

The impact of different thinning scenarios on the stand structure, stability and growth: a computer-based analysis by means of Forest Simulator BWINPro

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Introduction

- main components of close-to-nature silviculture



species (provenances) & broadleaves in particular Conservation of old trees, deadwood & protection of endangered plant & animal species



Source: Pommerening & Murphy (2004, slightly mod.)

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New challenges







Some thinning definitions

Thinning is a silvicultural operation where the main **objective is to reduce the density** of trees in a stand, improve the quality and growth of the remaining trees and produce a saleable product.

Thinning can also achieve other objectives such as altering the species composition of a stand, improving the health of the remaining trees or disturbing an established ground flora to enhance opportunities for natural regeneration.

(Kerr and Haufe 2011)

Steering of interaction between trees and between trees and the environment to meet the overall objectives defined by human. (Schütz 2001)

Marking is a key responsibility of silviculturists at the interface between global management planning and local implementation. (Junod 2011)





Maximising the total volume production of a stand. (+,-)

Maximising the production of certain, individual trees. (+)

Improving the stability at the tree and stand level. (+)

Promotion of disiered tree species composition and particular structures.

(+)









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1949

BPN - oddz. 319

Spruce

Pine

Oak

Birch

Lime

H-beam

subplot 60 x 40 m 1936-2011

Spruce

Pine

Oak

Birch

Lime

H-beam

2011

BPN - oddz. 319 subplot 60 x 40 m 1936-2011

Spruce

Pine

Oak

Birch

Lime

H-beam





Without thinning



Slightly promotion of beech



Strong promotion of beech



Source: Pretzsch (2011, mod.)



Without thinning



Slightly promotion of beech



Strong promotion of beech



Source: Pretzsch (2011, mod.)

Shaping the desired tree species composition and intermingling form can be effectively performed by "sharp axe".



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Thinning is a central part of any mitigation strategy to reduce the impact of future changes in the climate, as:

- wood products from stands that are thinned (and pruned) are more likely to be used in long-term end-uses,
- thinning helps to maintain healthy, resilient forests that are able to lock up carbon from the atmosphere and store it as woody biomass,
- material produced in thinning can be used as woodfuel, a source of renewable energy, to help reduce fossil fuel emissions.

(Kerr and Haufe 2011)



Thinning in BWINPro

Thinning from below





100%





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Thinning in BWINPro – crop tree selection





Thinning in BWINPro – hindering trees selection by the A-value

$$E_{ij} < G$$

Eij – observed distance of hindering tree (*i*) to crop tree (*j*) in m, *G* – minimum distance (critical distance) between neighbour tree (i) and crop tree (j) in m.





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Methods (field work):

N- ctwo	L- ctwo	Oddz.	Pow. (ha)	TSL	Wiek (lata)	Skład gat.	Nr pow. bad.
Waliły	Turo- wo	70h	7,85	BMśw	24	9So 1Św	1a 1b
Krynki	Borsu- kowina	405Ъ	8,61	BMśw	37	10So Brz, Św	2a 2b
Krynki	Lesz- czana	497c	4,25	BMśw	47	10So Brz, Św	3a 3b
Krynki	Lesz- czana	395a	7,28	BMśw	59	10S0 Brz, Św	4a 4b
Krynki	Borsu- kowina	505a	4,18	BMśw	63	10So Brz, Św	5a 5b

So – pine; Bz – birch; Św – spruce







Methods (treatments):

I: Thinning according to the Polish Silvicultural Guidelines (2003), (treatment TZHL);

II: Thinning according to the concept of selection thinning by Ilmurzyński (1969) (treatment TILM);

III: Thinning according to the concept (target trees selection) by Klädke and Abetz (2004; 2010) (treatment TDOC).





Results: Tree's dbh structure: treatment TZHL







Results: Tree's dbh structure: treatment TILM







Results:

Tree's dbh structure: treatment TDOC







Results: Thinning intensity by tree numbers







Results: Thinning intensity by volume



TZHL TILM TDOC





Results: Mean volume of removed trees





















