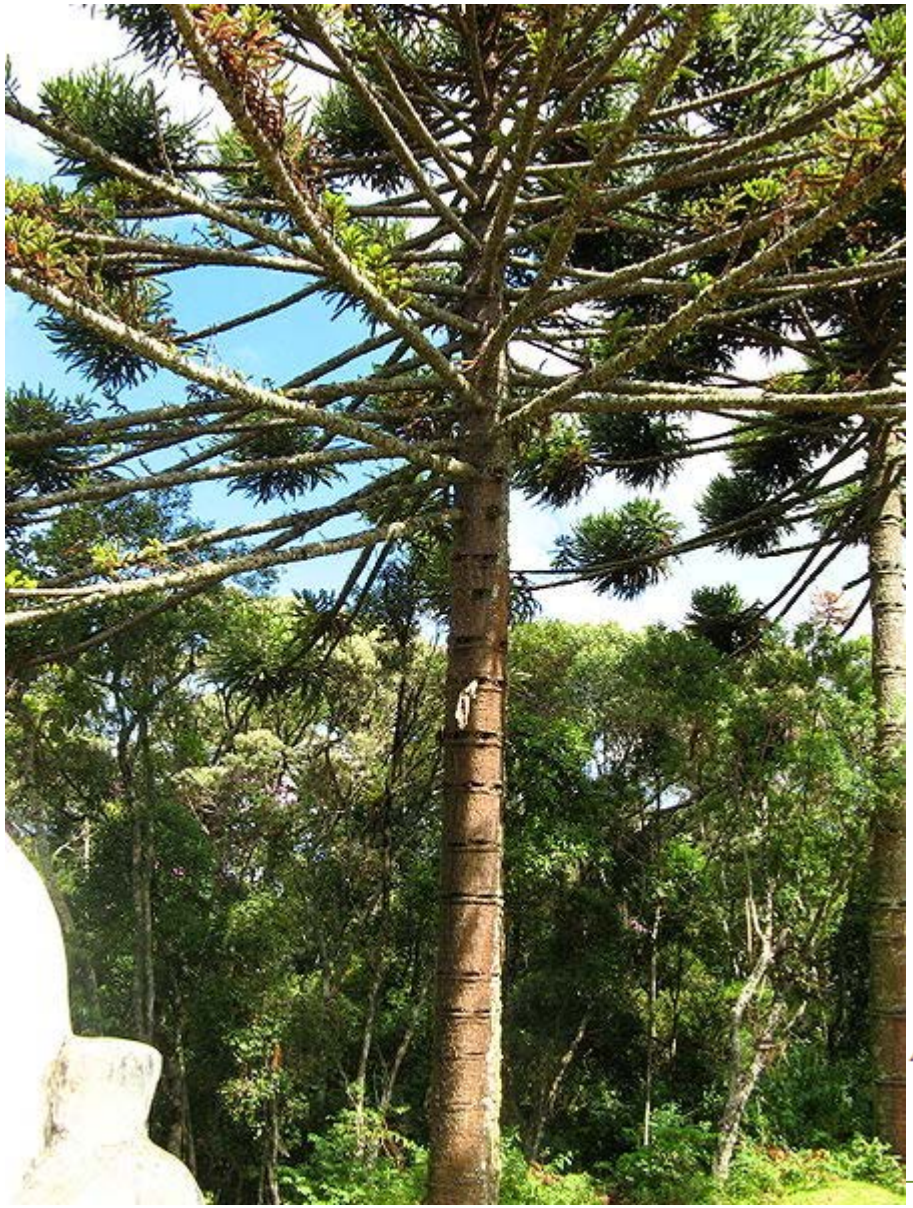


Fig. 3. Pruning of 18 month old eucalypts with P100 Pro-Pruner shear. The forest workers have to use personal protection equipment consisting of closed boots, snake protection, helmet, gloves and eye protectors.

single tree oriented management



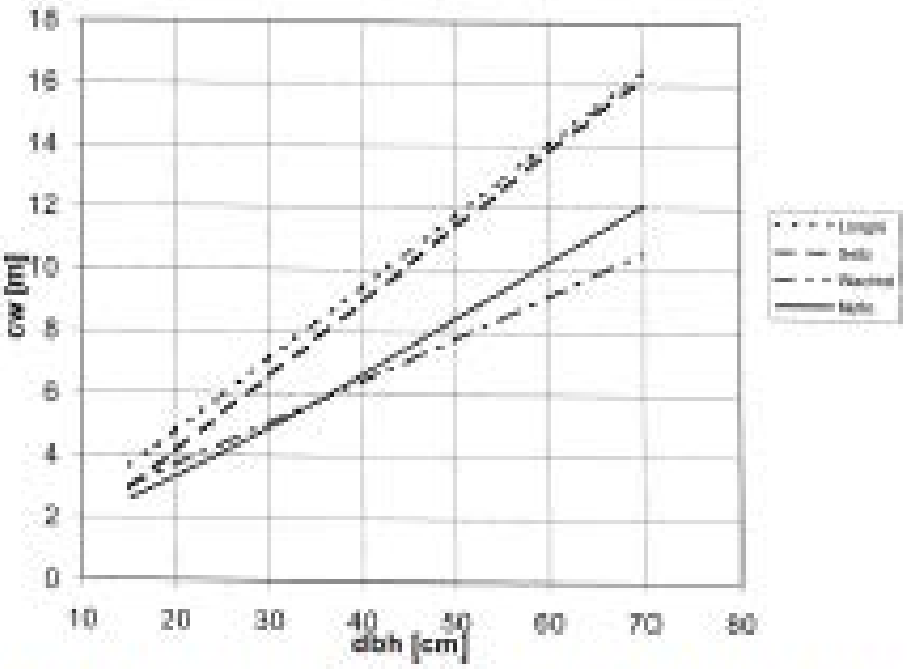
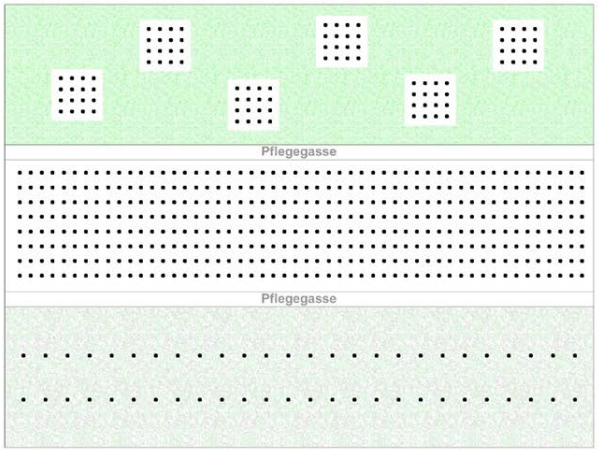


Figure 6. Comparison of three crown width models (Longhi 1980; Seitz 1986 and Wachtel 1990) with the model found in this study (Nutto).

Managing diameter growth and natural pruning of Parana pine, *Araucaria angustifolia* (Bert.) O Ktze., to produce high value timber

Leif NUTTO[a], Peter SPATHELF[b]*, Robert ROGERS[c]

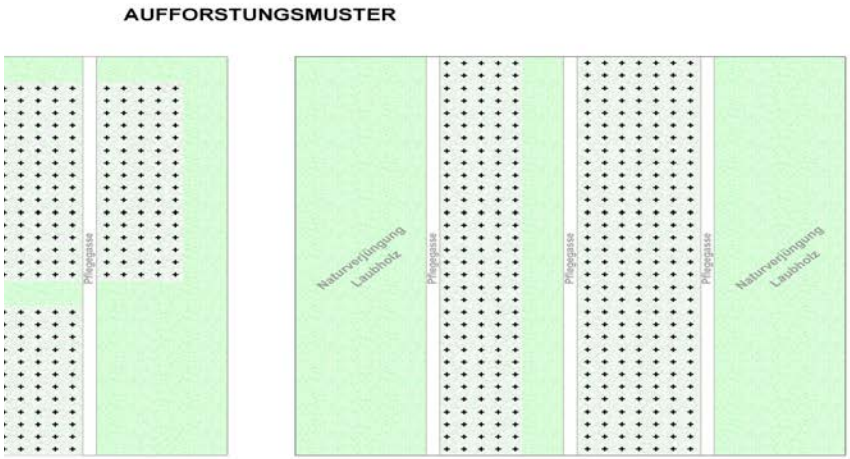
afforestation design



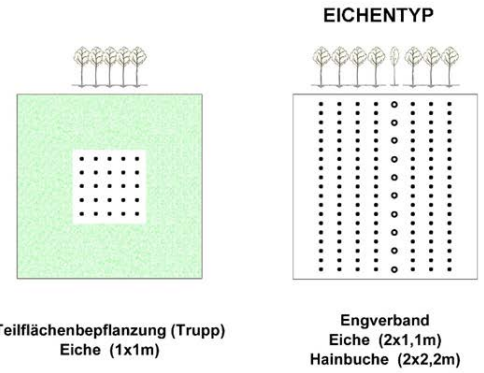
Teilflächen (Trupp)

Engverband

Weitverband



KIEFERN- LAUBBAUMTYP



objectives - principles	site	climate
genetic diversity	●	
tree species diversity	●	●
structure diversity (texture, layering,	●	
stability	●	
stand diversity		
self organisation		
harvesting intensity		

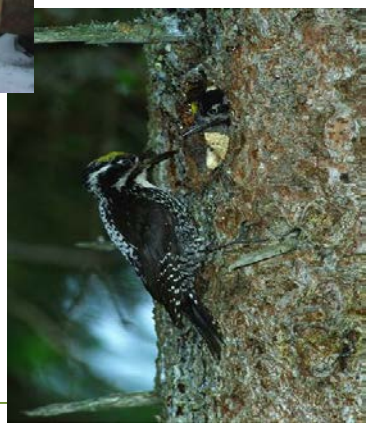
Balancing different interests

Strategic – operative implementation

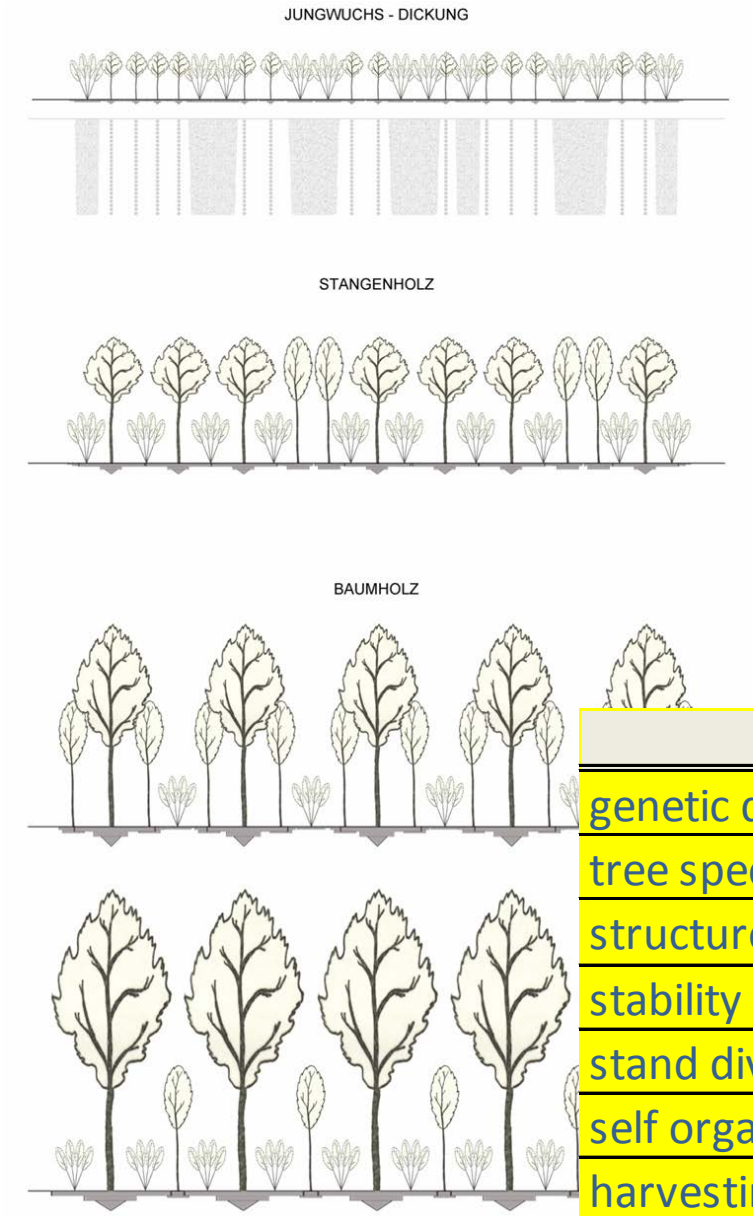
- o **silvicultural system**
- o **silvicultural techniques**

Zielsetzungen/Fu

Verjüngungsverfahren/Waldbausysteme	
schlagweise	Kahlhieb
	Lochhieb (Kleinkahlhieb)
	Schirmhieb
	Femelhieb
schlagfrei	Einzelbaumhieb - Plenterung (zB. Fi-Ta-(Bu) DW)
	Gruppenhieb - Kleinkollektiv (zB. Bu-DW; Fi-Lä DW)
	Schirmhieb (zB. Mittelwald)

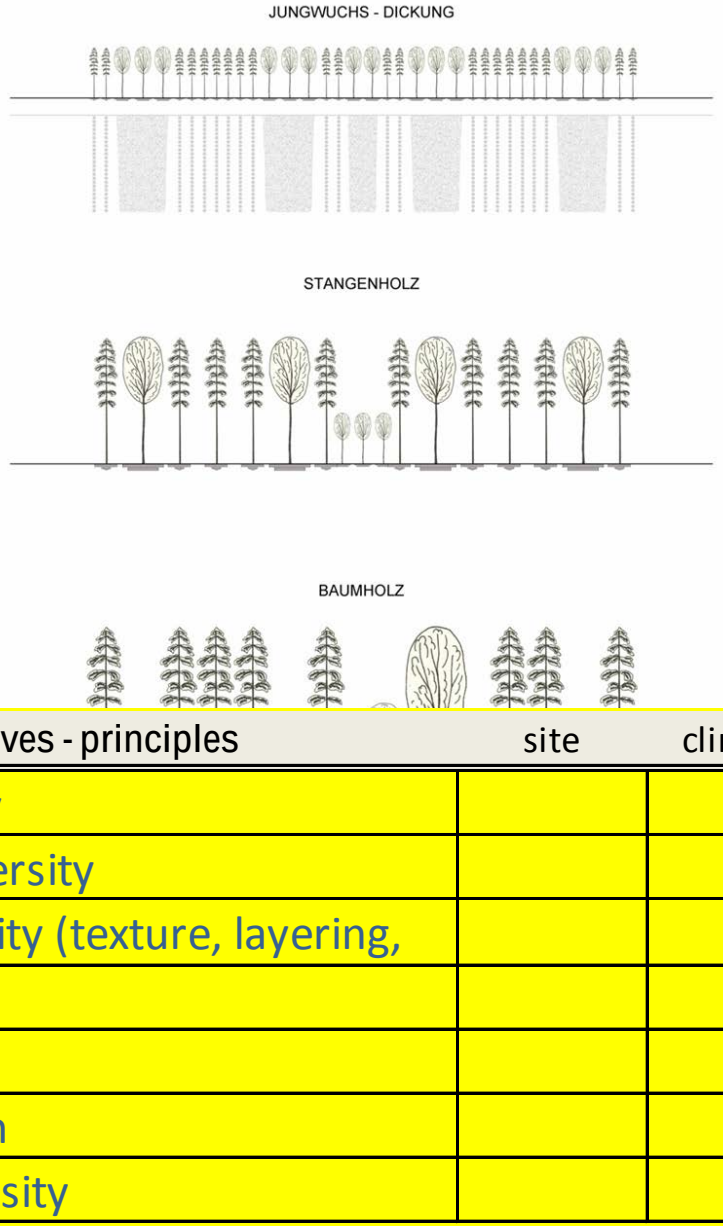


Single tree oriented management - stand development



Behandlungstyp: Eiche - Hainbuche

Grafik: Weidl & Hochbichler 2014

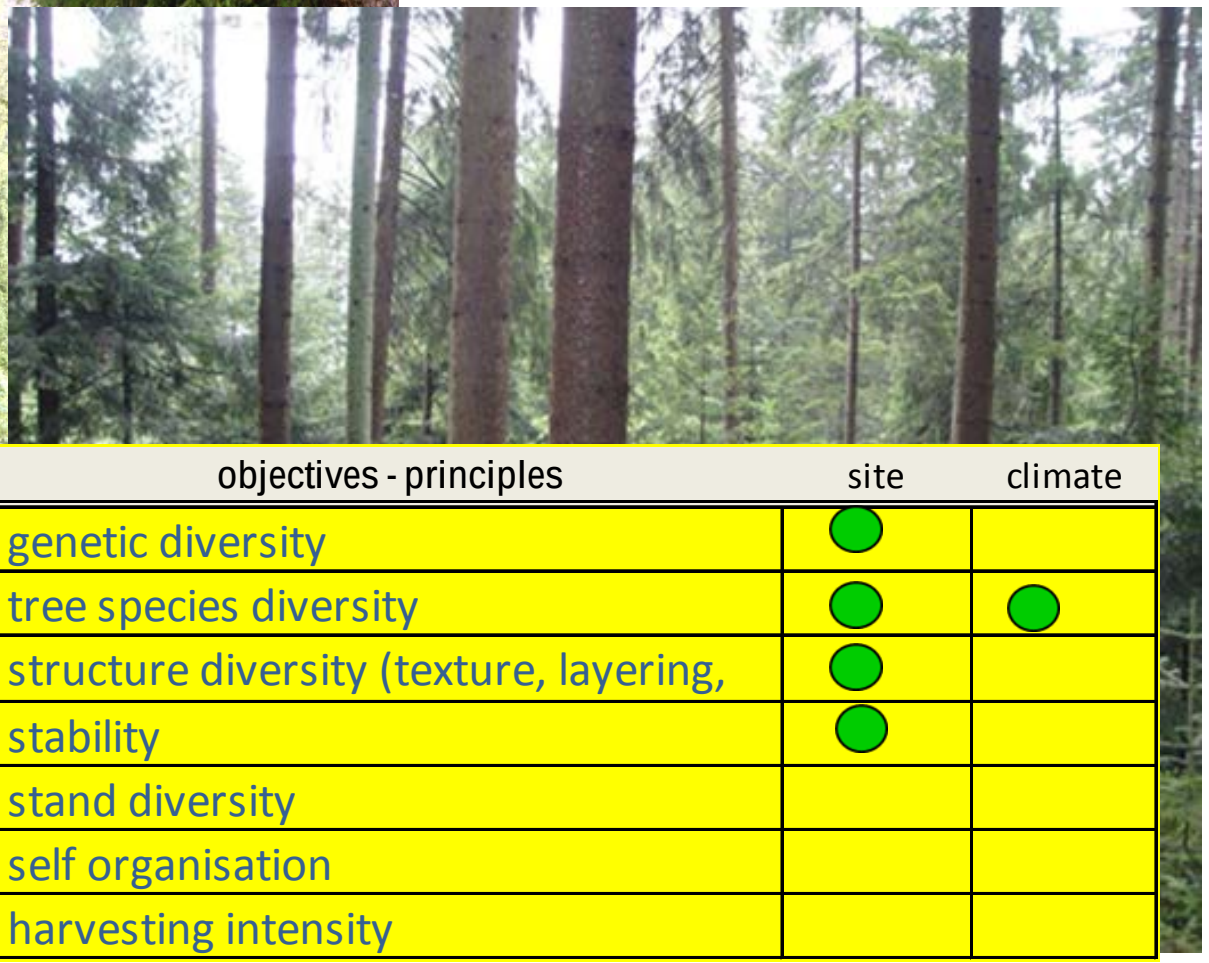


Behandlungstyp: Weißkiefer - Buche

Grafik: Weidl & Hochbichler 2014

objectives - principles	site	climate
genetic diversity		
tree species diversity		
structure diversity (texture, layering,		
stability		
stand diversity		
self organisation		
harvesting intensity		

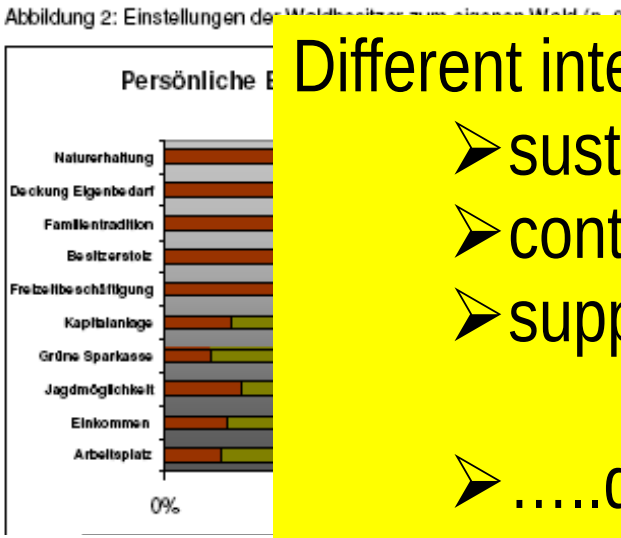
Natural regeneration : single tree cutting
group selection cutting



objectives - principles	site	climate
genetic diversity	●	
tree species diversity	●	●
structure diversity (texture, layering,	●	
stability	●	
stand diversity		
self organisation		
harvesting intensity		

Strukturelle Kopplung zwischen Lebewesen und Milieu(Maturana und Valera 1984)

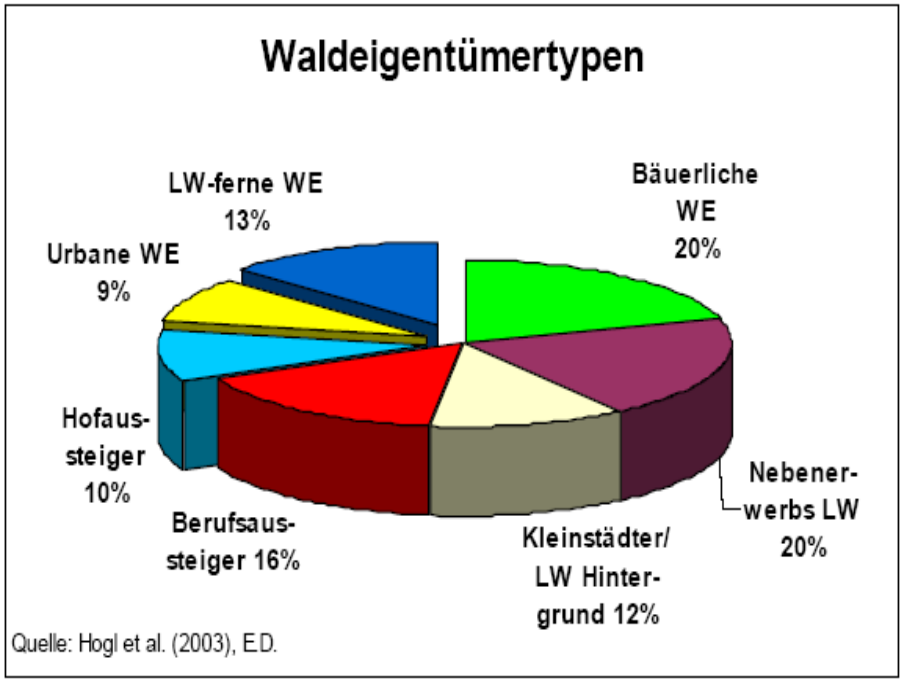
Small scale forestry [- 200 ha]



Different interests

- sustainable management
- continuous income (saw timber, high valuable timber)
- supply for firewood

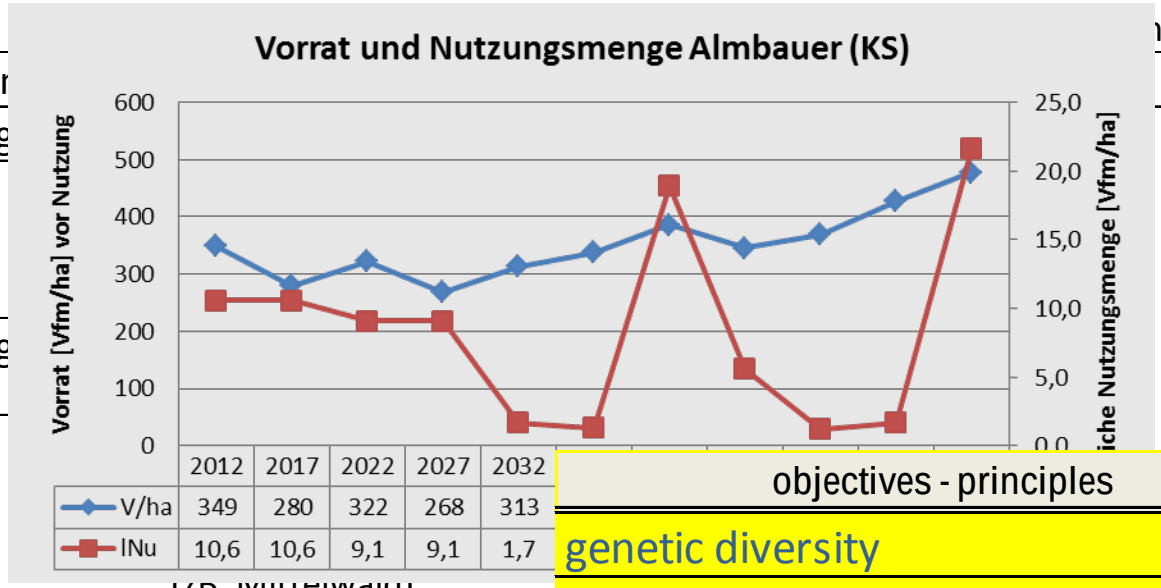
- .....delight being forest owner



different forest owner types

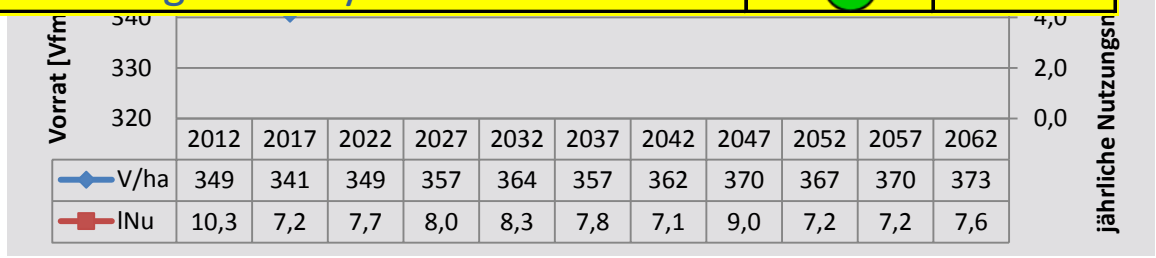
Waldeigentümer - Meinung (Weiss& Bach 2007)

Potentials of success for small forest owner



objectives - principles	site	climate
genetic diversity	●	
tree species diversity	●	
structure diversity (texture, layering,	●	
stability	●	
stand diversity		
self organisation	●	
harvesting intensity	●	

Interests/targets:
sustainable income
natural regeneration
no whole timber harvest

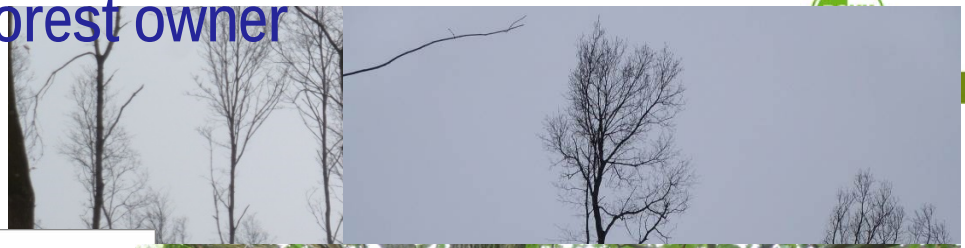


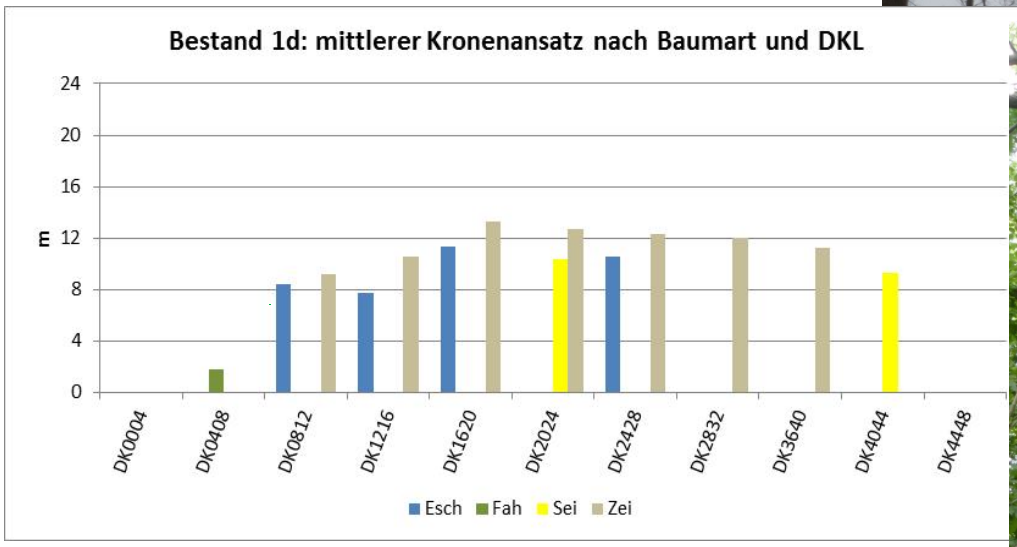
Development of
Growing stock and cutting volume per ha

(Marschnig2015)

Potentials of success for small forest owner

Stand analysis





target – decision - implementation

Oak – high valuable tree species type

Stepwise conversion
of coppice
to coppice with standards

(Hochbichler, Bauer, Peter, 2013)

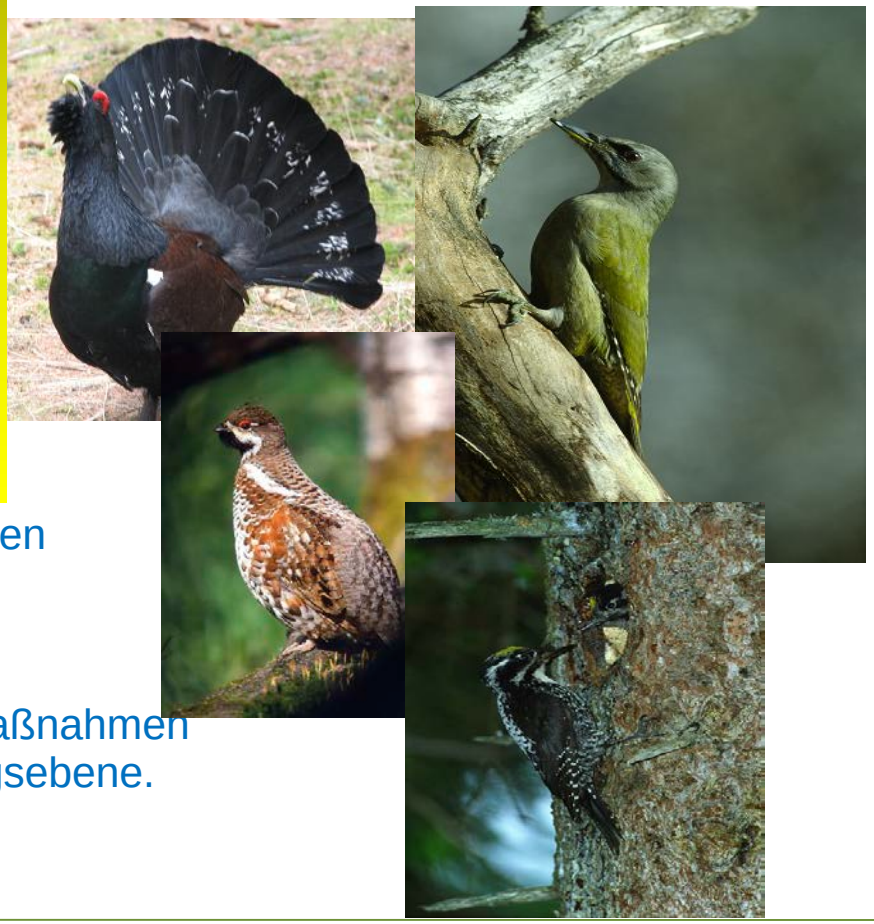
Habitat management (Pfandl 2010)

Integratives waldbauliches Behandlungskonzept mit besonderer Berücksichtigung der Habitatansprüche bedeutender Vogelarten für das Gebiet Neuberg-Außerberg (Tirol) –
Österreichische Bundesforste AG

- beneficiary interests:
  - Forest management
  - Silvopasturing
  - Tourism
  - Nature conservation
  - Hunting

ndenberg und Steinberg am Rofan)

ndalpines Fichten-Tannen-buchenwald)



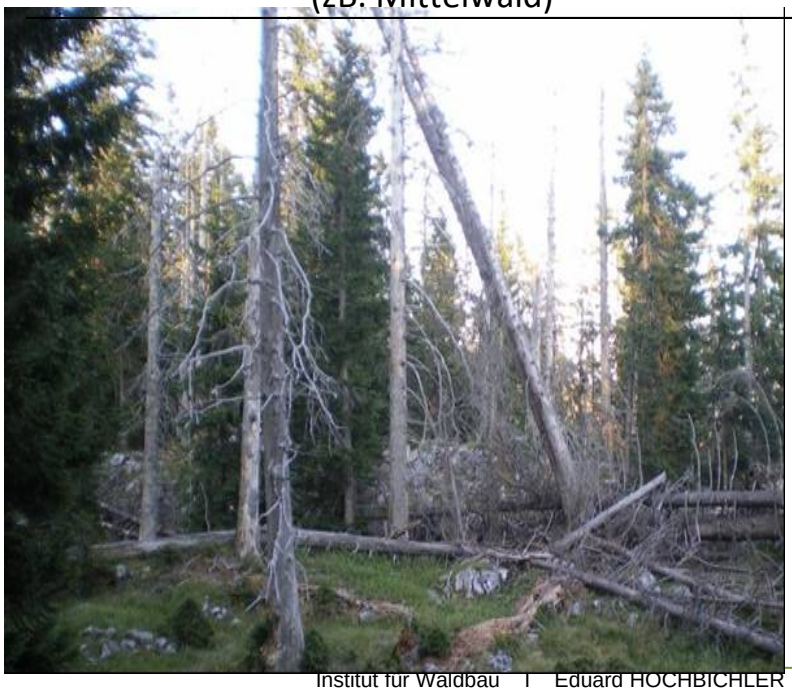
-Kenntnisse der Habitatansprüche der relevanten Vogelarten
- Erfassung des Waldzustandes, potentieller vogelspezifischer Habitate, Prognose der Habitatveränderungen durch waldbaulichen Maßnahmen
- Integrative Maßnahmenplanung auf Abteilungsebene.

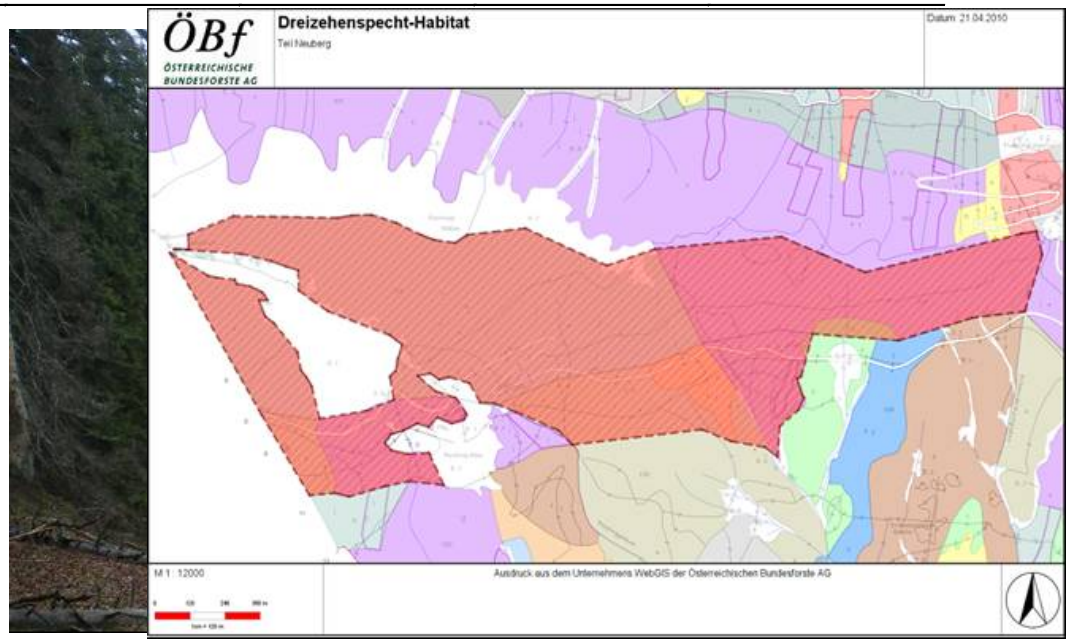
Habitat management (Pfandl 2010)

Verjüngungsverfahren/Waldbausysteme		Zielsetzungen/Funktionen/Dienstleistungen
schlagweise	Kahlhieb	
	Lochhieb (Kleinkahlhieb)	
	Schirmhieb	
	Femelhieb	
schlagfrei	Einzelbaumhieb - Plenterung	
	(zB. Fi-Ta-(Bu) DW)	
	Gruppenhieb - Kleinkollektiv	
	(zB. Bu-DW; Fi-Lä DW)	
	Schirmhieb	
	(zB. Mittelwald)	

habitat criteria (key indicators) – Dreizehenspecht (three – toed woodpecker)

- **dead wood : >= 20% of stem number**
- **share of tree species: >=9/10 spruce**
- **structure: >=3/10 gaps**





Habitat management (Pfandl 2010)

Abteilung 135:
objectives:
- Goal stand type: 6 FI 2-3 BU 1-2 KI/LA
- Maintanance of habitat structure: Auerhuhn, Dreizehenspecht; Grauspecht
- Reducing silvopasture

operations:
• group selection system (larch in management unit 135a1 und b
• regulation of silvopasturing

Effects of operations on interests :

	Wirkungen				
Maßnahme	**Forstwirtschaft**	**Naturschutz**	**Jagd**	**Waldweide**	**Tourismus**
1	positiv	positiv	negativ	unbedeutend	unbedeutend
2	positiv	positiv	negativ	positiv	unbedeutend

Bergmischwald- Waldweide – (Reinweide) - Lichtweide

Regulation of forest pasture rights:

-> establish pure pasture

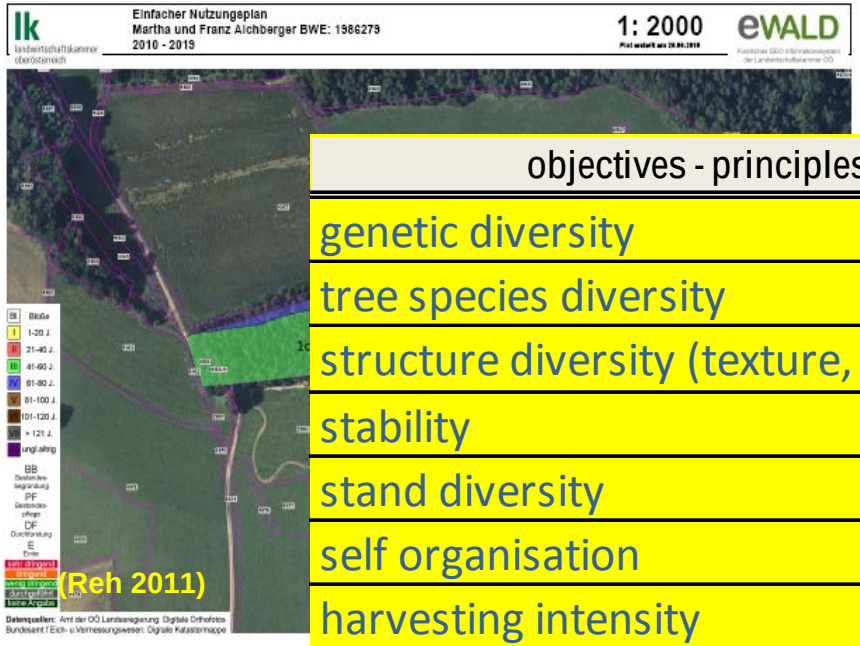
-> trend to pure „shelterwood“ pasture

fandl 2008

Potentials of success : small scale forestry - > landscape level

- **species (α) – diversity**
- **structural (β) – diversity**
- **spatial (γ)- diversity**

(Steinhardt et al. 2005)



(Reh 2011)

❖Different interests/targets determine the implementaton of

objectives - principles	site	climate
genetic diversity		
tree species diversity		
structure diversity (texture, layering,		
stability		
stand diversity	●	
self organisation		
harvesting intensity		

cepts
sities

Many thanks for attention and invitation!!