Factors of Norway spruce (*Picea abies*) survival during severe bark beetle (*Ips typographus*) outbreak in Central Europe: non-linear tree resistance responses

:EXTEMIT-K

CZU Faculty of Forestry and Wood Sciences

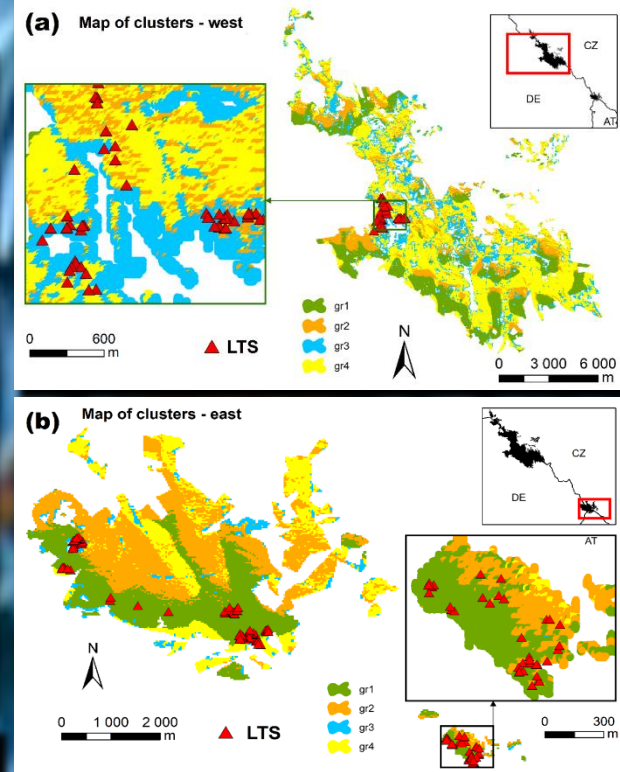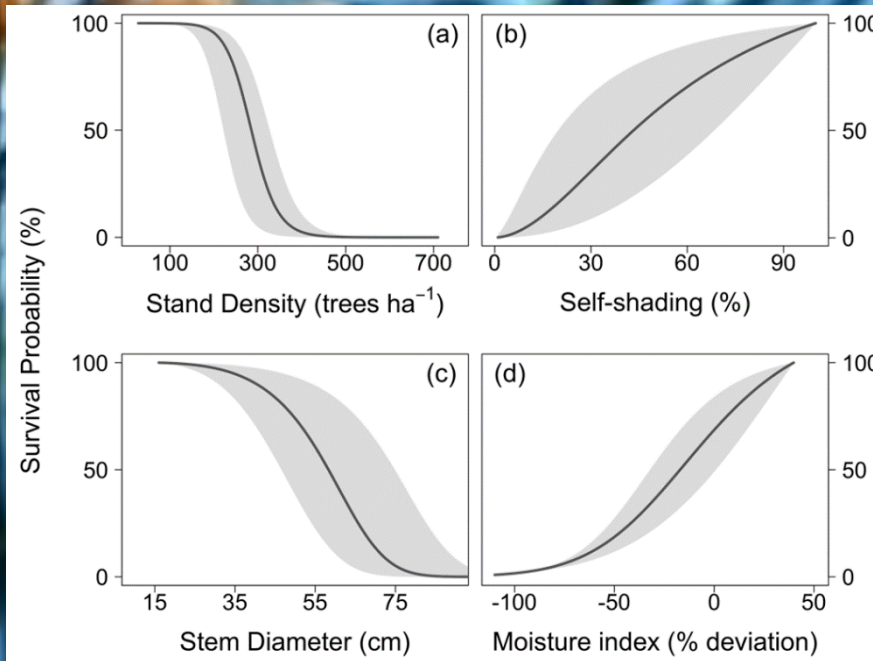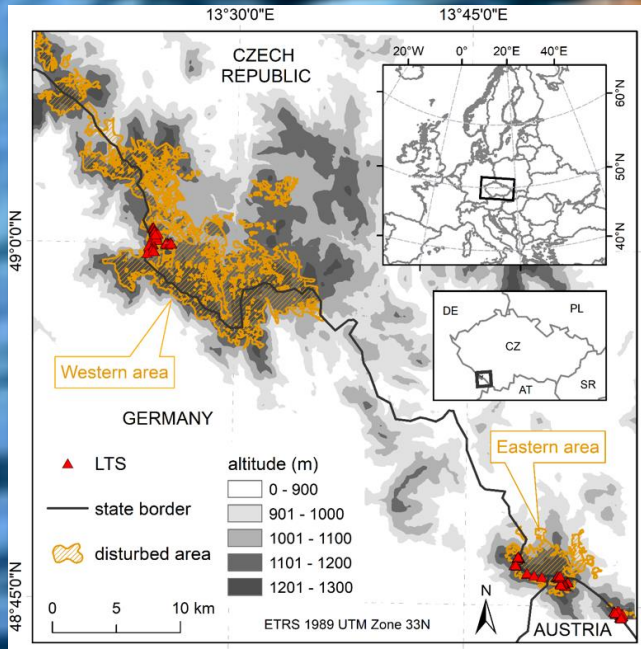*Nataliya Korolyova[a], Arne Buechling[a], Renata Ďuračiová[b], Rastislav Jakuš[a]*

BETTER CHANCE TO SURVIVE have trees:
- in LESS DENSE STANDS
- with LONGER CROWNS
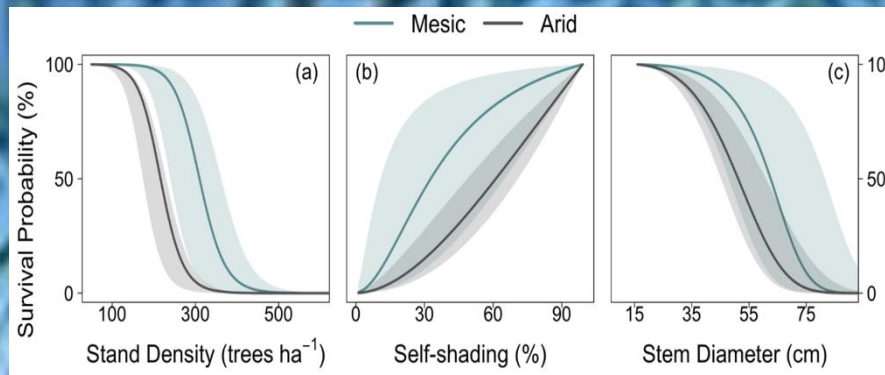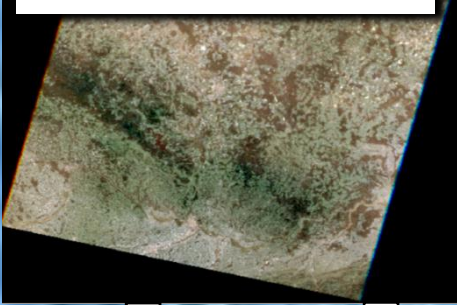- of SMALLER SIZE
- in MORE MESIC SOIL

LAST STANDING TREES (LTS)
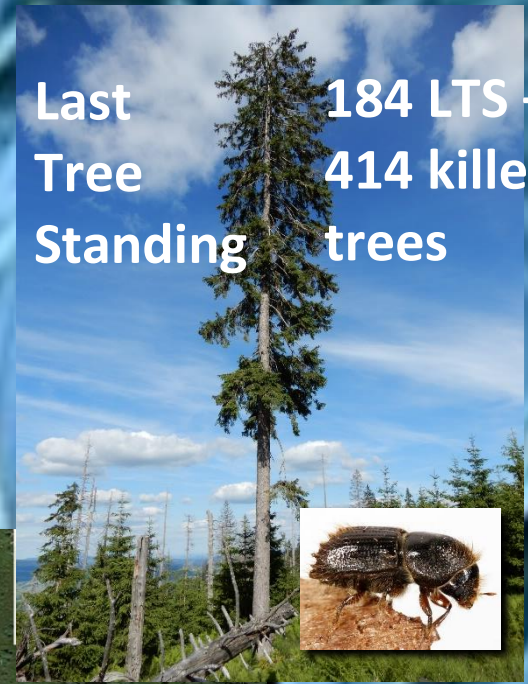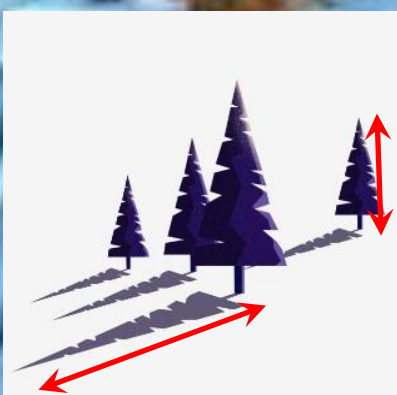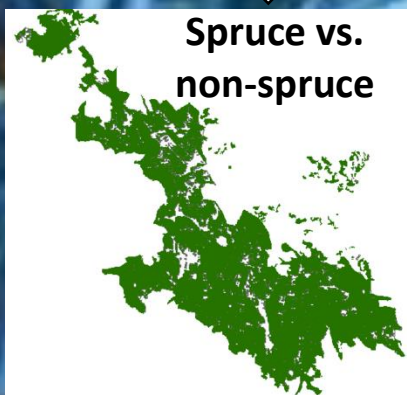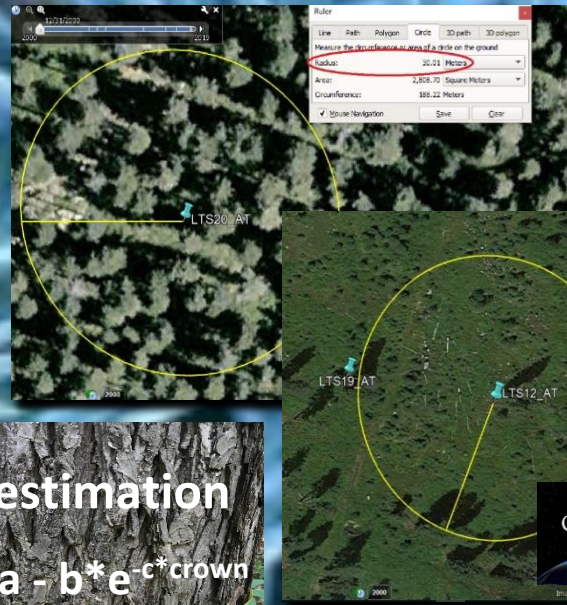**SURVIVE IN CLUSTERS at upper slope positions**

Landsat 5, 1986

Last Tree Standing   184 LTS + 414 killed trees

Training polygons

ERDAS IMAGINE®

Spruce vs. non-spruce

Pre-outbreak stand density estimation exponential model with non-linear Tasseled Cap wetness index, spectral bands 3, 4, 5, structural index, folded aspect

DBH estimation

$DBH = a - b*e^{-c*crown}$

Google earth

Copernicus Europe's eyes on Earth

CHELSA
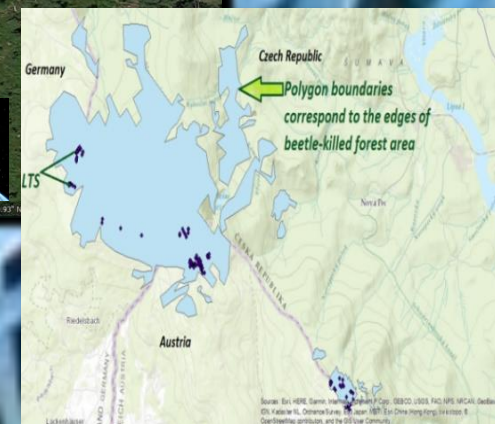
Survival probability = POT[country] x Stand density x Self-shading x DBH x Soil Moisture Index

pseudo-R^2 = 0.85, bias = 0.99, POT is a theoretical, maximum tree survival probability determined by likelihood estimation

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