

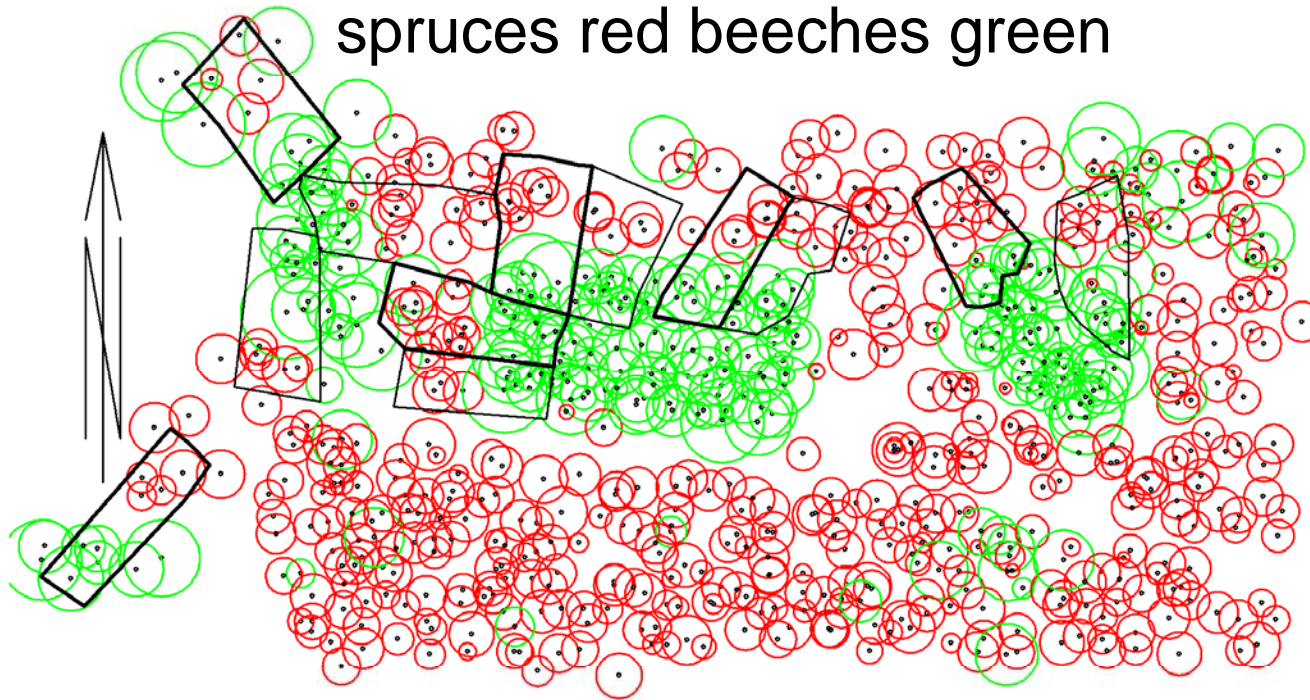
Growth reaction patterns of Norway spruce and European beech under drought stress. Initial situation before the rewatering in 2019

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<http://waldwachstum.wzw.tum.de/index.php?id=presentations>

Trees on the 12 KROOF plots and trees outside of the plots used for the following analyses.

spruces red beeches green

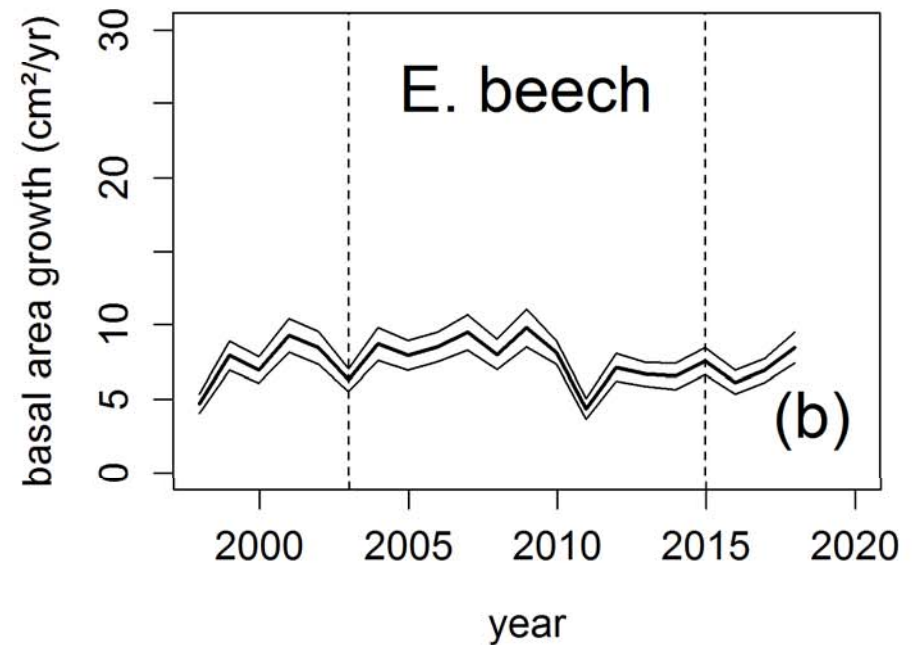
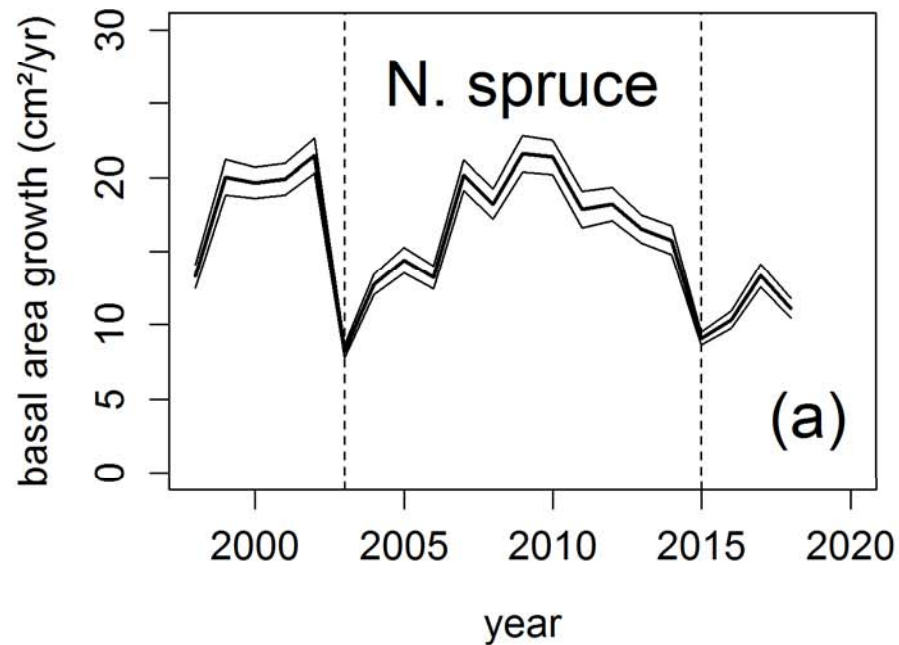


Questions:

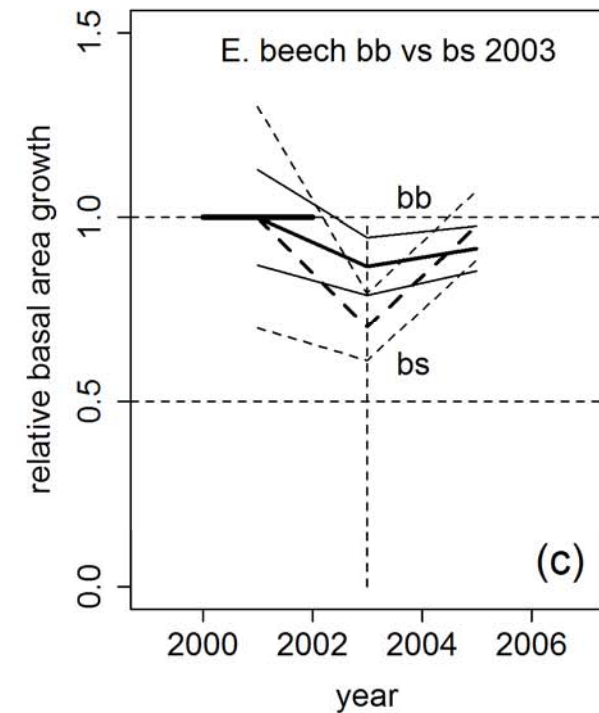
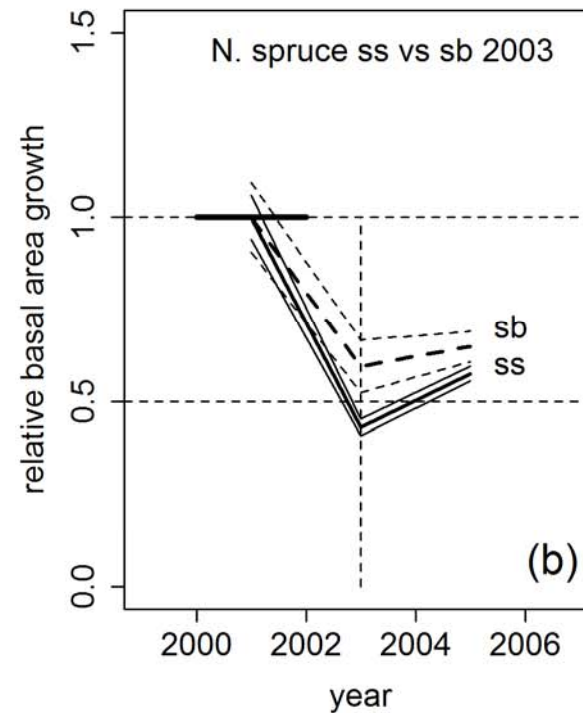
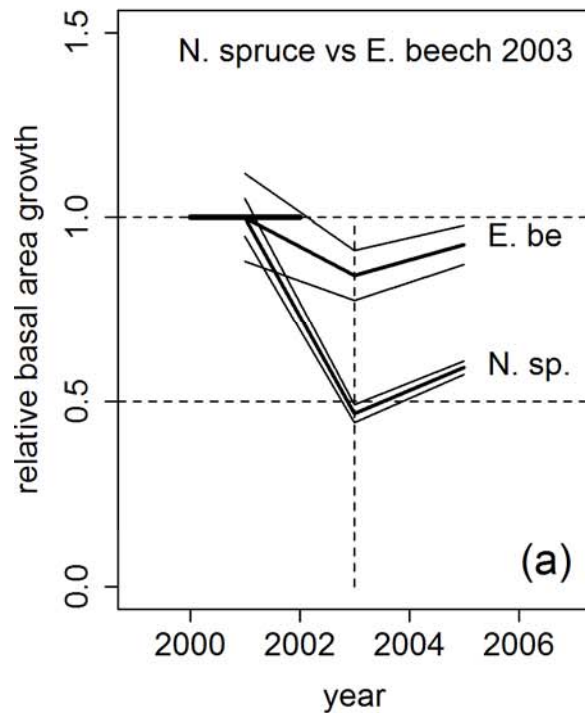
- 1 growth reactions of N. spruce versus E. beech
- 2 growth reactions in intra- versus inter-specific environment
- 3 Relationship between growth trends and drought stress events



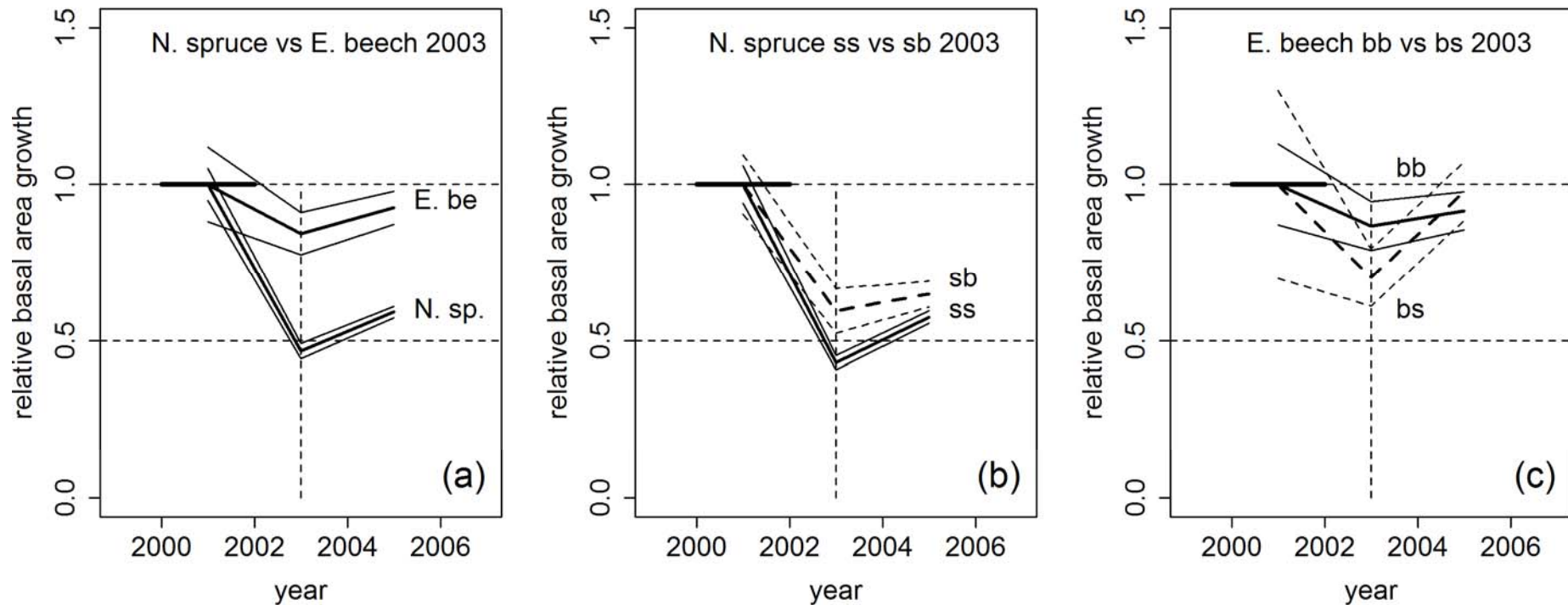
All trees in Kranzberg except those on the 6 plots with
water retention from 2014-2018



Relative basal area growth all trees in Kranzberg except those on the 6 plots with water retention from 2014-2018

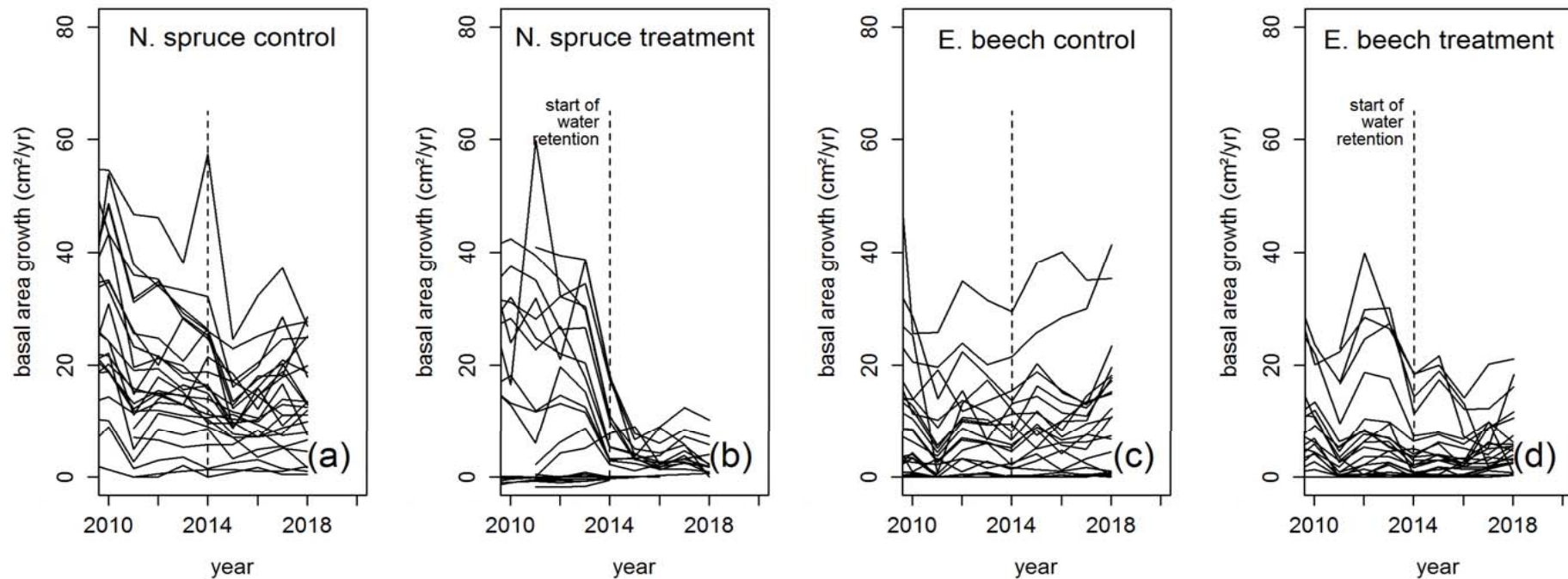


Relative basal area growth all trees in Kranzberg except those on the 6 plots with water retention from 2014-2018

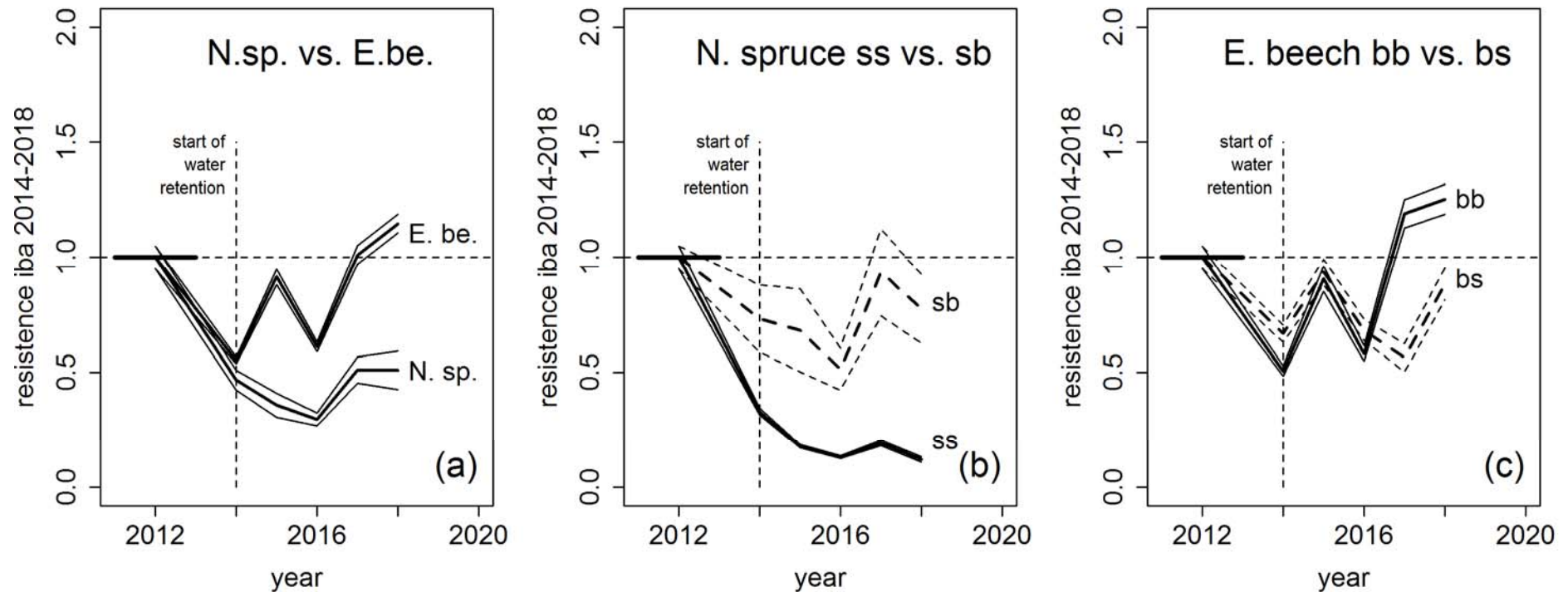


- growth reduction of Norway spruce in dry years 50-60 %
- growth reduction of European beech only half, i. e. 25-30 %
- stress reduction in inter-specific neighborhood for N. sp.

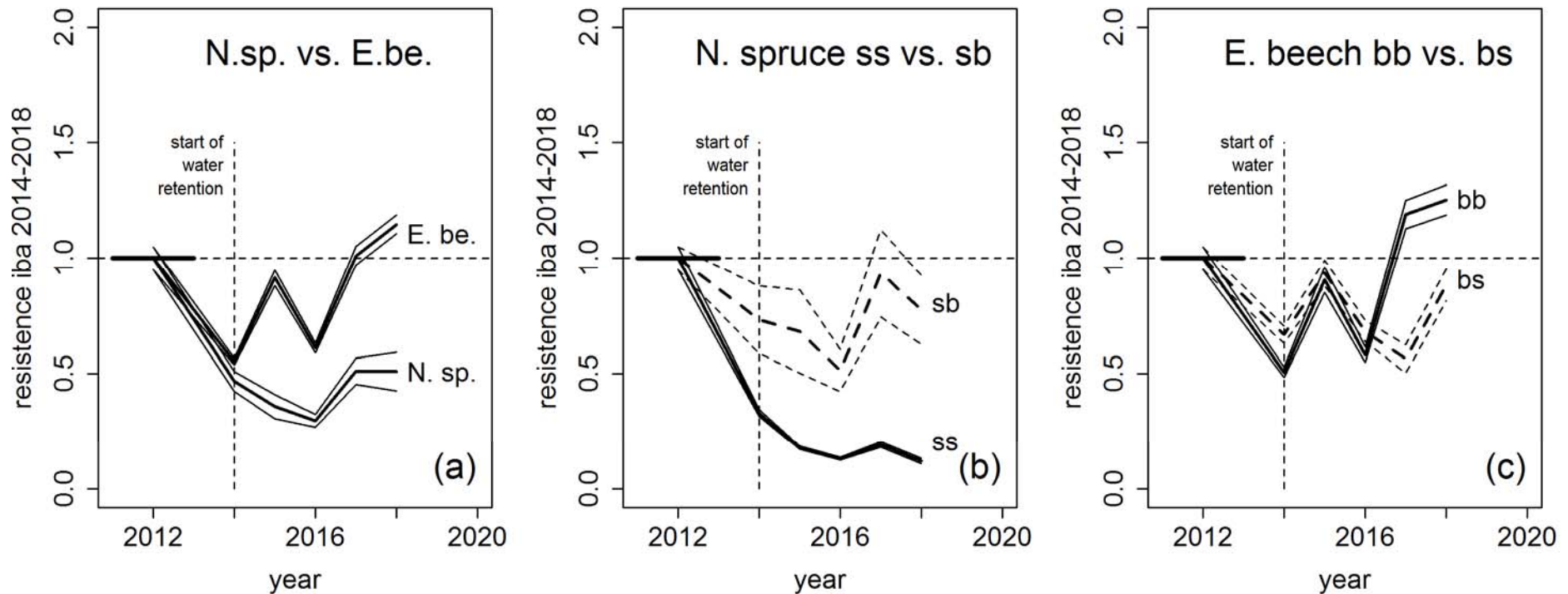
Annual basal area growth of the trees on the 12 plots: N. spruce vs. E. beech and control vs. treatment



Relative basal area growth under water retention 2014-2018 (reference 2011-2013)

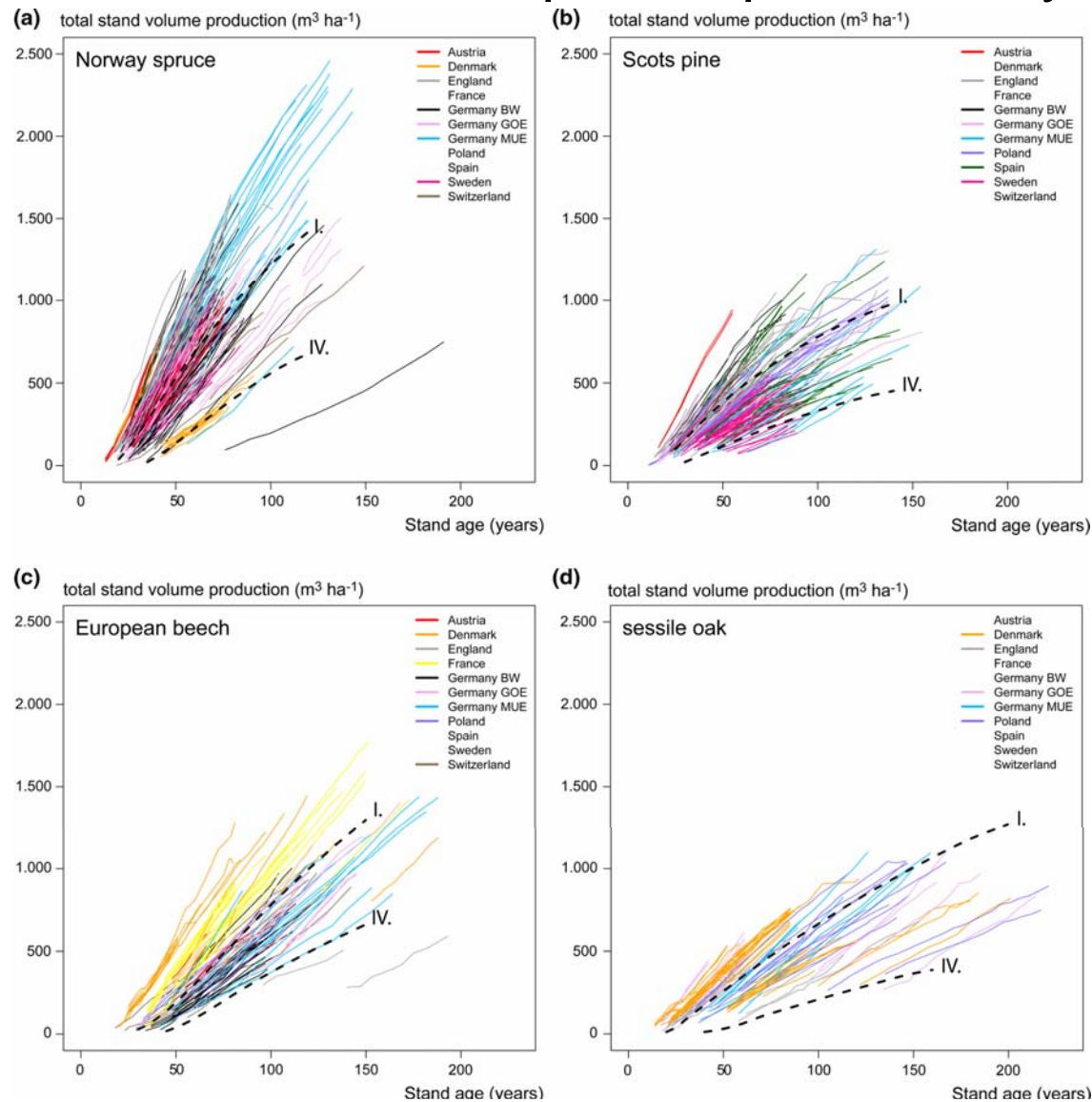


Relative basal area growth under water retention 2014-2018 (reference 2011-2013)

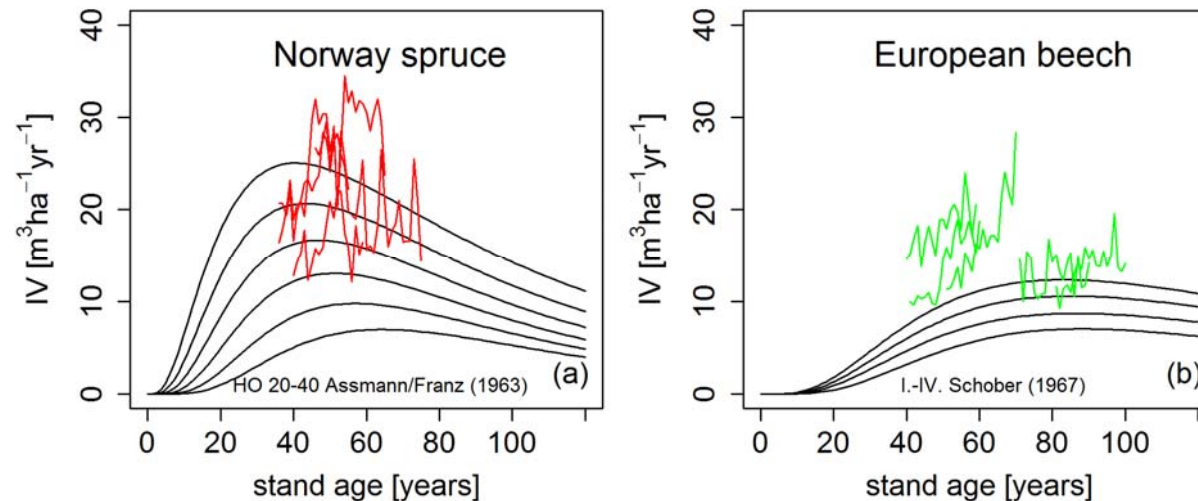


- in first 1-2 years experimental drought stress causes similar growth as natural drought in 2003, 2015
- reduction of drought stress in inter-specific neighborhood for N. sp.
- N. sp. benefits significantly, E. beech loses slightly
- N. sp. stabilizes at low level, E. beech recovers

Total stand volume production since 1860 on 577 long-term experiments across Europe compared with yield tables

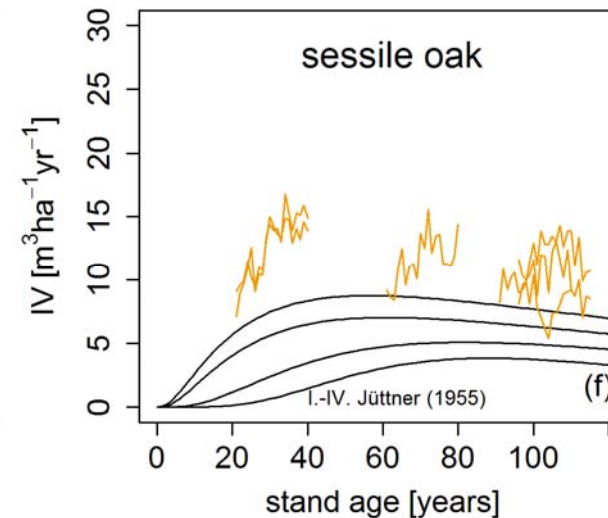
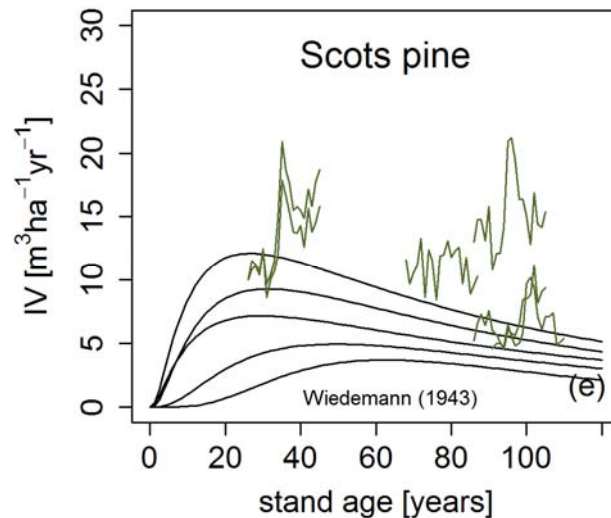
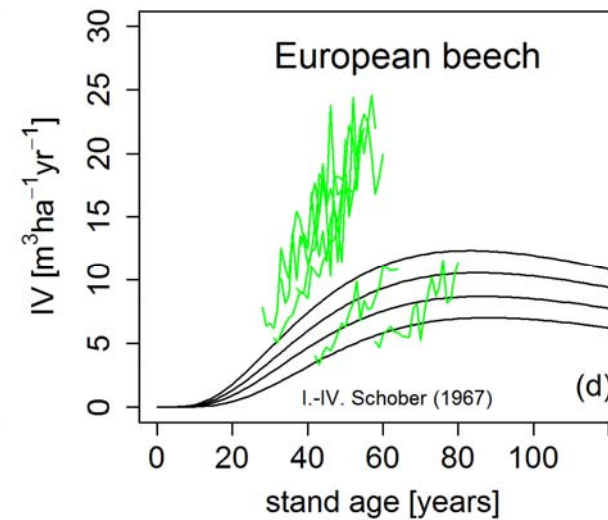
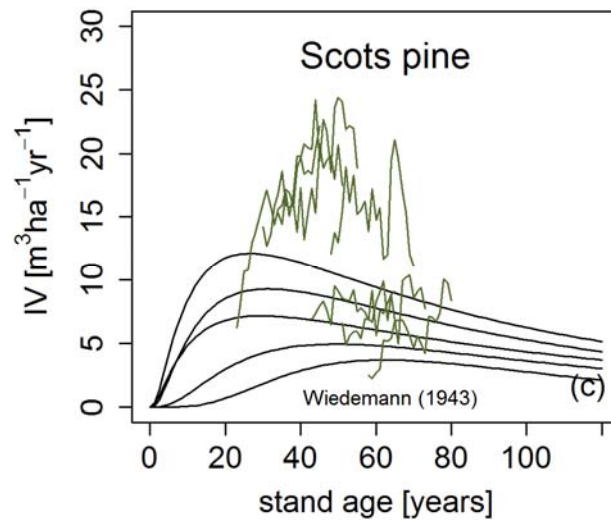


Stand growth at high level, interrupted by drought years



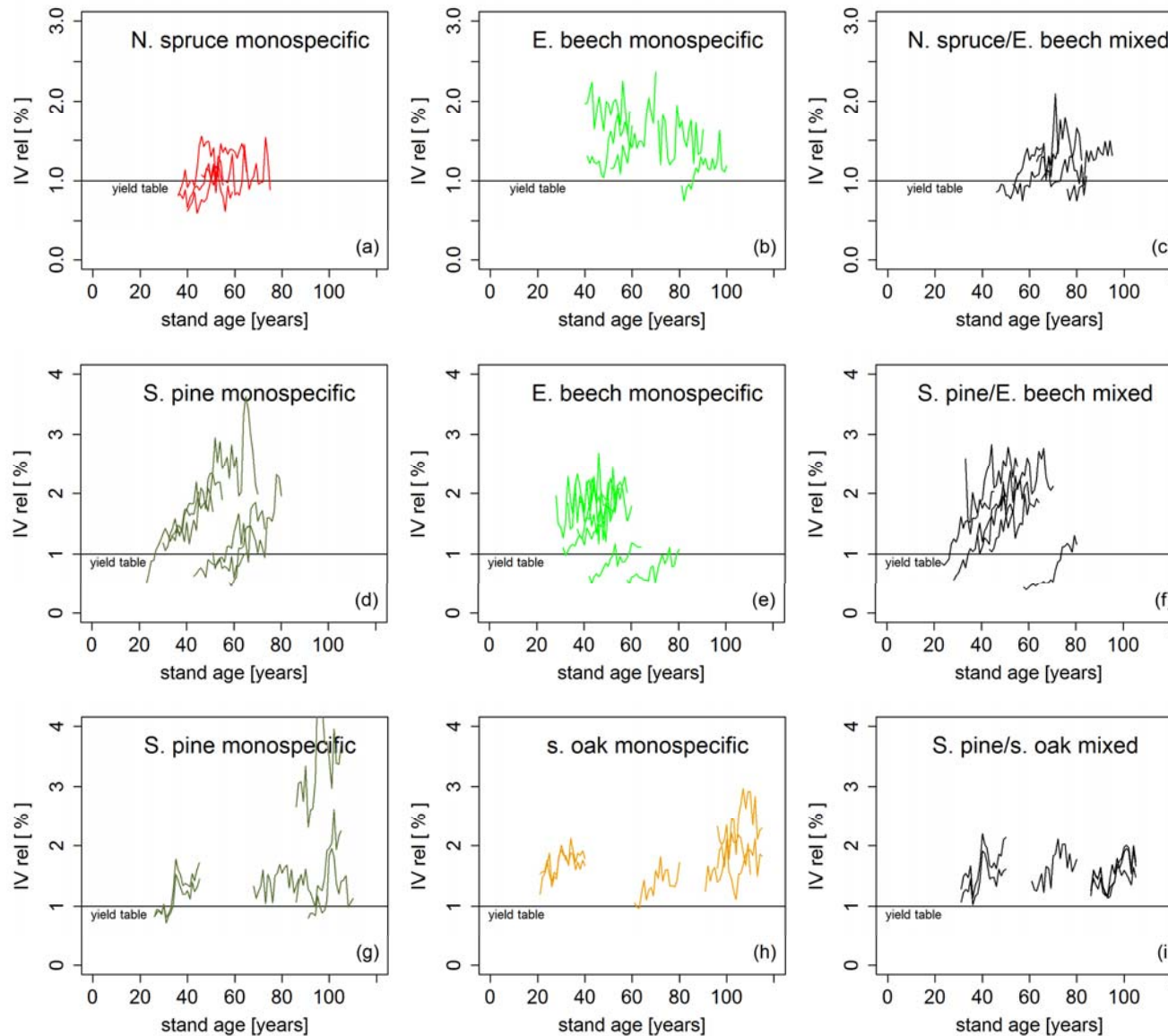
mean site index: I.-III.
mean annual T: 8-10 °C
mean precip: 503-1,200 mm yr⁻¹
mean Martonne: 26-63 mm °C⁻¹

Stand growth at high level, interrupted by drought years

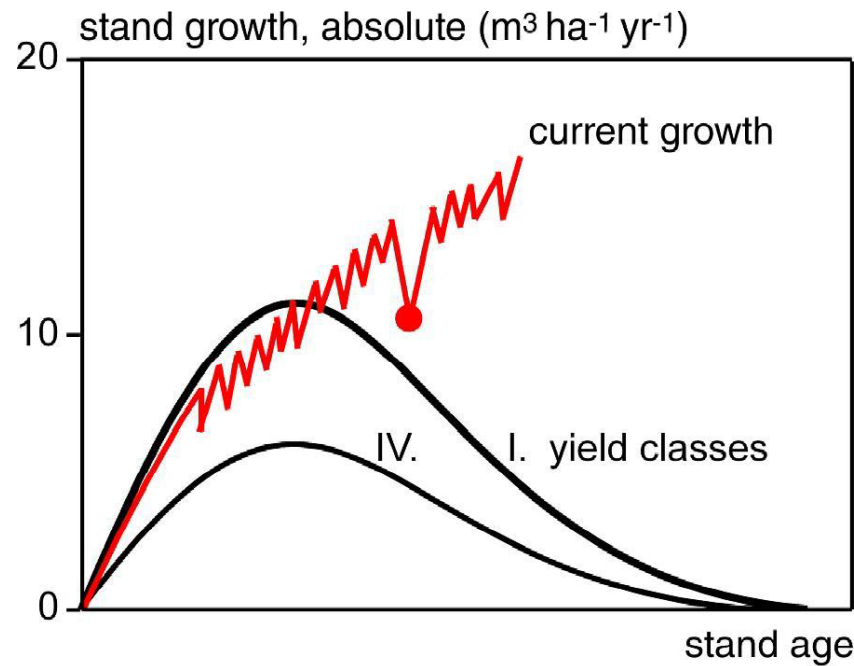


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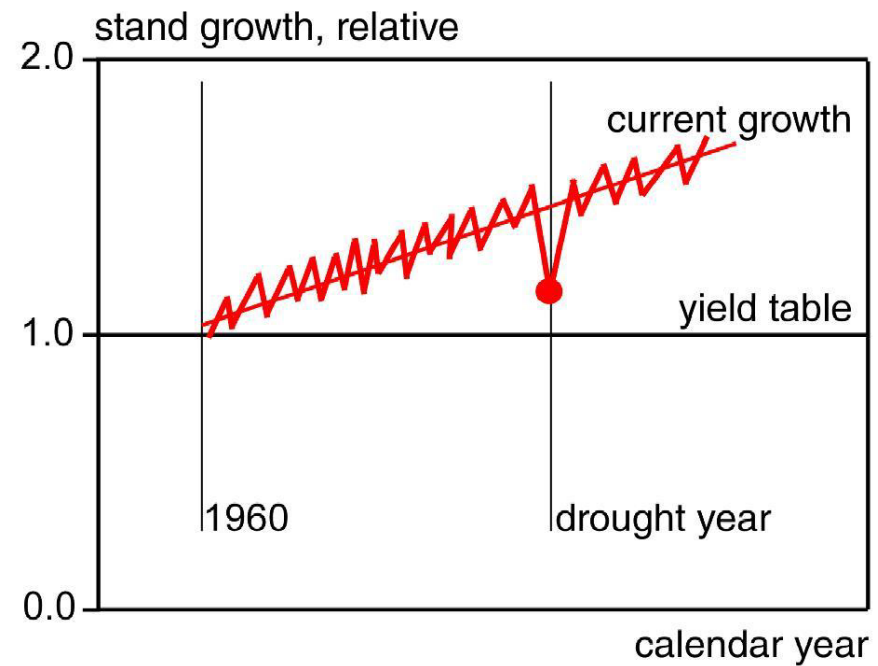
Stand growth at high level, interrupted by drought years



Growth trends, stress events and deviations from the yield tables. Schematic consolidated overview



(a)



(b)

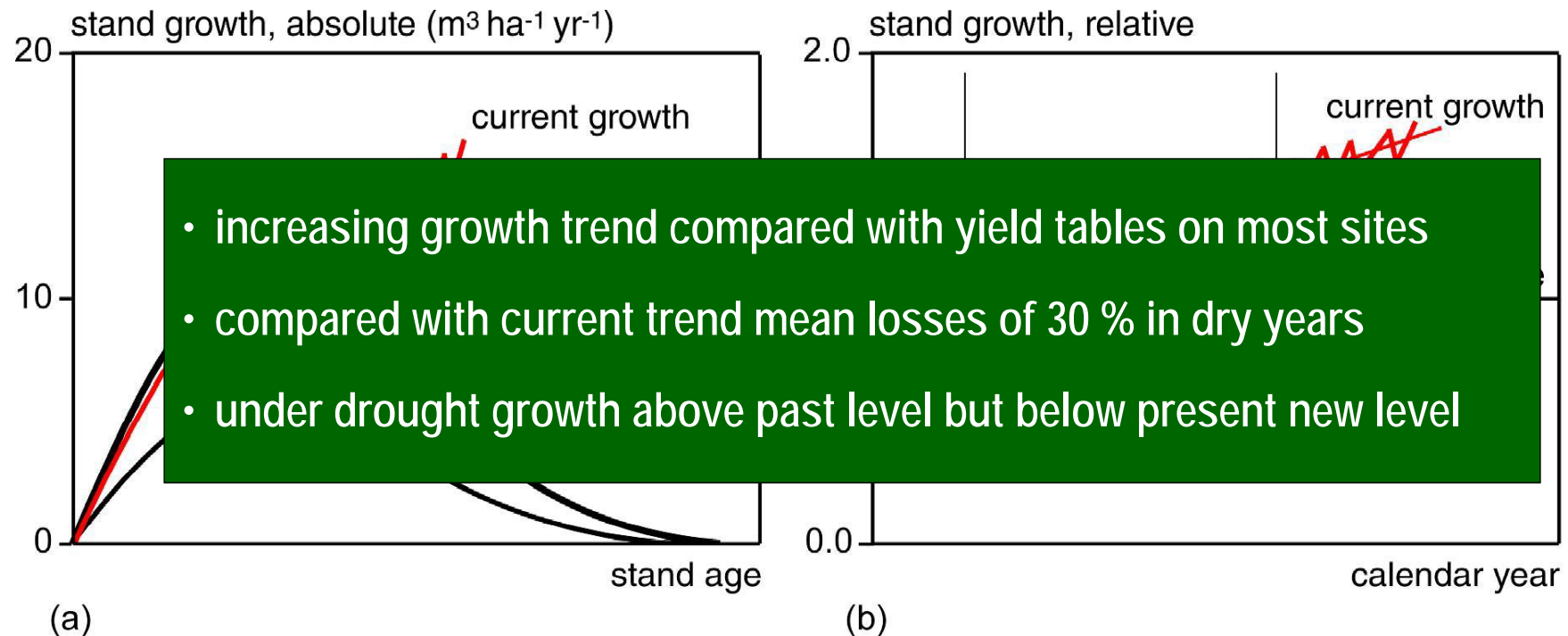
mean ratio to yield tables: 1.48 ± 0.07

mean increase: 0.026 ± 0.002

mean ratio to trend in dry years: 0.72 ± 0.01

mean ratio to yield table in dry years: 1.07 ± 0.05

Growth trends, stress events and deviations from the yield tables. Schematic consolidated overview



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Mortality rate of N. spruce increased from 1.2 % to 7.45 % per year

group	species	begin	N _b	end	N _e	number of years n	mortality rate in % m _%
all non treat.	spruce	1998	277	2018	213	21	1.24
all non treat.	beech	1998	156	2018	102	21	2.00
all non treat.	total	1998	433	2018	315	21	1.50
treatment	spruce	2011	26	2018	14	8	7.45
treatment	beech	2011	27	2018	24	8	1.46
treatment	total	2011	53	2018	38	8	4.07
control	spruce	2011	26	2018	26	8	0.00
control	beech	2011	31	2018	29	8	0.83
control	total	2011	57	2018	55	8	0.45

Quantification of intra- and interspecific neighbourhood

