LIFE ADAPT BRDY

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D2.3

General management guidelines

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Climate Change Adaptation of Forests in the Brdy Highland

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Content

1. Introduction and assignment

One of important outputs of LIFE ADAPT BRDY are modified General management guidelines (RSH). According to agenda of the project, these are to contain prescriptions and principles for application of near-natural silvicultural approaches, which aim to adaptation of contemporary forest stands to climate change, i.e. a conversion of monocultures with dominant Norway spruce (NS) into stands manifesting diverse species, age and multistorey structures. This task directly follows the output of T2.1 and T2.2 task with outputs D2.1 and D2.2 – foundation of demonstration objects (DO) and operational Forest Inventory and it is a prerequisite for an elaboration of a guide for foresters (T4.2, D4.1).

The GMG emphasize a long-term basis of the prescribed measures. It is obvious that such change, i.e. a conversion towards the target condition, cannot be achieved over one rotation. To speed up the change, this project also emphasizes the need for a decrease of hoofed game density to stop the game damage, especially on natural regeneration.

The subject of the amendments (version 1.2) is to take into account the current change in related legislation coming into effect on 1 January 2026. This is Act No. 250/2025 Coll., which amends Act No. 289/1995 on forests and related decrees (No. 559/2025 Coll., which amends No. 298/2018 Coll. and 456/2021 Coll. and the new decree 558/2025 Coll.).

2. Information source and methods

The study area natural conditions taken into consideration

Regarding differences in soils and stands (based on the forest site classification), the contemporary forests were differentiated as follows:

1. beech with oak on acidic and nutrient-medium soils (CHS 43 a 45)
2. fir with oak on nutrient-medium gleyic and acidic gleyic soils (CHS 47)
3. beech with fir and spruce on acidic, nutrient-poor and stony soils (CHS 51 a 53)
4. fir with beech and spruce, wet fir, wet nutrient-poor spruce with fir + ash with sycamore (CHS 57, 59, 79 a 29).

This differentiation represents the majority of forest type groups (SLT) present in the area of interest. The attributes of all DO and their affiliation to the groups of management guidelines are presented in table 1. Based on valid forest management plans (LHP), we included the dominant SLT (based on tree species domain in generalized soil and other conditions) with share of 10 % and more on DO. It is clear from the overview that there are often diverse environmental conditions at DOs. The most homogeneous (one group) in this direction are DO "Pod Slonovcem" and "Vosecká". On the contrary, the most varied (three groups) are the conditions at DO "Kudibal" and "Kreslovna". The other DOs represent two groups of conditions according to the above mentioned differentiation.

Table 1: The demonstration objects affiliating to particular groups of general management guidelines (RSH).

Name of DO	Prevailing forest site group (SLT)[1] (% by area)	CHS[2]	PCHS[3]	Group of general management guidelines (RSH)
Pod Slonovcem	3K+4K (91 %)	43	43 a,b	1
V můrách	3I+4I (57 %)	43	43 a,b	1
	3O+3P+4O+4P (42 %)	47	47a,b	2
Brdce	5K+5M (57 %)	53	53 a,c	3
	5N (25 %)	51	51 a	3
	6P (18 %)	57	57e	4
Čihadla	6K+6M (73 %)	53	53 b,c	3
	6Q (23 %)	57	57e	4
Rafanda	5K+5M (68 %)	53	53 a,c	3
	5P (19 %)	57	57e	4
	7T (12 %)	79	79a	4
Vosecká	6K+6M (51 %)	53	53 b,c	3
	6N (47 %)	51	51b	3
Štítov	4S (47 %)	45	45 b	1
	4O (47 %)	47	47a	2
Kudibal	4P (63 %)	47	47b	2
	4I (25 %)	43	43b	1
	5G (11 %)	59	59b	4
Kreslovna	4I+4K (42 %)	43	43b	1
	5O+5P (25 %)	57	57 b,e	4
	4O+4P (23 %)	47	47a,b	2
Rokle	4P (90 %)	47	47b	2
	[3U (8 %)]	[29]	29g	4
Horní muničák	4P (55 %)	47	47b	2
	4I+4K (42 %)	43	43b	1

Captions: [1]tree species domains: 3 beech-oak; 4 beech; 5 beech-fir; 6 beech-spruce; 7 spruce-fir; soil conditions: S nutrient-medium; K acidic; I compacted acidic; M nutrient-poor; N stony acidic; O nutrient-medium gleyic; P acidic gleyic; T nutrient-poor wet; G nutrient-medium wet; U valley); [2]target management unit; [3]target management subunit

Consideration of three forest development types (FDT)

The three FDT (target – transitional – distant) were differentiated based on the three criteria such as share of spruce, % area covered with natural regeneration and stand storeys (table 2).

Table 2: Forest development types according the attributes.

	Species composition (% share of NS)	Relative area (%) of natural regeneration	Height structure (number of storeys)
A – target	<50	>50	>2
B – transitional	50 – 75	5 - 50	2
C – distant	>75	<5	1

As for species composition, the distinguishing criterion is a share of Norway spruce (NS). Its share reflects different growing conditions generalized in target management units (CHS); it is expected generally that NS share will be less than 50%. On the other hand, more than 75% share of NS classifies the stands in the context of project strategy as distant ones. A transitional type covers all range between these two limits.

Regarding the presence of natural regeneration, the limits are between 5 and 50% of stand area, where 5% represent the distant type and more than 50% is a target type. Again, a transitional type covers all range between these two limits.

The last criterion is a height structure characterized by a number of storeys present. The target are multi-storey stands with mosaic of groups or even various trees. The boundary distinguishing the types of development are two storeys. One-storey stands are a distant type, two-storey stands are a transitional type and multi-storeyed stands reflect the satisfactory condition.

It is supposed that real conditions of forest stands will be often a combination of the criteria. Therefore, more weight is given to the share of NS, less important is % area of natural regeneration and the least one is the height structure. Every case ranking will be regarded according to the target needed including relevant forestry practice capacity and facility (D2.2). For example, a multi-storeyed, naturally-regenerated NS monoculture would be ranked as the target type. If it is on upper water-logged site with area less than 0.5 ha, one can accept that. However, if the NS monoculture is larger or at lower altitude, it is likely to be ranked as transitional or distant type.

Large clearcuts exceeding 1 ha of area and inappropriately thinned (high h/d ratio, short live crowns posing a risk of abiotic damage) stands are also the distant type.

As mentioned above, the shift on the way between distant→transitional or transitional→target cannot be accomplished over one rotation. More quick achievements are supposed in conversion of the distant type to the transitional one by mitigation the hoofed game pressure on natural regeneration and regeneration of other tree species (for example beech and fir) by underplanting or udersowing.

Information sources

The prescriptions, particularly for dominant spruce stands, are based on regional plans of forest development, long-term research and experience of practice. The sources are:

- Approved Regional plan of forest development (OPRL) for Natural forest area (PLO) 7 – Brdská vrchovina with validity 2023-2042. Download at: https://www.uhul.cz/wp-content/uploads/OPRL_PLO_7.zip.
- Certified methodology issued in edition Forestry guide (LP) focused on stabilisation and extending the life of existing spruce stands for the needs of their conversion, including silviculture recommendations for following stands:
    - LP 4/2007 - Thinning of forest stands of the main forest tree species. Download at: https://www.vulhm.cz/files/uploads/2019/03/lp_2007_04.pdf
    - LP 4/2008 – Guidelines for Norway spruce stand transformation on sites naturally dominated by mixed forest stands. Download at: https://www.vulhm.cz/files/uploads/2019/03/lp_2008_04.pdf

- LP 13/2016 - Methods of thinning for silvicultural, ecological and economic optimum of beech forest stands in forest management units 43 and 45. Download at: https://www.vulhm.cz/files/uploads/2019/03/LP_13_2016.pdf
- LP 14/2016 - Methods of thinning for silvicultural, ecological and economic optimum of spruce forest stands in forest management units 43 and 45. Download at: https://www.vulhm.cz/files/uploads/2019/03/LP_14_20161.pdf
- LP 7/2017 - Soil improving and stabilising functions of forest trees in site complexes of pine and spruce management. Download at: https://www.vulhm.cz/files/uploads/2019/03/LP_7_2017.pdf
- LP 10/2018 - Silviculture of declining spruce stands, a set of thinning measures for areas exhibiting die-off. Download at: https://www.vulhm.cz/files/uploads/2019/03/LP_10_2018_web.pdf
- LP 5/2020 - Silviculture measures in drought-endangered forest stands at sites dominated by non-native spruce. Download at: https://www.vulhm.cz/files/uploads/2021/02/LP_5_2020.pdf
- LP 10/2021 - Silviculture techniques in spruce and pine stands threatened by snow and wind. Download at: https://www.vulhm.cz/files/uploads/2022/02/LP_10_2021.pdf

- Management principles in forests managed by the project partner – State forests of Saxony (Sachsenforst). Citation: Richtlinie zu den Waldentwicklungstypen im Staatswald des Freistaates Sachsen. Teil 1 und 2. Graupa, Staatsbetrieb Sachsenforst 2013, 41 p. + annexes
- Conclusions from online meeting (27. 2. 2024) T3.2 (Innovation and upscaling of EU funded projects). A record of the meeting is available at https://www.youtube.com/watch?v=IfG1uNipXSI.

3. Elaborated General management guidelines (RSH)

RSH are elaborated that way – each group 1 – 4 contain prescribed measures for three types of forest development (A – target, B – transitional and C – distant). At present, the demonstration objects are composed of different stand types (PT), i.e. not only the spruce ones. Therefore the options were segmented as individual tables (see appendices). The document then contains:

- RSH 1 (43_45) **Acidic and nutrient-medium beech with oak** – four tables for PT: 431+451, 433, 435, 436
- RSH 2 (47) **Nutrient-medium gleyic fir with oak** – two tables for PT 471, 476
- RSH 3 (51_53) **Acidic, nutrient-poor and stony beech with fir and spruce** – one table for PT 511+531
- RSH 4 (57_59_79_29) **Acidic, nutrient-poor and nutrient-medium fir with beech and spruce, wet fir, wet nutrient-poor spruce with fir+ash with sycamore** – four tables for PT 571+591, 597, 791, 291

4. Conclusion

General management guidelines present a general approach of management measures elaborated from available information basis and present-day knowledge of forest management of stands with dominant spruce on sites of former mixed stands. Based on guideliness, the detailed procedures taking the present-day stand conditions into consideration (outputs D2.1 and D2.2) will be elaborated in the following activity and the guide for foresters (T4.2, D4.1).

5. List of acronyms

CDS – target species composition
CHS – target management unit
DO – demonstration object
HZ – silvicultural system (P – shelterwood, N – strip felling, H – clearcutting, V – selection cut)
LHP – forest management plan
LVS – forest vegetation zone
NT – sanitary (salvage) cut
OPRL – regional plan of forest development
PLO – natural forest area
PT – stand type
RSH – general management guidelines

Tree species:

Czech	English*	Scientific name
BB – javor babyka	FM – field maple	*Acer campestre* L.
BK – buk lesní	BE – European beech	*Fagus sylvatica* L.
BO – borovice lesní	SP – Scots pine	*Pinus sylvestris* L.
BR – bříza bělokorá	SBI – siver birch	*Betula pendula* Roth
BRP – bříza pýřitá	BI – downy birch	*Betula pubescens* Ehrh.
DB – duby letní a zimní	OK – pedunculate + sessile oaks	*Quercus robur* L. + *Q. petraea* (Matt.) Liebl.
DG – douglaska tisolistá	DF – Douglas fir	*Pseudotsuga menziesii* (Mirb.) Franco
HB – habr obecný	HBM – hornbeam	*Carpinus betulus* L.
JD – jedle bělokorá	SF – silver fir	*Abies alba* Mill.
JDO – jedle obrovská	GF – grand fir	*Abies grandis* (Doug. ex D. Don) Lindl.
JL - jilmy	EM – elms	*Ulmus* sp.
JLH – jilm horský	WEM – wych elm	*Ulmus glabra* Hudson
JR – jeřáb ptačí	ROW – rowan	*Sorbus aucuparia* L.
JS – jasan ztepilý	AH – ash	*Fraxinus excelsior* L.
JV – javor mléč	NOM – Norway maple	*Acer platanoides* L.
KL – javor klen	SY – sycamore maple	*Acer pseudoplatanus* L.
LP – lípa srdčitá	SLI – small-leaved linden	*Tilia cordata* Mill.
MD – modřín opadavý	EL – European larch	*Larix decidua* Mill.
OL – olše lepkavá	CAR – common alder	*Alnus glutinosa* (L.) Gaertner
OLS – olše šedá	GAR – grey alder	*Alnus incana* (L.) Moench
OS – topol osika	ASP – aspen	*Populus tremula* L.
SM – smrk ztepilý	NS – Norway spruce	*Picea abies* (L.) Karst.

**borrowed from Jenkins et al. 2011. Tree Species – Adocument listing the tree species included in the 2011 Production Forecast.*

6. Appendices

- RSH 1 (43_45)
- RSH 2 (47)
- RSH 3 (51_53)
- RSH 4 (57_59_79_29)

7. List of change

1. Introduction and assignment
6. Appendices

RSH 1 - Acidic and nutrient-medium beech with oak (CHS 43 a 45)

STAND TYPE (PT) **431 a 451**			
	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	100	80
REGENERATION PERIOD [yrs]	continuous	30	30
BEGINNING OF REGENERATION	irrelevant	81	61
SILVICULTURAL SYSTEM	V	n(p)P, n(p)N	nN, nH
MANAGEMENT FORM	High forest		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	BE (NS, SP, OK and mixed) target management for middle altitudes		
Target species composition for 43a subunit	BE 20, OK 25, NS 10, SP 10, SF 10, EL 15, DF 3, SLI (SY) 4, GF 2, SBI (ASP, ROW) 1		
Target species composition for 43b subunit	BE 35, NS 20, SP 10, SF 10, EL 15, DF 3, SLI (SY, OK) 4, GF 2, SBI (ASP, ROW) 1		
Target species composition for 45b subunit	BE 30, NS 29, SF 10, SLI (LLI, SY, NOM) 5, EL 15, EM (HBM, WCH, OK) 5, DF 2, GF 3, SBI (ASP, ROW, GAR) 1		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation selection – salvage felling at all growing stages. • Support of quality and stability – to release quality crop trees including maintenance of accompanying species (NS, SF, OK individually, BE or SY as groups), in older	**Regeneration** To prefer natural regeneration, large shelterwood cutting (or small one or small shelterwod cuttings ahead) should be done with uneven intensity. In total – 2 interventions per 10 yrs (removal amounts ca 5-yr increment of standing volume). To prefer removal of low-quality trees, to release canopy in order to initialise natural regeneration. To combine a	**Regeneration** One can begin the regeneration also earlier (in 60th yr of age) – where is a risk of rapid disintegration. When planning and conducting renewal cuts, take account of NS stand present on the site maximally. If instable (high h/d ratio, short live crown), the stand should be thinned less intensively with shorter period between the interventions, when clearcutting – use smaller cuts.

	parts prefer removal of low-quality competitors. • Support and maintenance of target stand structure – adjustments based on comparison of current structure with model one. • Harvest of „mature“ trees according to their development stage and management goals. Target diameter ranges between 40-60 cm. The removed trees are not only the thickest dominants, but also those ones, which will not perform well and which hamper a vertical canopy development. • Intervention intensity (including salvage cut) in the context of total current increment accumulated following a previous intervention. • Support of regeneration – to relese locally, preferentially at sites where a vertical canopy is needed to develop (NS and SF individually or small patches, BE or SY in small groups). Support of light-demanding species such as SP, EL and DF.	target-diameter felling approach (regeneration initiated), group fellings (growth and selfpruning) and thinning (more uniform structure stands in areas among the above-mentioned shelterwood parts). Soil scarification can be used if possible. In following phases, one should maintain the residual parent stand and postpone its presence on the site or alternatively leave it on the site with no final felling conducted. Artificial regeneration (including underplanting or undersowing) only for CDS species, which are missing (SF and BE). To initiate regeneration of SF ahead of time, BE up to 10 years after regeneration of SF. Open areas from salvage cut can be used for artificial or combined (if they are present in the mother stand) regeneration of light-demanding trees (SP, OK, SY, EL, DF). On larger areas after salvage cut, leave SBI, ROW, ASP as preparatory trees for subsequent easier introduction of SF or BE. **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand (upper storey), to release accompanying species and conduct sanitation cut. • if no shleter above, advanced growth should be cleaned (in NS also using a shrub cutter – schematic approach) supporting (even individually) accompanying species. • in young stands with gaps (exceeding 0.04 ha), repair planting with crop species that are capable of stabilizing and soil-imroving (EL, DF, OK, SY) or support of pioneering species such as ROW, SBI and ASP. ***Stands younger than 40yrs*** Heavy thinning in NS focused on individual stability and maintenance of long live crowns	Group or group-edge cuts conduct where patches of natural regeneration (also around the individual parents) of trees already exists – preferably BE, SF and SP, OK, SY, EL, DF, which need more light). When releasing desirable undergrowth, remove NS from the upper storeys preferably. Underplant SF (within the stand) and BE (inner strip), provided the parent stands are vigorous. Support all self-seeded desirable tree species. In case of a rapid parent stand disintegration risk, support and rely on pioneering species (SP, ASP, SIB) and crop species regenerate below the preparatory stands. Instable uniform overaged NS stands need to be qiuckly regeneratated using a strip felling with narrov clearcuts on which intolerant desirable trees are to be planted. **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand overstorey, release accompanying species and conduct a sanitation cut. Aditional regeneration of NS is not desirable. To release undergrowth more quickly compared to the B - transitional type (BE when dominants‘ height is 4 m, SY, alternatively AH when the height is 2 m). • if not sheltered, the advance growth needs heavy cleaning (In NS also schematically – shrub cutter); all accompanying tree species should be supported maximally. • gaps in plantations and advance growths (gaps larger than 0.04 ha) need a repair planting with stabilizers or soil-improvers (EL, DF or OK, SY) and also self-seeded ROW, SIB, ASP are beneficial. ***Stands younger than 40yrs*** If the first thinning is conducted appropriately (before top height 7 m) – follow the B-transitional

		(beginning when top height is 5 m – 1.6 thousand trees are left on the site, second thinning when the dominants are 10 m tall – 1.2 thousand trees are left on the site. To release accompanying species at the expense of NS. In larger groups, an uneven thinning intensity is beneficial (mozaic following site conditions, health and share of valuable species); at the same time establish skidding lines in appropriate density (4 m wide lines 30 m apart). ***Stands older than 40 yrs*** To maintain (preferably locally) thinner canopy as crop trees (ca 300 per ha) are released from 1-2 competitors supporting natural regeneration (species from CDS) already after thinning. To support accompanying species in upper and lower storeys. The larger stand area the moreemphasis is put on uneven canopy (alternating thinner and denser patches). Interval of interventions 5-10 yrs. A gradual removal of NS that have reached the target diameters. Support of regeneration beginning of the other species such as SF (regenerated 10 yrs in advance before expected NS crop diameters are reached) and BE regenerated below the mature NS.	type prescriptions. Emphasis on development of larger live crowns in accompanying species following the release cut. Uniform NS stands can be thinned also schematically. If no thinning was conducted before top height 10 m or the density after slight thinning exceeds 1.4 thousand per ha, heavy thinning approach is not allowed any more. A light thinning from below consists in gradual removal of declining but still competing trees (high h/d ratio) – the intervention period 5-10 yrs. All other vigorous species than NS are beneficial. ***Stands older than 40 yrs*** If thinned appropriately (NS dominats show h/d 60-80 with live crown sharing at least 50% of the stem) – follow the prescriptions for B-transitional type. Emphasis on release cut (larger crowns expected) of the other trees, their support (also undergrowth) when thinned. Monospecific NS parts should not be thinned heavily in order to prevent weed infestation (on nutrient-medium soils) and restrict NS regeneration (20-30% can be tolerated). The stands too dense with inappropriate h/d ratio should be thinned from below (labile undestory), upper storey should be thinned slightly in periods 5-7 yrs. Gaps followin salvage cut plant or regenerate naturally with desirable tree species.
Measures in stands damaged by biotic and abiotic agents	Thorough sanitation cut of trees infested by bark beetle. **Stands damaged by game (bark browsing and peeling):** The thickets – try to find at least 300 trees per ha in the upper storey, which show no and/or slight damage – these ones release (according to density) and protect individually in order to prevent damage, support every accompanying species, remove the most injured trees gradually, period of intervention no longer than 5 yrs. In stand with logs – release minimally damaged crop trees, remove the most injured trees, support natural regeneration i gaps following a salvage-cutting or plant (also underplant) them with desirable tree species. Period of intervention no longer than 7 yrs. **The stands manifesting decline (yellowing, defoliation etc.)**		

	The advance growths manifesting yellowing in more than 50% trees – do not use a schematic approach, focus on support of every healthy NS including the accompanying individuals. At top height 2 m, reduce a density to 4 thousand per ha – remove preferably the all-damage trees. Support all healthy NS trees regardless of the storey they thrive in. The gaps plant with desirable EL, DF, OK or leave them to SIB, ROW, ASP self-seeding. The thickets and small-pole stands – if at least 1.4 thousand healthy NS trees are present, reduce the density to ca 2 thousand per ha at top height 7 m and continue to 1.5 thousand per ha when top height is 15 m. Remove all moribund and crooked trees, support all other desirable species. If less than 1.4 tree per ha are present on the site, support the healthiest 300-400 trees per ha, these ones release from the nearest competitors. The others leave without intervention excepting support of accompanying species. As pole stage is achieved, thinning of declining NS stands is risky – threat of a sooner disintegration. If the stand contains a satisfactory share of accompanying species, support it maximally. Otherwise a sanitation cut and conversion are conducted. In case of a slower disintegration, all desirable tree species are underplanted and interplanted.
Production safety	(Non-evaluated)
Production potential	(Non-evaluated)
Note	

STAND TYPE (PT) **433**			
	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	100	100
REGENERATION PERIOD [yrs]	continuous	30	30
BEGINNING OF REGENERATION	irrelevant	81	81
SILVICULTURAL SYSTEM	V	nP, nH, (P)	nH, (N,nP)
MANAGEMENT FORM	High forest		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	BE (NS, SP, OK and mixed) target management of middle altitudes		
Target species composition for 43a subunit	SP 40, OK 20, BE 10, EL 15, DF 3, SF 5, SLI (SY) 4, GF 2, SBI (ASP, ROW, NS) 1		
Target species composition for 43b subunit	SP 35, BE 25, SF 10, EL 15, DF 3, NS 5, SLI (SY, OK) 4, GF 2, SBI (ASP, ROW) 1		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation cut in all growing stages. • Support of quality and stability – in younger parts care of crop trees including support of accompanying species, in older parts prefer removal of low-quality competitors. • Support and maintain target structure – alternating patches of different age with desirable species.	**<u>Regeneration</u>** Regeneration conduct within smaller patches with the regeneration period longer (30 yrs). Combination of shelterwood, strip and selection cut – also shade-intolerant trees (OK, SP, EL) thrive there. To prefer all desirable species natural regeneration below SP stands. Soil scarification can be beneficial in seed years. In uniform SP stands, introduce BE, SF, SLI into shelterwood cuttings artificially, use EL for the repair planting.	**<u>Regeneration</u>** To begin even earlier (in 60th yr of age) – where is a risk of faster disintegration. Use strip and small-clearcuts, if longer lifetime of stands is expected, BE, SF and SLI can be planted below groups with broken canopy. Planting of OK, DF, EL on clearcuts. Larger stands divide into segments where different tree species are preferred thus creating a mosaic mixture. All self-seeded desirable tree species are beneficial.

	• Harvest of „mature“ trees, group selection according to condition and management goals. The crop-log diameters 35-50 cm. In groups without SP adjust all interventions to needs of all species present on the site; remove not only „crop“, but also undesirable competitors, which hamper development of vertical canopy. • Intervention intensity (including a sanitation cut) based on total current increment accumulated following a previous intervention. • Support of regeneration – release groups of advance regeneration of desirable species where is already present.	To initiate regeneration below stand with shade-tolerant trees (SF, BE), tolerant ones such as OK add later in the final phase of the renewal. In case of small-area clearcutting, leave SP, SF and broadleaved standards. Release cuts in shelterwood adjust to the species needs – intolerant ones have to be released quickly (maximally two phases), the tolerant trees release gradually (to the very final cutting of the SP stand). **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand (upper storey), just release accompanying species and conduct sanitation cut. • if non-sheltered, reduce density (In SP also schematically – shrub cutter), maximally support accompanying species (even the individuals). Remove SP wolf trees. • In plantation and advance growth gaps (larger than 0.04 ha), conduct a repair planting with stabilizers or soil imrovers (EL, DF or OK, SY) or support self-seeding of ROW, SIB and ASP. ***Stands younger than 40 yrs*** Intensive thinning from below in SP supporting individual stability and preventing short crowns – these should share at least 30% of the stem (first intervention at top height 5 m reduces density to 6 thousand trees per ha, the second one to 3.5 thousand per ha at top height 10 m and the third one (top height 17 m) reduces density to 1.9 thousand per ha. The accompanying species should be released at the expense of dominant SP. In larger groups support uneven intensity of interventions – establish skidding lines in appropriate density and design (4 m wide lines 30 m apart). ***Porosty nad 40 let/Stands older than 40yrs***	If there is a risk of faster disintegration, SIB, ASP and ROW self-seeding is benefitial and crop trees are regenerated later. **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • If sheltered by a parent stand from above, release accompanying species and conduct a sanitation cut. Do not support SP and NS natural regeneration. • If not sheltered, advance growth needs a cleaning (in SP geometrical approach – power cutter) and support accompanying species maximally. • In plantation and advance growth gaps (larger than 0.04 ha), conduct a repair planting with stabilizers or soil imrovers (EL, DF or OK, SY) or support self-seeding of ROW, SIB and ASP. ***Stands younger than 40 yrs*** Intensive thinning from below in SP supporting individual stability and relesing other tree species (first intervention top height 5 m reduces density to 5.5 thousand trees per ha, the second one to 3.0 thousand per ha at top height 10 and the third one (top height 17 m) reduces density to 1.8 thousand per ha. The accompanying species should be released at the expense of dominant SP. In larger groups support uneven intensity of interventions – establish skidding lines in appropriate density and design (4 m wide lines 30 m apart). If the stands have not been thinned (no intervention before top height 10 m or these were thinned so slightly that density is 4.2 trees per ha), the intensive approach is beneficial no longer. The stands should be thinned slightly from below removing dying trees and understory competitors (inappropriate h/d ratio); intervention return i severy 5-10 yrs. Support all vigorous accompanying species.

		Shift to a positive approach – release ca 300 crop trees per ha from 1-2 competitors. Interval between interventions 5-10 yrs. Harvest of target-diameter SP prepares regeneration simultaneously – prefer groups, break canopy for underplanting, alternatively undersowing.	***Stands older than 40yrs*** If thinning was conducted appropriatelly (SP dominants show h/d 80-100, live crowns share at least 30%) – see basic prescriptions for B-transitional type. Emphasis on released accompanying species in order to maintain their large crowns and support their natural regenereration already in the stage of thinning. Monospecific SP parts should not be released too much – weed control (nutrient-medium site) and do not support SP regeneration (30-40% share can be tolerated). In dense stands with inappropriate h/d ratio, remove labile trees from undestorey, in main storey apply slight intensity thinning every 5-7 yrs. Gaps of salvage cut origin can be either planted or naturally regenerated with desirable tree species.
Measures in stands damaged by biotic and abiotic agents	**Stands damaged by game (bark browsing and peeling):** In thickets, try to find at least 300 trees per ha in main storey that show slight or no damage – these ones release and protect them individually in order to prevent further injury, support all acompanying species, remove the most injured trees, intervention period should not be longer than 5 yrs. In stands with logs – release the least injured crop trees, remove the most injured ones, support natural regeneration in gaps following salvage cuts, alternatively – plant (also underplanting) them with desirable species. Intervention period should not be longer than 7 yrs. **The stands threatened by drought** Reduce density of advance regeneration and young thickets (reduces interception and number of transpiring trees. Where SP stands have NS understorey, remove the NS at once.		
Production safety	(Non-evaluated)		
Production potential	(Non-evaluated)		
Note			

STAND TYPE (PT) **435**			
	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	120	120
REGENERATION PERIOD [yrs]	continuous	40	40
BEGINNING OF REGENERATION	irrelevant	101	101
SILVICULTURAL SYSTEM	V	nP, pN, pP	nP, pN, pP
MANAGEMENT FORM	High forest		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	BE (NS, SP, OK and mixed) target management at middle altitudes		
Target species composition for 43a subunit	OK 50, BE 15, EL 15, DF 3, SF 5, SP 5, SLI (SY) 4, GF 2, SBI (ASP, ROW, NS) 1		
Target species composition for 43b subunit	BE 35, EL 15, OK 30, DF 3, SP (SF, NS) 10, SLI (SY) 4, GF 2, SBI (ASP, ROW) 1		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation cut in all growing stages. • Support of quality – in younger parts combined approach, i.e. remove wolf trees and release quality trees including the support of accompanying species (groups more appropriate), in older parts support crop trees preferentially. • Support and maintenance of target structure – alternating larger patches of	**<u>Regeneration</u>** Regeneration conduct using a shelterwood strip felling with shelterwood groups placed ahead, these enlarge using a peripheral felling. Two-phase shelterwood – the first phase is a seed cutting including appropriate soil scarification. The second on eis a final cutting where 3-4-yr-old advance growth of 0.5 m height is released. Segment the stand appropriatelly in order to proceed the regeneration as quickly as possible, differentiate species composition of desirable	**<u>Regeneration</u>** Two-phase shelterwood. In the first seed cutting conduct soil scarification. Missing desirable species (BE, SF, SLI) plant into groups placed ahead or within inner edge of strip. Larger stands segment and prefer particular tree species in order to get a mosaic – mix of groups. Support self-seeded species. The wors parent OK stand, the quicker should be its regeneration – also prefer other desirable species. **<u>Tending</u>**

	different age and different desirable species. • Harvest of „mature“ trees, group selection according to condition and management goals. The crop-log diameters 50-70 cm. In groups without OK adjust all interventions to needs of all species present on the site; remove undesirable competitors, which hamper development of vertical canopy. • Intervention intensity based on total current increment accumulated following a previous intervention. Support of regeneration – release in larger groups (0-5 ha) when seed yrs are expected.	species. In case of regeneration failure, it is necessary to plant OK of local origin within renewal patches of 0.5 ha minimally. **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • reduce density of advance growths (risk of development of inappropriate h/d ratio in OK and damage by snow load). Both naturally regenearted and planted OK – remove wolf trees first and support OK at the expense of fast-growing competitors such as SBI and ASP. • where are gaps in juvenile stands (over 0.04 ha), conduct repair planting or support self-seeding of desirable stabilizers or soil improvers (EL, DF or SY, SLI). ***Stands younger than 40 yrs*** Remove wolf trees at top height 5 m, negative approach in upper and main storey. Next intervention at top height 11 m in upper and main storey resulting in 6 thousanf trees per ha. Simultaneously segment the stand by skidding lines appropriatelly (4 m wide lines 30 m apart). Further interventions aim at support of crop trees (first 200, later 100 crop trees per ha) when top height is 16, 20 and 24 m. Iniciate and maintain desirable undestory of SLI and other shade-tolerant species (SF and others). ***Stands older than 40yrs*** Further release of crop trees and segmentation of stands to regenerate them – group mixture of the other species where OK is missing.	***Plantations (underplanting, undersowing) and advanced growth*** • Both naturally regenerated and planted OK – remove wolf trees and support self-seeding of all other desirable species. • Where are gaps in juvenile stands (over 0.04 ha), conduct repair planting or support self-seeding of desirable stabilizers or soil improvers (EL, DF or SY, SLI). ***Stands younger than 40 yrs*** Negative intervention in all stand parts – reduced density promotes inkrement. Take care of 100 crop trees – release them from 1-2 competitors. Simultaneously segment the stand by skidding lines appropriatelly (4 m wide lines 30 m apart). Support all other desirable species by relesing them from undestory. ***Stands older than 40yrs*** Release crop trees continually. Emphasise on promotion of larger live crowns of accompanying species and initiation of their natural regeneration already during thinning the stands.
Measures in stands damaged by biotic and abiotic agents	Remove heavily damaged and weakened trees. In stands older than 100 yrs wher stocking dropped below 0.5, initiate their regeneration. **Stands threatened by drought:** Maintain lower storey of broadleaves (SLI, HBM, SBI, ASP, NOM), which support microclimatic maintenance of soil moisture and nurses OK (self-pruning).		
Production safety	(Non-evaluated)		

Production potential	(Non-evaluated)
Note	

STAND TYPE (PT) **436**			
	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	120	100
REGENERATION PERIOD [yrs]	continuous	40	40
BEGINNING OF REGENERATION	irrelevant	101	81
SILVICULTURAL SYSTEM	V	P, (pN)	P, (pN)
MANAGEMENT FORM	High forest		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	BE (NS, SP, OK and mixed) target management at middle altitudes		
Target species composition for 43a subunit	BE 40, OK 25, EL 15, DF 3, SF 5, SP 5, SLI (SY) 4, GF 2, SBI (ASP, ROW, NS) 1		
Target species composition for 43b subunit	BE 55, EL 15, OK 10, DF 3, SP (SF, NS) 10, SLI (SY) 4, GF 2, SBI (ASP, ROW) 1		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation cut in all growing stages. • Support quality – in younger parts remove wolf trees and release quality trees including desirable group admixture, in older focus on crop trees. • Support and maintain a target structure – alternating larger multi-age groups of desirable species.	**<u>Regeneration</u>** Use 4-phase sheletrwood cutting. Modify the stocking as follows: 8 – preparatory cutting, 6 – seed cutting, 3 – release cutting and finally remove shelter above 0.5 m high advance growth. Timing of phases 1 and 2 coincide with seed yrs. The number of phases can be lower depending on cutting rate. SF underplant as small groups. In the last phase, OK is allowed to be planted. Leave standards of desirable species.	**<u>Regeneration</u>** Prioritize strip felling for faster regeneration and the possibility to more actively change the species composition towards CDS. Missing species (SF, SLI) by artificial regeneration in advanced groups or inner edges of the strips. For open areas of - light-demanding species of CDS (EL, OK, DF, SP). Larger stands segment and prefer particular tree species in order to get a mosaic – mix of groups. Support self-seeded species.

	• Harvest of „mature“ trees, group selection according to condition and management goals. The crop-log diameters 40-60 cm. In groups without BE adjust all interventions to needs of all species present on the site; remove undesirable competitors, which hamper development of vertical canopy. • Intervention intensity (incl. salvage cut) based on total current increment accumulated following a previous intervention. • Support of regeneration – release in larger groups (0-5 ha) when seed yrs are expected.	Stand should be appropriatelly segmented to differentiate desirable species composition. **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • Remove wolf trees in BE advance growths and plantations. • Where are gaps in juvenile stands (over 0.04 ha), conduct repair planting or support self-seeding of desirable stabilizers or soil improvers (EL, DF, OK or SY, SLI). ***Stands younger than 40 yrs*** Remove wolf trees at top height 5 m, negative approach in upper and main storey. Next intervention at top height 10 m in upper and main storey resulting in 6 thousanf trees per ha. Simultaneously segment the stand by skidding lines appropriatelly (4 m wide lines 30 m apart). After 10 yrs when top height is 15 m, reduce density to 4-5 thousand trees per ha. Further intervention at top height 20 m supports 300-400 crop trees per ha. No intervention in understorey. ***Stands older than 40yrs*** Continue releasing 130-200 crop trees per ha every 5-10 yrs. Support stand segmentation to get group mixture where BE is missing.	The wors parent BE stand, the quicker should be its regeneration – also prefer other desirable species. **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • Remowe wolf trees in BE advance growths and plantations, support all other desirable species. • Where are gaps in juvenile stands (over 0.04 ha), conduct repair planting or support self-seeding of desirable stabilizers or soil improvers (EL, DF, OK or SY, SLI). ***Stands younger than 40 yrs*** Negativní zásahy ve všech částech porostu – podpora přírůstu snížením hustoty. Redukce při Ho 10 a 15 m na 5 a 3 tis. ks/ha./Remove undesirable trees – support increment by reduced density. At top height 10 and 15 m, the density should be 5 and 3 thousand trees per ha, respectively. Take care o fat least 100 promising trees – release them from 1-2 competitors. Simultaneously segment the stand by skidding lines appropriatelly (4 m wide lines 30 m apart). ***Stands older than 40yrs*** Continue releasing crop trees (ar least 50 per ha). Emphasise releasing accompanying species to promote larger live crowns and support their natural regeneration already during the last thinning.
Measures in stands damaged by biotic and abiotic agents	Support any accompanying species to prevent disintegration of forest stands over large areas.		
Production safety	(Non-evaluated)		
Production potential	(Non-evaluated)		
Note			

RSH 2 - Nutrient-medium gleyic fir with oak (CHS 47)

STAND TYPE (PT) **471**			
	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	100	80
REGENERATION PERIOD [yrs]	continuous	30	30
BEGINNING OF REGENERATION	irrelevant	81	61
SILVICULTURAL SYSTEM	V	pN, (pP)	pN, (pH)
MANAGEMENT FORM	High forest		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	BE (NS, SP, OK and mixed) target management for middle altitudes		
Target species composition for 47a subunit	NS 20, SF 15, BE 10, OK 25, EL 10, SLI (NOM, SY) 10, WEM (EM, AH) 5, CAR (GAR) 3, GF 1, SBI (ASP, ROW, HBM, FM) 1		
Target species composition for 47b subunit	OK 30, NS 20, SF 20, SP 10, EL 8, BE (SLI) 4, CAR (GAR) 5, GF 2, SBI (ASP, ROW) 1		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation selection – salvage felling at all growing stages. • Support of quality and stability – to release quality crop trees including maintenance of accompanying species (NS, SF individually, OK or CAR as groups), in older parts prefer removal of low-quality competitors.	**<u>Regeneration</u>** To prefer natural regeneration, large shelterwood cutting (or small one or small shelterwod cuttings ahead) should be done with uneven intensity. In total – 2 interventions per 10 yrs (removal amounts ca 5-yr increment of standing volume). To prefer removal of low-quality trees, to release canopy in order to initialise natural regeneration. In category „O“ (nutrient-medium gleyed soils) excessive canopy	**<u>Regeneration</u>** One can begin the regeneration also earlier (in 60th yr of age) – where is a risk of rapid disintegration. When planning and conducting renewal cuts, <u>take account of NS stand present on the site maximally</u>. If instable (high h/d ratio, short live crown), the stand should be thinned less intensively with shorter period between the interventions, when clearcutting – use smaller cuts. Group or group-edge cuts conduct where patches of natural regeneration (also around the individual

	• Support and maintenance of target stand structure – adjustments based on comparison of current structure with model one. • Harvest of „mature“ trees according to their development stage and management goals. Target diameter ranges between 40-60 cm. The removed trees are not only the thickest dominants, but also those ones, which will not perform well and which hamper a vertical canopy development. • Intervention intensity (including salvage cut) in the context of total current increment accumulated following a previous intervention. • Support of regeneration – to release locally, preferentially at sites where a vertical canopy is needed to develop (NS and SF individually or small patches, BE or SY in small groups).	opening is not desirable, due to the risk of subsequent weed development. To combine a target-diameter felling approach (regeneration initiated), group fellings (growth and selfpruning) and thinning (more uniform structure stands in areas among the above-mentioned shelterwood parts). In following phases, one should maintain the residual parent stand and postpone its presence on the site or alternatively leave it on the site with no final felling conducted. Artificial regeneration (including underplanting or undersowing) only for CDS species, which are missing (SF and BE). To initiate regeneration of SF ahead of time. Open areas from salvage cut can be used for artificial or combined (if they are present in the mother stand) regeneration of light-demanding trees (OK, CAR, alt. EM). On larger areas after salvage cut, leave SBI, ROW, ASP as preparatory trees for subsequent easier introduction of SF or BE. **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand (upper storey), to release accompanying species and conduct sanitation cut. • if no shelter above, advanced growth should be cleaned (in NS also using a shrub cutter – schematic approach) supporting (even individually) accompanying species. • in young stands with gaps (exceeding 0.04 ha), repair planting with crop species that are capable of stabilizing and soil-improving (OK, CAR) or support of pioneering species such as ROW, SBI and ASP. ***Stands younger than 40yrs*** Heavy thinning in NS focused on individual stability and maintenance of long live crowns	parents) of trees already exists – preferably BE, SF and SP, OK, SY, EL, which need more light). When releasing desirable undergrowth, remove NS from the upper storeys preferably. Underplant SF (within the stand) and BE (inner strip), provided the parent stands are vigorous. Support all self-seeded desirable tree species. In case of a rapid parent stand disintegration risk, support and rely on pioneering species (SP, ASP, SIB) and crop species regenerate below the preparatory stands. Instable uniform overaged NS stands need to be qiuckly regenerated using a strip felling with narrow clearcuts on which light-demanding desirable trees are to be planted. **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand overstorey, release accompanying species and conduct a sanitation cut. Aditional regeneration of NS is not desirable. To release undergrowth more quickly compared to the B - transitional type (BE when dominants‘ height is 4 m, SY, alternatively AH when the height is 2 m). • if not sheltered, the advance growth needs heavy cleaning (In NS also schematically – shrub cutter); all accompanying tree species should be supported maximally. • gaps in plantations and advance growths (gaps larger than 0.04 ha) need a repair planting with stabilizers or soil-improvers (OK, CAM) and also self-seeded RW, SIB, ASP are beneficial. ***Stands younger than 40yrs*** If the first thinning is conducted appropriately (before top height 7 m) – follow the B-transitional type prescriptions. Emphasis on development of larger live crowns in accompanying species

		(beginning when top height is 5 m – 1.6 thousand trees are left on the site, second thinning when the dominants are 10 m tall – 1.2 thousand trees are left on the site. To release accompanying species at the expense of NS. In larger groups, an uneven thinning intensity is beneficial (mozaic following site conditions, health and share of valuable species); at the same time establish skidding lines in appropriate density (4-5 m wide lines 30 m apart). ***Stands older than 40 yrs*** To maintain (preferably locally) thinner canopy as crop trees (ca 300 per ha) are released from 1-2 competitors supporting natural regeneration (species from CDS) already after thinning. To support accompanying species in upper and lower storeys. The larger stand area the more emphasis is put on uneven canopy (alternating thinner and denser patches). Interval of interventions 5-10 yrs. A gradual removal of NS that have reached the target diameters. Support of regeneration beginning of the other species such as SF (regenerated 10 yrs in advance before expected NS crop diameters are reached) and other species regenerated below the mature NS.	following the release cut. Uniform NS stands can be thinned also schematically. If no thinning was conducted before top height 10 m or the density after slight thinning exceeds 1.4 thousand per ha, heavy thinning approach is not allowed any more. A light thinning from below consists in gradual removal of declining but still competing trees (high h/d ratio) – the intervention period 5-10 yrs. All other vigorous species than NS are beneficial. ***Stands older than 40 yrs*** If thinned appropriately (NS dominants show h/d 60-80 with live crown sharing at least 50% of the stem) – follow the prescriptions for B-transitional type. Emphasis on release cut (larger crowns expected) of the other trees, their support (also undergrowth) when thinned. Monospecific NS parts should not be thinned heavily in order to prevent weed infestation (on nutrient-medium soils) and restrict NS regeneration (20-30% can be tolerated). The stands too dense with inappropriate h/d ratio should be thinned from below (labile understory), upper storey should be thinned slightly in periods 5-7 yrs. Gaps following salvage cut plant or regenerate naturally with desirable tree species.
Measures in stands damaged by biotic and abiotic agents	Thorough sanitation cut of trees infested by bark beetle. **Stands damaged by game (bark browsing and peeling):** The thickets – try to find at least 300 trees per ha in the upper storey, which show no and/or slight damage – these ones release (according to density) and protect individually in order to prevent damage, support every accompanying species, remove the most injured trees gradually, period of intervention no longer than 5 yrs. In stand with logs – release minimally damaged crop trees, remove the most injured trees, support natural regeneration i gaps following a salvage-cutting or plant (also underplant) them with desirable tree species. Period of intervention no longer than 7 yrs. **The stands manifesting decline (yellowing, defoliation etc.)** The advance growths manifesting yellowing in more than 50% trees – do not use a schematic approach, focus on support of every healthy NS including the accompanying individuals. At top height 2 m, reduce a density to 4 thousand per ha – remove preferably the all-damage trees. Support all healthy NS trees regardless of the storey they thrive in. The gaps plant with desirable EL, DF, OK or leave them to SIB, ROW, ASP self-seeding.		

	The thickets and small-pole stands – if at least 1.4 thousand healthy NS trees are present, reduce the density to ca 1,5 thousand per ha at top height 5 m and continue to 1.1 thousand per ha when top height is 10 m. Remove all moribund and crooked trees, support all other desirable species. If less than 1.4 tree per ha are present on the site, support the healthiest 300-400 trees per ha, these ones release from the nearest competitors. The others leave without intervention excepting support of accompanying species. As pole stage is achieved, thinning of declining NS stands is risky – threat of a sooner disintegration. If the stand contains a satisfactory share of accompanying species, support it maximally. Otherwise a sanitation cut and conversion are conducted. In case of a slower disintegration, all desirable tree species are underplanted and interplanted.
Production safety	(Non-evaluated)
Production potential	(Non-evaluated)
Note	

STAND TYPE (PT) **476**			
	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	120	100
REGENERATION PERIOD [yrs]	continuous	40	40
BEGINNING OF REGENERATION	irrelevant	101	81
SILVICULTURAL SYSTEM	V	(p)P, (pN)	(p)P, (pN)
MANAGEMENT FORM	High forest		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	BE (NS, SP, OK and mixed) target management at middle altitudes		
Target species composition for 47a subunit	OK 18, BE 50, EL 9, SLI (NOM, SYM, FM, HBM, EM, WEM, AH) 10, SF (NS) 5, CAR (GAR) 5, GF 2, SBI (ASP, ROW, SP) 1		
Target species composition for 47b subunit	OK 50, SF 19, BE 10, EL 9, NS 5, SP 4, GF 2, SBI (ASP, ROW, CAR, GAR, SLI) 1		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation cut in all growing stages. • Support quality – in younger parts remove wolf trees and release quality trees including desirable group admixture, in older focus on crop trees. • Support and maintain a target structure – alternating larger multi-age groups of desirable species.	**<u>Regeneration</u>** Use 4-phase shelterwood cutting. Modify the stocking as follows: 8 – preparatory cutting, 6 – seed cutting, 3 – release cutting and finally remove shelter above 0.5 m high advance growth. Timing of phases 1 and 2 coincide with seed yrs. The number of phases can be lower depending on cutting rate. SF underplant as small groups. In the last phase, OK is allowed to be planted. Leave standards of desirable species.	**<u>Regeneration</u>** Prioritize strip felling for faster regeneration and the possibility to more actively change the species composition towards CDS. Missing species (SF, SLI) by artificial regeneration in advanced groups or inner edges of the strips. For open areas of - light-demanding species of CDS (primarily OK). Larger stands segment and prefer particular tree species in order to get a mosaic – mix of groups. Support self-seeded species.

	• Harvest of „mature“ trees, group selection according to condition and management goals. The crop-log diameters 40-60 cm. In groups without BE adjust all interventions to needs of all species present on the site; remove undesirable competitors, which hamper development of vertical canopy. • Intervention intensity (incl. salvage cut) based on total current increment accumulated following a previous intervention. • Support of regeneration – release in larger groups (0-5 ha) when seed yrs are expected.	Stand should be appropriatelly segmented to differentiate desirable species composition. **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • Remove wolf trees in BE advance growths and plantations. • Where are gaps in juvenile stands (over 0.04 ha), conduct repair planting or support self-seeding of desirable stabilizers or soil improvers (EL, DF, OK or SY, SLI). ***Stands younger than 40 yrs*** Remove wolf trees at top height 5 m, negative approach in upper and main storey. Next intervention at top height 10 m in upper and main storey resulting in 6 thousand trees per ha. Simultaneously segment the stand by skidding lines appropriately (4 m wide lines 30 m apart). After 10 yrs when top height is 15 m, reduce density to 4-5 thousand trees per ha. Further intervention at top height 20 m supports 300-400 crop trees per ha. No intervention in understorey. ***Stands older than 40yrs*** Continue releasing 130-200 crop trees per ha every 5-10 yrs. Support stand segmentation to get group mixture where BE is missing.	The wors parent BE stand, the quicker should be its regeneration – also prefer other desirable species. **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • Remowe wolf trees in BE advance growths and plantations, support all other desirable species. • Where are gaps in juvenile stands (over 0.04 ha), conduct repair planting or support self-seeding of desirable stabilizers or soil improvers (OK, SLI, EL, SY). ***Stands younger than 40 yrs*** Remove undesirable trees – support increment by reduced density. At top height 10 and 15 m, the density should be 5 and 3 thousand trees per ha, respectively. Take care of at least 100 promising trees – release them from 1-2 competitors. Simultaneously segment the stand by skidding lines appropriately (4 m wide lines 30 m apart). ***Stands older than 40yrs*** Continue releasing crop trees (at least 50 per ha). Emphasise releasing accompanying species to promote larger live crowns and support their natural regeneration already during the last thinning.
Measures in stands damaged by biotic and abiotic agents	Support any accompanying species to prevent disintegration of forest stands over large areas.		
Production safety	(Non-evaluated)		
Production potential	(Non-evaluated)		
Note			

RSH 3 - Acidic, nutrient-poor and stony beech with fir and spruce (CHS 51 a 53)

STAND TYPE (PT) **511 a 531**	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	110	90
REGENERATION PERIOD [yrs]	continuous	40	30
BEGINNING OF REGENERATION	irrelevant	91	71
SILVICULTURAL SYSTEM	V	(n)N, (n)P	(n)N, nH
MANAGEMENT FORM	vysoký		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	BE-NS (SF and mixed) target management for higher altitudes		
Target species composition for 51a subunit	NS 40, BE 30, EL 10, SF 10, DF 1, GF 1, SLI (SY, OK) 4, SP 3, SBI (ASP, ROW, GAR) 1		
Target species composition for 51b subunit	NS 50, BE 25, EL 10, SF 5, DF 1, GF 1, SY 4, SP 3, SBI (ASP, ROW, GAR) 1		
Target species composition for 53a subunit	NS 40, BE 19, SF 10, EL 15, DF 5, SP 5, SLI (SY, OK) 5, SBI (ASP, ROW, GAR) 1		
Target species composition for 53b subunit	NS 46, BE 19, EL 15, SF 10, DF 5, SP 2, SY 2, SBI (ASP, ROW, GAR) 1		
Target species composition for 53c subunit	NS 46, BE 20, EL 15, SF 10, DF 5, SP 2, SBI (ASP, ROW, GAR) 2		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:**	**Regeneration** To prefer natural regeneration, large shelterwood cutting (or small one or small shelterwod cuttings ahead) should be done with	**Regeneration** One can begin the regeneration also earlier (in 70th yr of age) – where is a risk of rapid disintegration. When planning and conducting renewal cuts, take

	• Sanitation selection – salvage felling at all growing stages. • Support of quality and stability – to release quality crop trees including maintenance of accompanying species (NS, SF individually, BE as groups), in older parts prefer removal of low-quality competitors. • Support and maintenance of target stand structure – adjustments based on comparison of current structure with model one. • Harvest of „mature" trees according to their development stage and management goals. Target diameter ranges between 40-60 cm. The removed trees are not only the thickest dominants, but also those ones, which will not perform well and which hamper a vertical canopy development. • Intervention intensity (including salvage cut) in the context of total current increment accumulated following a previous intervention. • Support of regeneration – to release locally, preferentially at sites where a vertical canopy is needed to develop (NS and SF individually or small patches, BE or SY in small groups). Support of light-demanding species such as EL, DF or SP.	uneven intensity. In total – 2 interventions per 10 yrs (removal amounts ca 5-yr increment of standing volume). To prefer removal of low-quality trees, to release canopy in order to initialise natural regeneration. Soil scarification can be used if possible. To combine a target-diameter felling approach (regeneration initiated), group fellings (growth and selfpruning) and thinning (more uniform structure stands in areas among the above-mentioned shelterwood parts). In following phases, one should maintain the residual parent stand and postpone its presence on the site or alternatively leave it on the site with no final felling conducted. Artificial regeneration (including underplanting or undersowing) only for CDS species, which are missing (SF and BE). To initiate regeneration of SF ahead of time, BE up to 10 years after regeneration of SF. Open areas from salvage cut can be used for artificial or combined (if they are present in the mother stand) regeneration of light-demanding trees (EL, DF, alt. SP). On larger areas after salvage cut, leave SBI, ROW, ASP as preparatory trees for subsequent easier introduction of SF or BE. **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand (upper storey), to release accompanying species and conduct sanitation cut. • if no shelter above, advanced growth should be cleaned (in NS also using a shrub cutter – schematic approach) supporting (even individually) accompanying species. • in young stands with gaps (exceeding 0.04 ha), repair planting with crop species that are capable of stabilizing and soil-improving (EL,	account of NS stand present on the site maximally. If instable (high h/d ratio, short live crown), the stand should be thinned less intensively with shorter period between the interventions, when clearcutting – use smaller cuts. Group or group-edge cuts conduct where patches of natural regeneration (also around the individual parents) of trees already exists – preferably SF and BE, on more open areas primarily EL, alt. SP, OK, NOM and SY). When releasing desirable undergrowth, remove NS from the upper storeys preferably. Underplant SF (within the stand) and BE (inner strip), provided the parent stands are vigorous. Support all self-seeded desirable tree species. Instable uniform overaged NS stands need to be qiuckly regenerated using a strip felling with narrow clearcuts on which light-demanding species are to be planted. **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand overstory, release accompanying species and conduct a sanitation cut. Additional regeneration of NS is not desirable. To release undergrowth more quickly compared to the B - transitional type (BE when dominants' height is 4 m, SY, alternatively DF when the height is 2 m). • if not sheltered, the advance growth needs heavy cleaning (In NS also schematically – shrub cutter); all accompanying tree species should be supported maximally. • gaps in plantations and advance growths (gaps larger than 0.04 ha) need a repair planting with stabilizers or soil-improvers (EL, DF) and also self-seeded RW, SIB, ASP are beneficial. ***Stands younger than 40yrs***

		DF) or support of pioneering species such as ROW, SBI and ASP. ***Stands younger than 40yrs*** Heavy thinning in NS focused on individual stability and maintenance of long live crowns (beginning when top height is 7 m – 1.9 thousand trees are left on the site, second thinning when the dominants are 15 m tall – 1.4 thousand trees are left on the site. To release accompanying species at the expense of NS. In larger groups, an uneven thinning intensity is beneficial (mozaic following site conditions, health and share of valuable species); at the same time establish skidding lines in appropriate density (4 m wide lines 30 m apart). ***Stands older than 40 yrs*** To maintain (preferably locally) thinner canopy as crop trees (ca 300 per ha) are released from 1-2 competitors supporting natural regeneration (species from CDS) already after thinning. To support accompanying species in upper and lower storeys. The larger stand area the more emphasis is put on uneven canopy (alternating thinner and denser patches). Interval of interventions 5-10 yrs. A gradual removal of NS that have reached the target diameters. Support of regeneration beginning of the other species such as SF (regenerated 10 yrs in advance before expected NS crop diameters are reached) and BE regenerated below the mature NS.	If the first thinning is conducted appropriately (before top height 9 m) – follow the B-transitional type prescriptions. Emphasis on development of larger live crowns in accompanying species following the release cut. Uniform NS stands can be thinned also schematically. If no thinning was conducted before top height 15 m or the density after slight thinning exceeds 1.7 thousand per ha, heavy thinning approach is not allowed any more. A light thinning from below consists in gradual removal of declining but still competing trees (high h/d ratio) – the intervention period 5-10 yrs. All other vigorous species than NS are beneficial. ***Stands older than 40 yrs*** If thinned appropriately (NS dominants show h/d 60-80 with live crown sharing at least 50% of the stem) – follow the prescriptions for B-transitional type. Emphasis on release cut (larger crowns expected) of the other trees, their support (also undergrowth) when thinned. Monospecific NS parts should not be thinned heavily in order to prevent weed infestation (on nutrient-medium soils) and restrict NS regeneration (40-50% can be tolerated). The stands too dense with inappropriate h/d ratio should be thinned from below (labile understory), upper storey should be thinned slightly in periods 5-7 yrs. Gaps following salvage cut plant or regenerate naturally with desirable tree species.
Measures in stands damaged by biotic and abiotic agents	Thorough sanitation cut of trees infested by bark beetle. **Stands damaged by game (bark browsing and peeling):** The thickets – try to find at least 300 trees per ha in the upper storey, which show no and/or slight damage – these ones release (according to density) and protect individually in order to prevent damage, support every accompanying species, remove the most injured trees gradually, period of intervention no longer than 5 yrs. In stand with logs – release minimally damaged crop trees, remove the most injured trees, support natural regeneration in gaps following a salvage-cutting or plant (also underplant) them with desirable tree species. Period of intervention no longer than 7 yrs.		

	The stands manifesting decline (yellowing, defoliation etc.) The advance growths manifesting yellowing in more than 50% trees – do not use a schematic approach, focus on support of every healthy NS including the accompanying individuals. At top height 2 m, reduce a density to 3.5 thousand per ha – remove preferably the all-damage trees. Support all healthy NS trees regardless of the storey they thrive in. The gaps plant with desirable EL, DF, OK or leave them to SIB, ROW, ASP self-seeding. The thickets and small-pole stands – if at least 1.4 thousand healthy NS trees are present, reduce the density to ca 2 thousand per ha at top height 7 m and continue to 1.5 thousand per ha when top height is 15 m. Remove all moribund and crooked trees, support all other desirable species. If less than 1.4 tree per ha are present on the site, support the healthiest 300-400 trees per ha, these ones release from the nearest competitors. The others leave without intervention excepting support of accompanying species. As pole stage is achieved, thinning of declining NS stands is risky – threat of a sooner disintegration. If the stand contains a satisfactory share of accompanying species, support it maximally. Otherwise a sanitation cut and conversion are conducted. In case of a slower disintegration, all desirable tree species are underplanted and interplanted.
Production safety	(Non-evaluated)
Production potential	(Non-evaluated)
Note	

RSH 4 - Acidic, nutrient-poor and nutrient-medium fir with beech and spruce, wet fir, wet nutrient-poor spruce with fir+ash with sycamore (CHS 57, 59, 79 a 29)

STAND TYPE (PT) **571 a 591**	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	100	80
REGENERATION PERIOD [yrs]	continuous	30	30
BEGINNING OF REGENERATION	irrelevant	81	61
SILVICULTURAL SYSTEM	V	pN, pP	pN, (pH)
MANAGEMENT FORM	High forest		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	BE-NS (SF and mixed) target management for higher altitudes (57) NS (SF, SP) management on clay and peat habitats (59)		
Target species composition for 57b subunit	NS 45, SF 20, BE 10, EL 6, DF 2, GF 2, OK 5, SLI (SY, NOM, WEM, AH) 9, SBI (ROW, ASP, CAR, GAR) 1		
Target species composition for 57e subunit	NS 40, SF 20, SP 10, BE 15, EL 6, DF 2, GF 2, SBI (ROW, ASP, CAR, GAR) 5		
Target species composition for 59b subunit	NS 40, SF 25, BE 10, CAR (GAR, ASP) 10, AH (SY) 10, OK 5		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation selection – salvage felling at all growing stages. • Support of quality and stability – to release quality crop trees including maintenance	**Regeneration** To prefer natural regeneration, large shelterwood cutting (or small one or small shelterwod cuttings ahead) should be done with uneven intensity. In total – 2 interventions per 10 yrs (removal amounts ca 5-yr increment of standing volume). To prefer removal of low-	**Regeneration** One can begin the regeneration also earlier (in 55th yr of age) – where is a risk of rapid disintegration. When planning and conducting renewal cuts, take account of NS stand present on the site maximally. If instable (high h/d ratio, short live crown), the stand should be thinned less intensively with

	of accompanying species (NS, SF individually, BE, OK or CAR as groups), in older parts prefer removal of low-quality competitors. • Support and maintenance of target stand structure – adjustments based on comparison of current structure with model one. • Harvest of „mature“ trees according to their development stage and management goals. Target diameter ranges between 40-60 cm. The removed trees are not only the thickest dominants, but also those ones, which will not perform well and which hamper a vertical canopy development. • Intervention intensity (including salvage cut) in the context of total current increment accumulated following a previous intervention. • Support of regeneration – to release locally, preferentially at sites where a vertical canopy is needed to develop (NS and SF individually or small patches, BE, alt. SY and AH in small groups). • Podpora obnovy – uvolňovat neceloplošně, přednostně v místech kde je třeba doplnit vertikální zápoj (SM a JD jednotlivě nebo v hloučcích, BK, příp. KL a JS ve skupinkách). Podpora světlomilných dřevin CDS (DB, OL, JL).	quality trees, to release canopy in order to initialise natural regeneration. In category „O“ (nutrient-medium gleyed soils) excessive canopy opening is not desirable, due to the risk of subsequent weed development. To combine a target-diameter felling approach (regeneration initiated), group fellings (growth and selfpruning) and thinning (more uniform structure stands in areas among the above-mentioned shelterwood parts). In following phases, one should maintain the residual parent stand and postpone its presence on the site or alternatively leave it on the site with no final felling conducted. Artificial regeneration (including underplanting or undersowing) only for CDS species, which are missing (SF and BE). To initiate regeneration of SF ahead of time. Open areas from salvage cut can be used for artificial or combined (if they are present in the mother stand) regeneration of light-demanding trees (SP, CAR, alt. EM). On larger areas after salvage cut, leave SBI, ROW, ASP as preparatory trees for subsequent easier introduction of SF or BE. **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand (upper storey), to release accompanying species and conduct sanitation cut. • if no shelter above, advanced growth should be cleaned (in NS also using a shrub cutter – schematic approach) supporting (even individually) accompanying species. • in young stands with gaps (exceeding 0.04 ha), repair planting with crop species that are capable of stabilizing and soil-improving (CAR, EL) or support of pioneering species such as ROW, SBI and ASP.	shorter period between the interventions, when clearcutting – use smaller cuts. Group or group-edge cuts conduct where patches of natural regeneration (also around the individual parents) of trees already exists – preferably SF and BE, on more open areas SP, OK, CAR, NOM, SY, EL). When releasing desirable undergrowth, remove NS from the upper storeys preferably. Underplant SF (within the stand) and BE, alt. SY (inner strip), provided the parent stands are vigorous. Support all self-seeded desirable tree species. In case of a rapid parent stand disintegration risk, support and rely on pioneering species (SP, ASP, SIB) and crop species regenerate below the preparatory stands. More open areas (min. 0.5 ha) can be used for artificial regeneration of CAR. Instable uniform overaged NS stands need to be qiuckly regenerated using a strip felling with narrow clearcuts on which light-demanding desirable trees are to be planted. **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand overstorey, release accompanying species and conduct a sanitation cut. Aditional regeneration of NS is not desirable. To release undergrowth more quickly compared to the B - transitional type (BE when dominants‘ height is 4 m, SY, alternatively AH when the height is 2 m). • if not sheltered, the advance growth needs heavy cleaning (In NS also schematically – shrub cutter); all accompanying tree species should be supported maximally. • gaps in plantations and advance growths (gaps larger than 0.04 ha) need a repair planting with stabilizers or soil-improvers (CAR, EL) and also self-seeded ROW, SBI, ASP are beneficial.

		Stands younger than 40yrs Heavy thinning in NS focused on individual stability and maintenance of long live crowns (beginning when top height is 5 m – 1.4 thousand trees are left on the site, second thinning when the dominants are 10 m tall – 1.0 thousand trees are left on the site. Third reduction (on 0.75 thousand trees) should be done at top height 15 m. To release accompanying species at the expense of NS. In larger groups, an uneven thinning intensity is beneficial (mozaic following site conditions, health and share of valuable species); at the same time establish skidding lines in appropriate density (4 m wide lines 30 m apart). ***Stands older than 40 yrs*** To maintain (preferably locally) thinner canopy as crop trees (ca 300 per ha) are released from 1-2 competitors supporting natural regeneration (species from CDS) already after thinning. To support accompanying species in upper and lower storeys. The larger stand area the more emphasis is put on uneven canopy (alternating thinner and denser patches). Interval of interventions 5-10 yrs. A gradual removal of NS that have reached the target diameters. Support of regeneration beginning of the other species such as SF (regenerated 10 yrs in advance before expected NS crop diameters are reached) and other species regenerated below the mature NS.	***Stands younger than 40yrs*** If the first thinning is conducted appropriately (before top height 7 m) – follow the B-transitional type prescriptions. Emphasis on development of larger live crowns in accompanying species following the release cut. Uniform NS stands can be thinned also schematically. If no thinning was conducted before top height 10 m or the density after slight thinning exceeds 1.2 thousand per ha, heavy thinning approach is not allowed any more. A light thinning from below consists in gradual removal of declining but still competing trees (high h/d ratio) – the intervention period 5-10 yrs. All other vigorous species than NS are beneficial. ***Stands older than 40 yrs*** If thinned appropriately (NS dominants show h/d 60-80 with live crown sharing at least 50% of the stem) – follow the prescriptions for B-transitional type. Emphasis on release cut (larger crowns expected) of the other trees, their support (also undergrowth) when thinned. Monospecific NS parts should not be thinned heavily in order to prevent weed infestation (on nutrient-medium soils) and restrict NS regeneration (40-50% can be tolerated). The stands too dense with inappropriate h/d ratio should be thinned from below (labile understory), upper storey should be thinned slightly in periods 5-7 yrs. Gaps following salvage cut plant or regenerate naturally with desirable tree species.
Measures in stands damaged by biotic and abiotic agents	Thorough sanitation cut of trees infested by bark beetle. **Stands damaged by game (bark browsing and peeling):** The thickets – try to find at least 300 trees per ha in the upper storey, which show no and/or slight damage – these ones release (according to density) and protect individually in order to prevent damage, support every accompanying species, remove the most injured trees gradually, period of intervention no longer than 5 yrs. In stand with logs – release minimally damaged crop trees, remove the most injured trees, support natural regeneration in gaps following a salvage-cutting or plant (also underplant) them with desirable tree species. Period of intervention no longer than 7 yrs.		

	The stands manifesting decline (yellowing, defoliation etc.) The advance growths manifesting yellowing in more than 50% trees – do not use a schematic approach, focus on support of every healthy NS including the accompanying individuals. At top height 2 m, reduce a density to 3-4 thousand per ha – remove preferably the all-damage trees. Support all healthy NS trees regardless of the storey they thrive in. The gaps plant with desirable EL, OK or leave them to SIB, ROW, ASP self-seeding. The thickets and small-pole stands – if at least 1.4 thousand healthy NS trees are present, reduce the density to ca 1,5 thousand per ha at top height 5 m and continue to 1.1 thousand per ha when top height is 10 m. Remove all moribund and crooked trees, support all other desirable species. If less than 1.4 tree per ha are present on the site, support the healthiest 300-400 trees per ha, these ones release from the nearest competitors. The others leave without intervention excepting support of accompanying species. As pole stage is achieved, thinning of declining NS stands is risky – threat of a sooner disintegration. If the stand contains a satisfactory share of accompanying species, support it maximally. Otherwise a sanitation cut and conversion are conducted. In case of a slower disintegration, all desirable tree species are underplanted and interplanted.
Production safety	(Non-evaluated)
Production potential	(Non-evaluated)
Note	

STAND TYPE (PT) **597**			
	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	70	70
REGENERATION PERIOD [yrs]	continuous	20	20
BEGINNING OF REGENERATION	irrelevant	61	61
SILVICULTURAL SYSTEM	V	pN	pN, (pH)
MANAGEMENT FORM	High forest		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	NS (SF, SP) management on clay and peat habitats (59)		
Target species composition for 59b subunit	CAR (GAR) 45, NS 20, SF 20, BE 5, AH (SY) 5, OK (ASP) 5		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation cut in all growing stages. • Support quality – in younger parts remove wolf trees and release quality trees including desirable group admixture, in older focus on crop trees. • Support and maintain a target structure – alternating larger multi-age groups of desirable species. • Harvest of „mature“ trees, group selection according to condition and management goals. The crop-log diameters 40-60 cm. In	**<u>Regeneration</u>** Use strip felling in combination with group shelterwood cutting. Leave standards (species according to CDS) on strips. SF underplant as small groups in forward (shelterwood) parts. BE is possible to use on drier places. Support of natural regeneration of CAR, alt. by sprouts – possible to use them as preparatory stands for other species (SF). NS regenerate only naturally up to 20 %. Stand should be appropriately segmented to differentiate desirable species composition. **<u>Tending</u>**	**<u>Regeneration</u>** Prioritize strip felling for faster regeneration and the possibility to more actively change the species composition towards CDS. Missing species (SF, SY) by artificial regeneration in advanced groups or inner edges of the strips. For open areas of - light-demanding species of CDS (primarily OK). Larger stands segment and prefer particular tree species in order to get a mosaic – mix of groups. Support self-seeded species. Initialization and support of second layer in monospecific CAR parts – desiccation function.

	groups without CAR adjust all interventions to needs of all species present on the site; remove undesirable competitors, which hamper development of vertical canopy. • Intervention intensity (incl. salvage cut) based on total current increment accumulated following a previous intervention. • Support of regeneration – release in larger groups (0-5 ha) when seed yrs are expected.	***Plantations (underplanting, undersowing) and advanced growth*** • Remove wolf and forked trees in CAR advance growths and plantations. • Where are gaps in juvenile stands (over 0.04 ha), conduct repair planting or support self-seeding of desirable stabilizers or soil improvers (OK, AH). ***Stands younger than 40 yrs*** Remove wolf trees at top height 5 m, negative approach in upper and main storey. Next intervention at top height 10 m in upper and main storey resulting in 2-3 thousand trees per ha (prevention of crown shortening). Simultaneously segment the stand by skidding lines appropriately (4 m wide lines 30 m apart). After 10 yrs when top height is 15 m, support 200-300 crop trees per ha. No intervention in understorey. ***Stands older than 40yrs*** Continue releasing 150-200 crop trees per ha every 5-10 yrs. Support stand segmentation to get group mixture where CAR is missing.	The wors parent CAR stand, the quicker should be its regeneration – also prefer other desirable species. **<u>Tending</u>** ***Plantations (underplanting, undersowing) and advanced growth*** • Remowe wolf and forked trees in CAR advance growths and plantations, support all other desirable species. • Where are gaps in juvenile stands (over 0.04 ha), conduct repair planting or support self-seeding of desirable stabilizers or soil improvers (OK, AH). ***Stands younger than 40 yrs*** Remove undesirable trees – support increment by reduced density. At top height 10 and 15 m, the density should be 2.0 and 1.5 thousand trees per ha, respectively. Take care of at least 100 promising trees – release them from 1-2 competitors. Simultaneously segment the stand by skidding lines appropriately (4 m wide lines 30 m apart). Support of other species by releasing, also in understorey. ***Stands older than 40yrs*** Continue releasing crop trees (at least 50 per ha). Emphasise releasing accompanying species to promote larger live crowns and support their natural regeneration already during the last thinning.
Measures in stands damaged by biotic and abiotic agents	Support any accompanying species to prevent disintegration of forest stands over large areas.		
Production safety	(Non-evaluated)		
Production potential	(Non-evaluated)		
Note			

STAND TYPE (PT) **791**			
	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	110	80
REGENERATION PERIOD [yrs]	continuous	40	30
BEGINNING OF REGENERATION	irrelevant	91	61
SILVICULTURAL SYSTEM	V	pP, (pN)	pN, (p)P, (H)
MANAGEMENT FORM	High forest		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	NS (natural) management for mountain altitudes		
Target species composition for 79a subunit	NS 70, BI (SBI, ASP, ROW) 12, GAR 10, BE 2, SF 5, SP (SY) 1		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation selection – salvage felling at all growing stages. • Support of quality and stability – to release quality crop trees including maintenance of accompanying species (NS, SF individually, CAR as groups), in older parts prefer removal of low-quality competitors. • Support and maintenance of target stand structure – adjustments based on comparison of current structure with model one. • Harvest of „mature“ trees according to their development stage and management goals. Target diameter ranges between 40-	**Regeneration** To prefer natural regeneration, large shelterwood cutting (or small one or small shelterwod cuttings ahead) should be done with uneven intensity. Strip felling in combination with shelterwood forward groups for shade-tolerant species (SF) is also possible. To prefer removal of low-quality trees, to release canopy in order to initialise natural regeneration. To combine a target-diameter felling approach (regeneration initiated), group fellings (growth and selfpruning) and thinning (more uniform structure stands in areas among the above-mentioned shelterwood parts). In following phases, one should maintain the residual parent stand and postpone its presence	**Regeneration** One can begin the regeneration also earlier (in 60th yr of age) – where is a risk of rapid disintegration. When planning and conducting renewal cuts, take account of NS stand present on the site maximally. If instable (high h/d ratio, short live crown), the stand should be thinned less intensively with shorter period between the interventions, when clearcutting – use smaller cuts. Group or group-edge cuts conduct where patches of natural regeneration (also around the individual parents) of trees already exists – preferably SF, and SBI, ASP, ROW, GAR, which need more light). When releasing desirable undergrowth, remove NS from the upper storeys preferably.

	60 cm. The removed trees are not only the thickest dominants, but also those ones, which will not perform well and which hamper a vertical canopy development. • Intervention intensity (including salvage cut) in the context of total current increment accumulated following a previous intervention. • Support of regeneration – to release locally, preferentially at sites where a vertical canopy is needed to develop (NS and SF individually or small patches. Support of light-demanding species from CDS (BI, SBI, ASP, ROW, GAR, SP).	on the site or alternatively leave it on the site with no final felling conducted. Artificial regeneration (including underplanting or undersowing) only for CDS species, which are missing (SF). To initiate regeneration of SF ahead of time. Open areas from salvage cut can be used for artificial or combined (if they are present in the mother stand) regeneration of light-demanding trees (BI, SBI, ASP, ROW, GAR, alt. SP). It can be used for SF underplanting. **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand (upper storey), to release accompanying species and conduct sanitation cut. • if no shelter above, advanced growth should be cleaned (in NS also using a shrub cutter – schematic approach) supporting (even individually) accompanying species. • in young stands with gaps (exceeding 0.04 ha), repair planting with crop species that are capable of stabilizing and soil-improving (CAR) or support of pioneering species such as SBI, ASP and ROW. ***Stands younger than 40yrs*** Heavy thinning in NS focused on individual stability and maintenance of long live crowns (beginning when top height is 5 m – 1.4 thousand trees are left on the site, second thinning when the dominants are 10 m tall – 1.0 thousand trees are left on the site. Third reduction (on 0.75 thousand trees) should be done at top height 15 m. To release accompanying species at the expense of NS. In larger groups, an uneven thinning intensity is beneficial (mozaic following site conditions, health and share of valuable species); at the	Underplant SF (within the stand) and BE or SY (inner strip), provided the parent stands are vigorous. Support all self-seeded desirable tree species. In case of a rapid parent stand disintegration risk, support and rely on pioneering species (SIB, ASP, ROW) and crop species regenerate below the preparatory stands. More open areas (min. 0.5 ha) can be used for artificial regeneration of GAR. Instable uniform overaged NS stands need to be qiuckly regenerated using a strip felling with narrow clearcuts on which light-demanding desirable trees are to be planted. **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand overstorey, release accompanying species and conduct a sanitation cut. Aditional regeneration of NS is not desirable. • if not sheltered, the advance growth needs heavy cleaning (In NS also schematically – shrub cutter); all accompanying tree species should be supported maximally. • gaps in plantations and advance growths (gaps larger than 0.04 ha) need a repair planting with stabilizers or soil-improvers (CAR) and also self-seeded SBI, ASP, ROW are beneficial. ***Stands younger than 40yrs*** If the first thinning is conducted appropriately (before top height 7 m) – follow the B-transitional type prescriptions. Emphasis on development of larger live crowns in accompanying species following the release cut. Uniform NS stands can be thinned also schematically. If no thinning was conducted before top height 10 m or the density after slight thinning exceeds 1.2 thousand per ha, heavy thinning approach is not allowed any more. A light thinning from below consists in gradual removal of declining but still

		same time establish skidding lines in appropriate density (4 m wide lines 30 m apart). ***Stands older than 40 yrs*** To maintain (preferably locally) thinner canopy as crop trees (ca 300 per ha) are released from 1-2 competitors supporting natural regeneration (species from CDS) already after thinning. To support accompanying species in upper and lower storeys. The larger stand area the more emphasis is put on uneven canopy (alternating thinner and denser patches). Interval of interventions 5-10 yrs. A gradual removal of NS that have reached the target diameters. Support of regeneration beginning of the other species such as SF (regenerated 10 yrs in advance before expected NS crop diameters are reached) and other species regenerated below the mature NS. To create more open areas for initiation of natural regeneration of light-demanding species (BI, SBI, ROW, ASP, CAR).	competing trees (high h/d ratio) – the intervention period 5-10 yrs. All other vigorous species than NS are beneficial. ***Stands older than 40 yrs*** If thinned appropriately (NS dominants show h/d 60-80 with live crown sharing at least 50% of the stem) – follow the prescriptions for B-transitional type. Emphasis on release cut (larger crowns expected) of the other trees, their support (also undergrowth) when thinned. Monospecific NS parts should not be thinned heavily in order to prevent weed infestation (on nutrient-medium soils) and restrict NS regeneration (up to 70% can be tolerated). The stands too dense with inappropriate h/d ratio should be thinned from below (labile understory), upper storey should be thinned slightly in periods 5-7 yrs. Gaps following salvage cut plant or regenerate naturally with desirable tree species.
Measures in stands damaged by biotic and abiotic agents	Thorough sanitation cut of trees infested by bark beetle. **Stands damaged by game (bark browsing and peeling):** The thickets – try to find at least 300 trees per ha in the upper storey, which show no and/or slight damage – these ones release (according to density) and protect individually in order to prevent damage, support every accompanying species, remove the most injured trees gradually, period of intervention no longer than 5 yrs. In stand with logs – release minimally damaged crop trees, remove the most injured trees, support natural regeneration in gaps following a salvage-cutting or plant (also underplant) them with desirable tree species. Period of intervention no longer than 7 yrs. **The stands manifesting decline (yellowing, defoliation etc.)** The advance growths manifesting yellowing in more than 50% trees – do not use a schematic approach, focus on support of every healthy NS including the accompanying individuals. At top height 2 m, reduce a density to 3-4 thousand per ha – remove preferably the all-damage trees. Support all healthy NS trees regardless of the storey they thrive in. The gaps plant with desirable EL, OK or leave them to SIB, ROW, ASP self-seeding. The thickets and small-pole stands – if at least 1.4 thousand healthy NS trees are present, reduce the density to ca 1,5 thousand per ha at top height 5 m and continue to 1.1 thousand per ha when top height is 10 m. Remove all moribund and crooked trees, support all other desirable species. If less than 1.4 tree per ha are present on the site, support the healthiest 300-400 trees per ha, these ones release from the nearest competitors. The others leave without intervention excepting support of accompanying species.		

	As pole stage is achieved, thinning of declining NS stands is risky – threat of a sooner disintegration. If the stand contains a satisfactory share of accompanying species, support it maximally. Otherwise a sanitation cut and conversion are conducted. In case of a slower disintegration, all desirable tree species are underplanted and interplanted.
Production safety	(Non-evaluated)
Production potential	(Non-evaluated)
Note	

STAND TYPE (PT) **291**			
	Present status		
	A - target	B - transitional	C - distant
SHARE [ha]			
SHARE [%]			
ROTATION [yrs]	irrelevant	90	80
REGENERATION PERIOD [yrs]	continuous	30	30
BEGINNING OF REGENERATION	irrelevant	71	61
SILVICULTURAL SYSTEM	V	pN	pN, (H)
MANAGEMENT FORM	vysoký		
PERIOD FOR PLANTATION ESTABLISHEMENT [yrs]	10		
SUPERORDINATE MANAGEMENT UNIT	CAR (AH) management on permanently wet and floodplain habitats		
Target species composition for 29g subunit	AH (OK) 45, SY (NOM, FM) 10, CAR 10, SF 10, EM (WEM) 10, BE (SLI, HBM) 5, SBI (ASP) 5, NS 5		
SILVICULTURAL PRESCRIPTIONS	**Selection felling interventions according to criteria:** • Sanitation selection – salvage felling at all growing stages. • Support of quality and stability – to release quality crop trees including maintenance of accompanying species (NS, SF individually, AH, SY, CAR, EM as groups), in older parts prefer removal of low-quality competitors. • Support and maintenance of target stand structure – adjustments based on comparison of current structure with model one. • Harvest of „mature“ trees according to their development stage and management	**Obnova** To prefer natural regeneration, strip felling in combination with shelterwood forward groups for shade-tolerant species (SF). To prefer removal of low-quality trees, to release canopy in order to initialise natural regeneration. To combine a target-diameter felling approach (regeneration initiated), group fellings (growth and selfpruning) and thinning (more uniform structure stands in areas among the above-mentioned shelterwood parts). In following phases, one should maintain the residual parent stand and postpone its presence on the site or alternatively leave it on the site with no final felling conducted. Artificial regeneration (including underplanting or	**Obnova** **Regeneration** One can begin the regeneration also earlier (in 60th yr of age) – where is a risk of rapid disintegration. When planning and conducting renewal cuts, take account of NS stand present on the site maximally. If instable (high h/d ratio, short live crown), the stand should be thinned less intensively with shorter period between the interventions, when clearcutting – use smaller cuts (also due to the risk of weed infestation. Group or group-edge cuts conduct where patches of natural regeneration (also around the individual parents) of trees already exists – preferably SF or BE, and AH, SY, CAR, EM, ASP, ROW, GAR, which need more light). When releasing desirable

	goals. Target diameter ranges between 40-60 cm. The removed trees are not only the thickest dominants, but also those ones, which will not perform well and which hamper a vertical canopy development. • Intervention intensity (including salvage cut) in the context of total current increment accumulated following a previous intervention. • Support of regeneration – to release locally, preferentially at sites where a vertical canopy is needed to develop (NS and SF individually or small patches. Support of light-demanding species from CDS (OK, CAR).	undersowing) only for CDS species, which are missing (SF, CAR, AH, OK). To initiate regeneration of SF ahead of time. Open areas from salvage cut can be used for artificial or combined (if they are present in the mother stand) regeneration of light-demanding trees (OK, CAR, AH). **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand (upper storey), to release accompanying species and conduct sanitation cut. • if no shelter above, advanced growth should be cleaned (in NS also using a shrub cutter – schematic approach) supporting (even individually) accompanying species. • in young stands with gaps (exceeding 0.04 ha), repair planting with crop species that are capable of stabilizing and soil-improving (CAR, SY, EM) or support of pioneering species such as SBI. ***Stands younger than 40yrs*** Heavy thinning in NS focused on individual stability and maintenance of long live crowns (beginning when top height is 5 m – 1.4 thousand trees are left on the site, second thinning when the dominants are 10 m tall – 1.0 thousand trees are left on the site. Third reduction (on 0.75 thousand trees) should be done at top height 15 m. To release accompanying species at the expense of NS. In larger groups, an uneven thinning intensity is beneficial (mozaic following site conditions, health and share of valuable species); at the same time establish skidding lines in appropriate density (4 m wide lines 30 m apart). ***Stands older than 40 yrs***	undergrowth, remove NS from the upper storeys preferably. Underplant SF (within the stand) and BE or SY (inner strip), provided the parent stands are vigorous. Support all self-seeded desirable tree species. In case of a rapid parent stand disintegration risk, support and rely on pioneering species (SIB, ASP, ROW) and crop species regenerate below the preparatory stands. More open areas (min. 0.5 ha) can be used for artificial regeneration of OK (mound or ridge planting of advanced planting stock). Instable uniform overaged NS stands need to be qiuckly regenerated using a strip felling with narrow clearcuts on which light-demanding desirable trees are to be planted. **Tending** ***Plantations (underplanting, undersowing) and advanced growth*** • if sheltered by a parent stand overstorey, release accompanying species and conduct a sanitation cut. Aditional regeneration of NS is not desirable. • if not sheltered, the advance growth needs heavy cleaning (In NS also schematically – shrub cutter); all accompanying tree species should be supported maximally. • gaps in plantations and advance growths (gaps larger than 0.04 ha) need a repair planting with stabilizers or soil-improvers (CAR. SY, EM) and also self-seeded SBI are beneficial. ***Stands younger than 40yrs*** If the first thinning is conducted appropriately (before top height 7 m) – follow the B-transitional type prescriptions. Emphasis on development of larger live crowns in accompanying species following the release cut. Uniform NS stands can be thinned also schematically.

		To maintain (preferably locally) thinner canopy as crop trees (ca 300 per ha) are released from 1-2 competitors supporting natural regeneration (species from CDS) already after thinning. To support accompanying species in upper and lower storeys. The larger stand area the more emphasis is put on uneven canopy (alternating thinner and denser patches). Interval of interventions 5-10 yrs. A gradual removal of NS that have reached the target diameters. Support of regeneration beginning of the other species such as SF (regenerated 10 yrs in advance before expected NS crop diameters are reached) and other species regenerated below the mature NS. To create more open areas for initiation of natural regeneration of light-demanding species (AH, CAR, OK).	If no thinning was conducted before top height 10 m or the density after slight thinning exceeds 1.2 thousand per ha, heavy thinning approach is not allowed any more. A light thinning from below consists in gradual removal of declining but still competing trees (high h/d ratio) – the intervention period 5-10 yrs. All other vigorous species than NS are beneficial. ***Stands older than 40 yrs*** If thinned appropriately (NS dominants show h/d 60-80 with live crown sharing at least 50% of the stem) – follow the prescriptions for B-transitional type. Emphasis on release cut (larger crowns expected) of the other trees, their support (also undergrowth) when thinned. Monospecific NS parts should not be thinned heavily in order to prevent weed infestation (on nutrient-medium soils) and restrict NS regeneration (up to 10% can be tolerated). The stands too dense with inappropriate h/d ratio should be thinned from below (labile understory), upper storey should be thinned slightly in periods 5-7 yrs. Gaps following salvage cut plant or regenerate naturally with desirable tree species.
Measures in stands damaged by biotic and abiotic agents	Thorough sanitation cut of trees infested by bark beetle. **Stands damaged by game (bark browsing and peeling):** The thickets – try to find at least 300 trees per ha in the upper storey, which show no and/or slight damage – these ones release (according to density) and protect individually in order to prevent damage, support every accompanying species, remove the most injured trees gradually, period of intervention no longer than 5 yrs. In stand with logs – release minimally damaged crop trees, remove the most injured trees, support natural regeneration in gaps following a salvage-cutting or plant (also underplant) them with desirable tree species. Period of intervention no longer than 7 yrs. **The stands manifesting decline (yellowing, defoliation etc.)** The advance growths manifesting yellowing in more than 50% trees – do not use a schematic approach, focus on support of every healthy NS including the accompanying individuals. At top height 2 m, reduce a density to 3-4 thousand per ha – remove preferably the all-damage trees. Support all healthy NS trees regardless of the storey they thrive in. The gaps plant with desirable EL, OK or leave them to SIB, ROW, ASP self-seeding. The thickets and small-pole stands – if at least 1.4 thousand healthy NS trees are present, reduce the density to ca 1,5 thousand per ha at top height 5 m and continue to 1.1 thousand per ha when top height is 10 m. Remove all moribund and crooked trees, support all other desirable species. If less		

	than 1.4 tree per ha are present on the site, support the healthiest 300-400 trees per ha, these ones release from the nearest competitors. The others leave without intervention excepting support of accompanying species. As pole stage is achieved, thinning of declining NS stands is risky – threat of a sooner disintegration. If the stand contains a satisfactory share of accompanying species, support it maximally. Otherwise a sanitation cut and conversion are conducted. In case of a slower disintegration, all desirable tree species are underplanted and interplanted.
Production safety	(Non-evaluated)
Production potential	(Non-evaluated)
Note	