

SURGE-Pro

The past development, present status and likely futures of Norway spruce in Eastern and Central Europe –
A scenario-based projection of forest resources and wood supply to support transition to green economies

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Introduction

During recent centuries Norway spruce (*Picea abies* [L.] Karst.) was often favored in forest restoration activities in many Central, Northern and Eastern European countries due to easy management and expected high economic return.

Today, the range of Norway spruce dominated forests is largely determined by former management practices rather than by natural factors and reaches far beyond its assumed range in Ukraine and Germany.

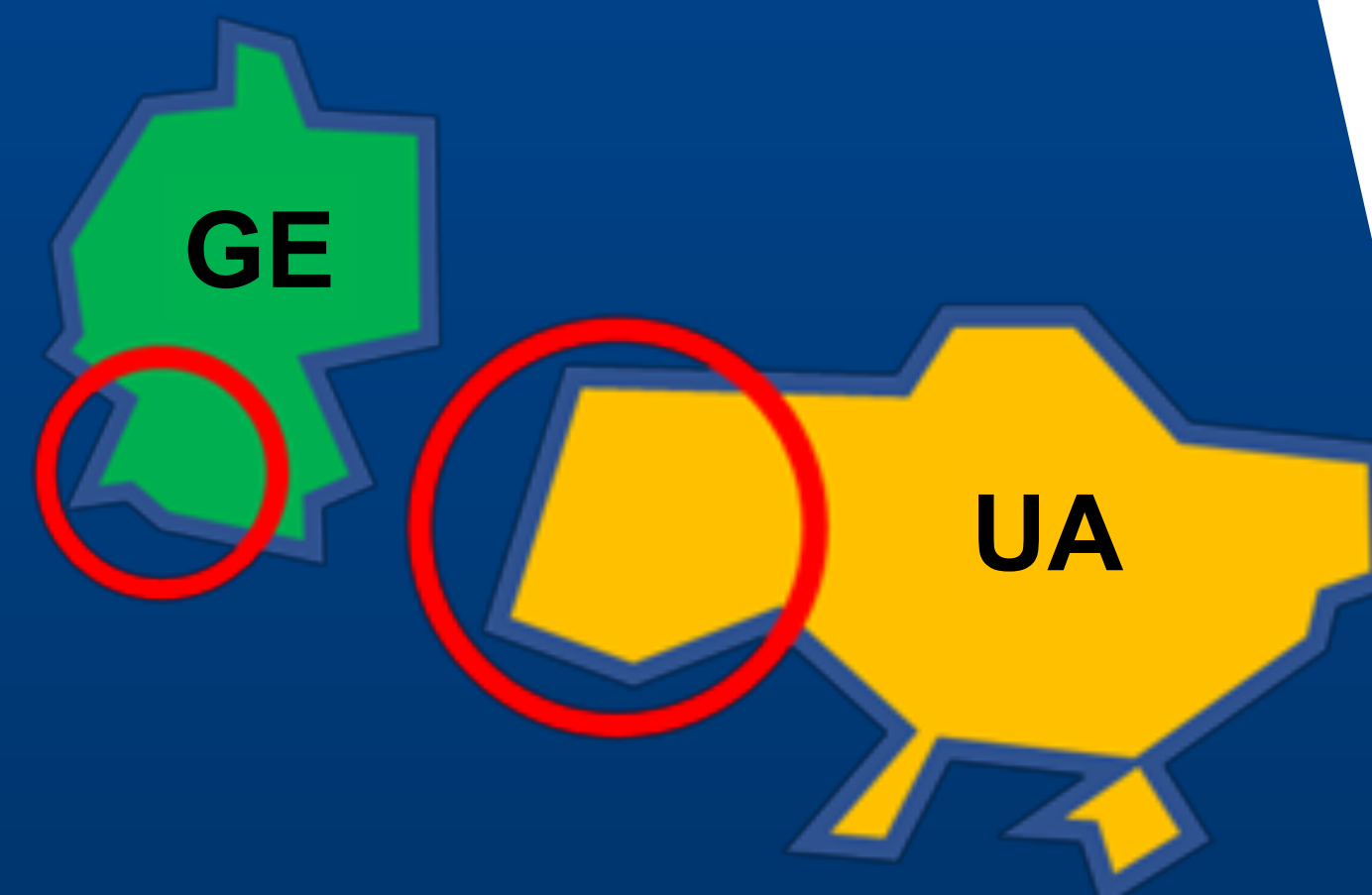
In Central and Eastern Europe Norway spruce is currently facing unprecedented threats by abiotic and biotic stressors due to the low resilience and adaptability of Norway spruce to climate change.

This underpins its vulnerability to climate warming, hence, giving reason to question the size of the climate change mitigation potential of the future forests.

In consequence, we hypothesize:

1. that **current trends** in growth and productivity, and in mortality and regeneration of Norway spruce in Western Ukraine and Southwest Germany are indicative of a **non-sustainable** development
2. that **adjusted management** practice can stabilise Norway spruce forests so that they can **continue to contribute** to adaptation and mitigation of climate change

Research areas*

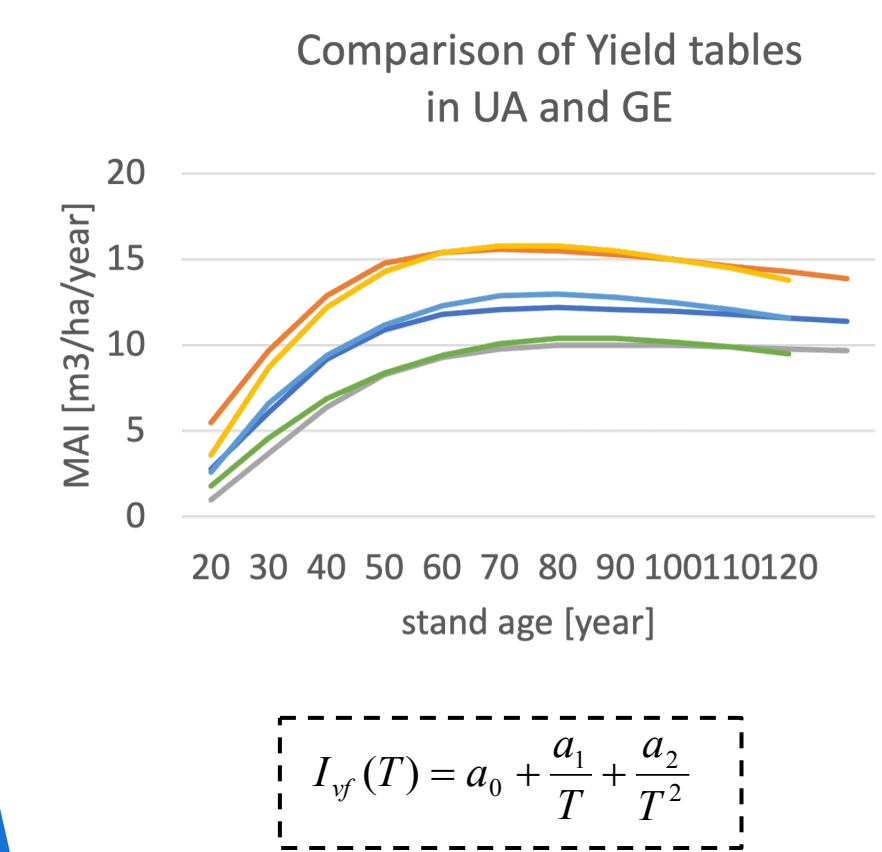


*GE refers to southwest Germany
UA refers to western Ukraine

NOTE

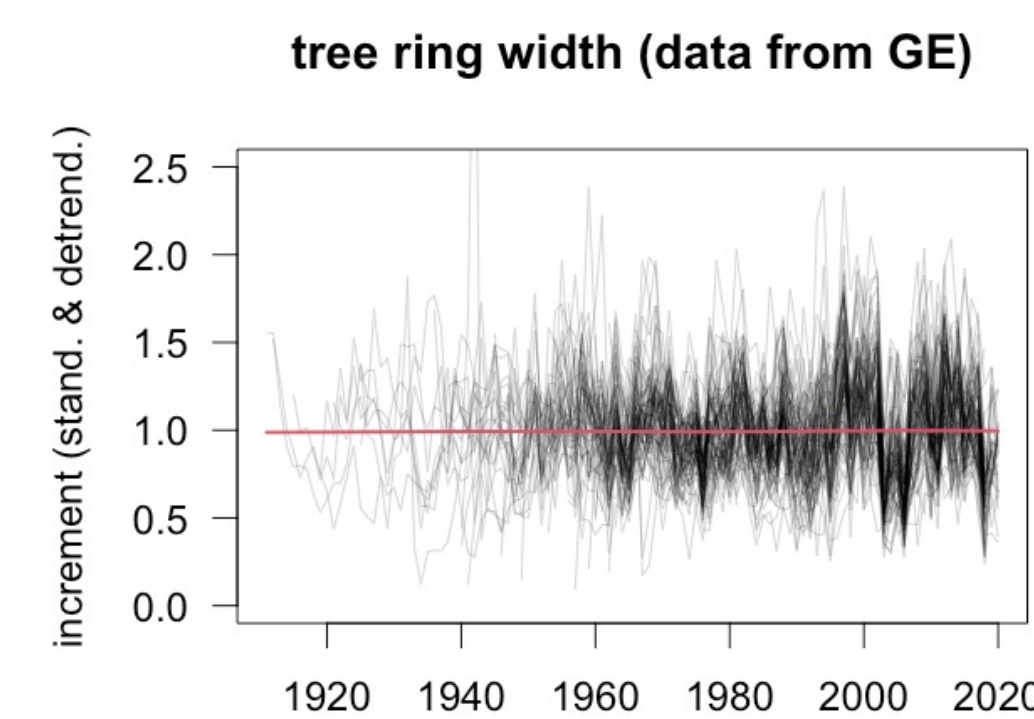
The SURGE-Pro Project started as a trilateral research project with partners from Ukraine, Russia & Germany. The trilateral cooperation ended February 24th, 2022 with the Russian invasion and war against Ukraine. The project continued into a bilateral research project with adjusted research questions, new members and revised working packages.

Methods

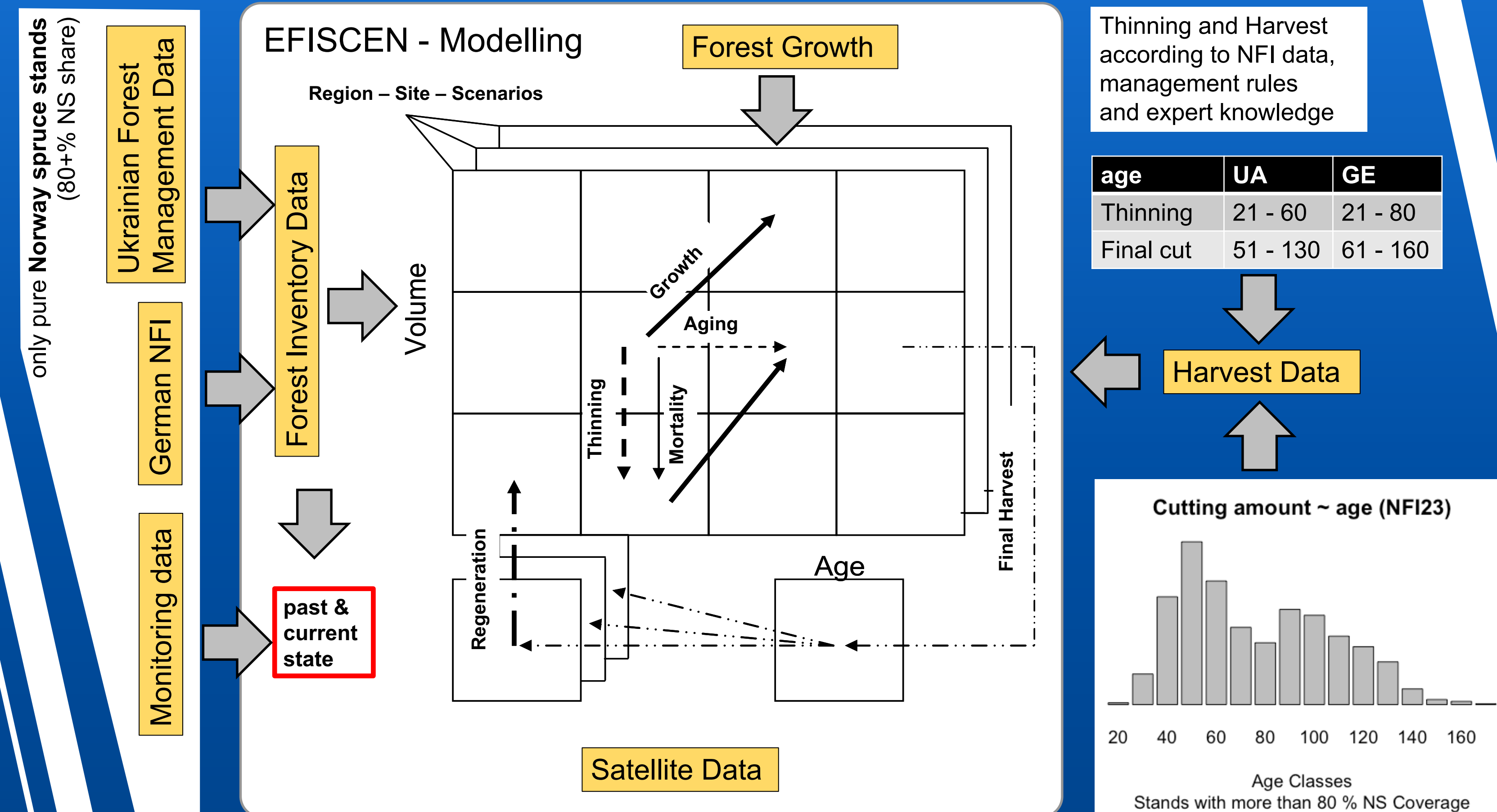


Increment Core Sampling:

UA: 250+ increment cores of 52 sites along altitudinal gradient
GE: 83 increment cores of 12 sites along altitudinal gradient
=> extract growth pattern for adjustment of growth function according to environmental factors

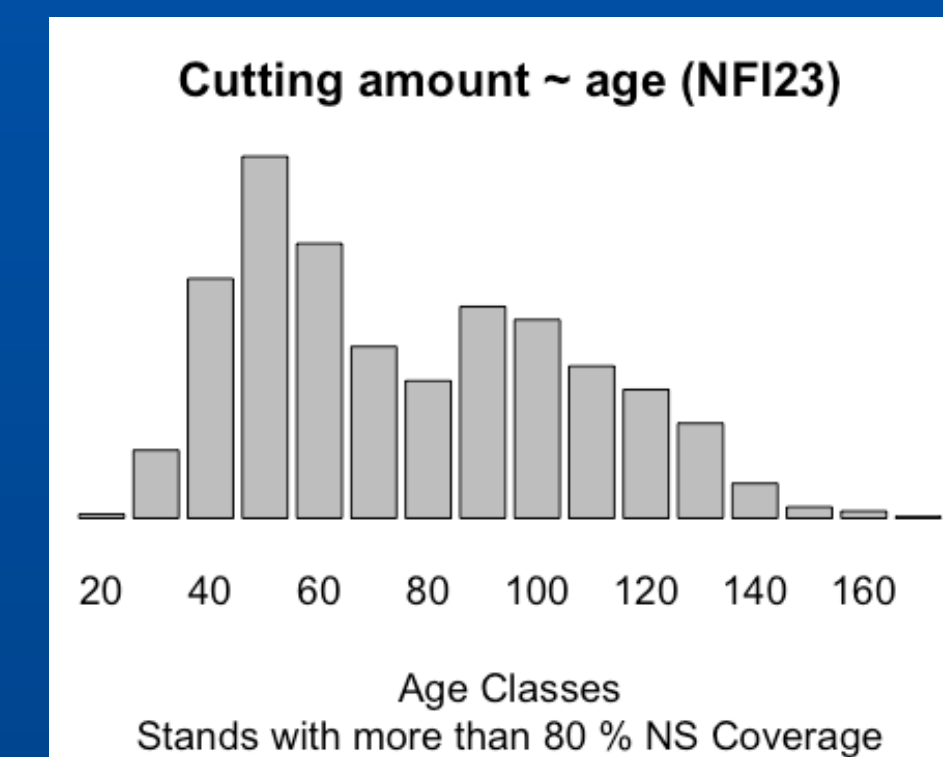


5-years relative volume increment



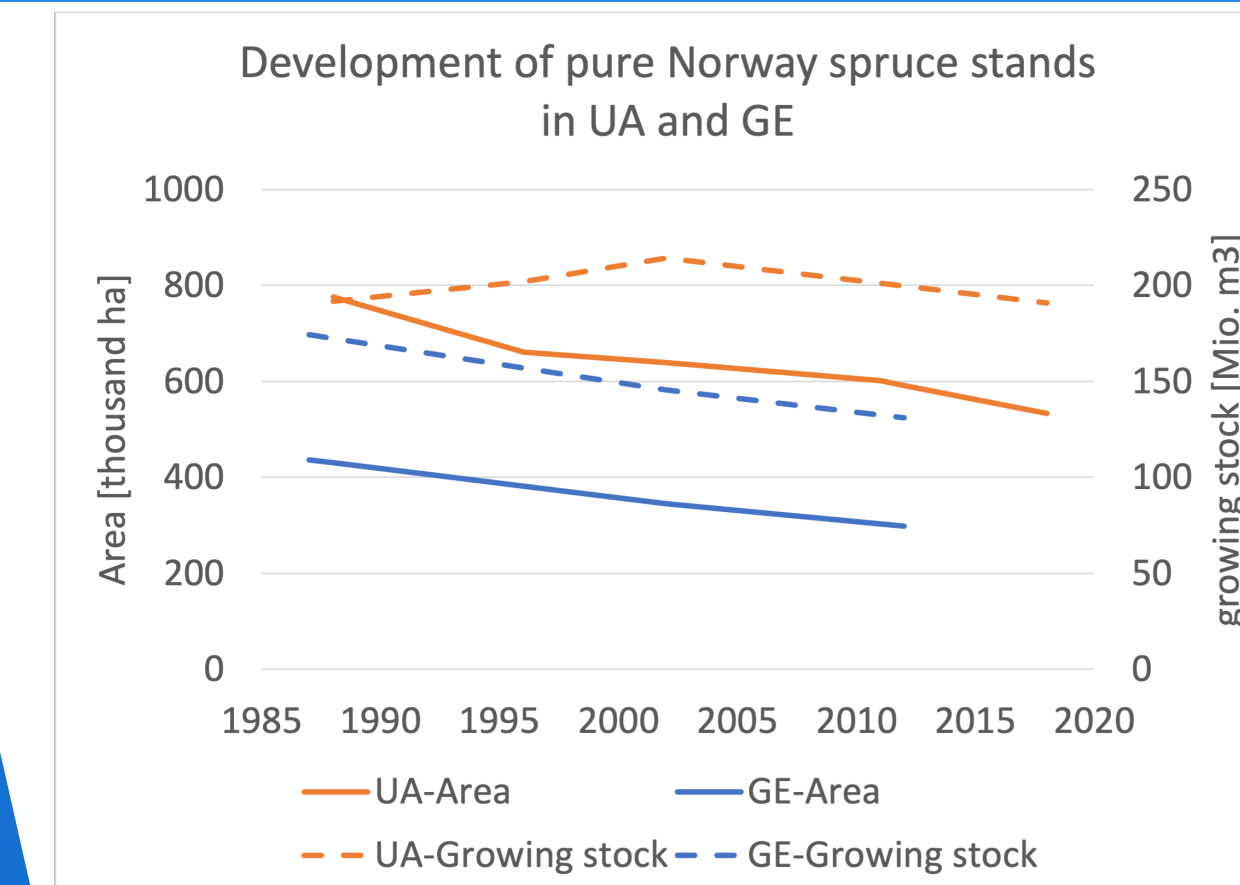
Thinning and Harvest according to NFI data, management rules and expert knowledge

age	UA	GE
Thinning	21 - 60	21 - 80
Final cut	51 - 130	61 - 160



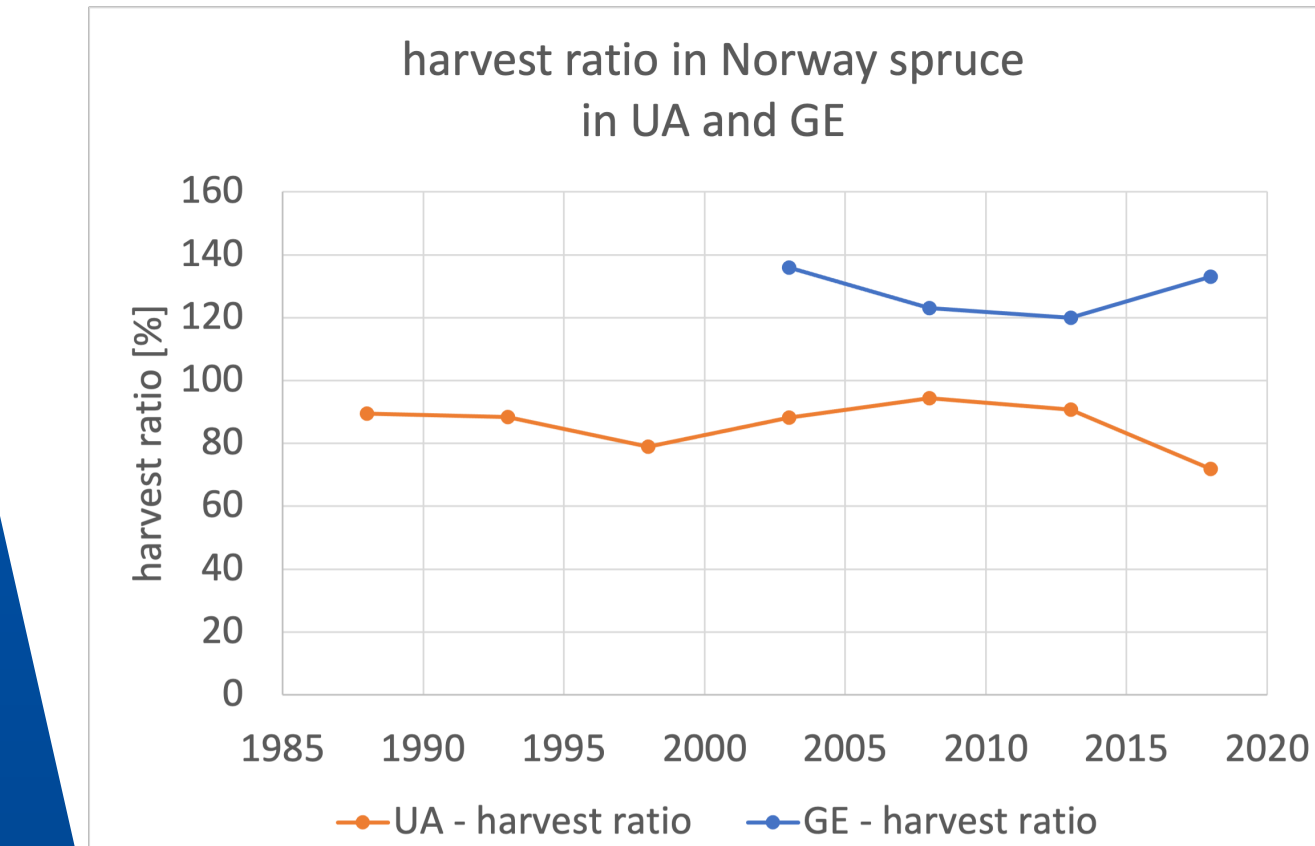
Results

Past development



Current status

	area 1000 ha	stock m³/ha	threatened by			
			storm	insects	drought	disease
UA	533	358	x	x	x	xx
GE	298	438	xx	x	.	.



- multiple biotic and abiotic threats
- loss in area and stock
- in GE harvest ratio above the sustainability condition (due to planned forest conversion)

Likely futures

- modelled using EFISCEN
- ongoing work
 - currently: actual status extrapolated
 - still missing:
 - harvest specification
 - area loss
 - change in growth pattern
 - missing mortality

Acquisition of Landsat images & Sentinel images

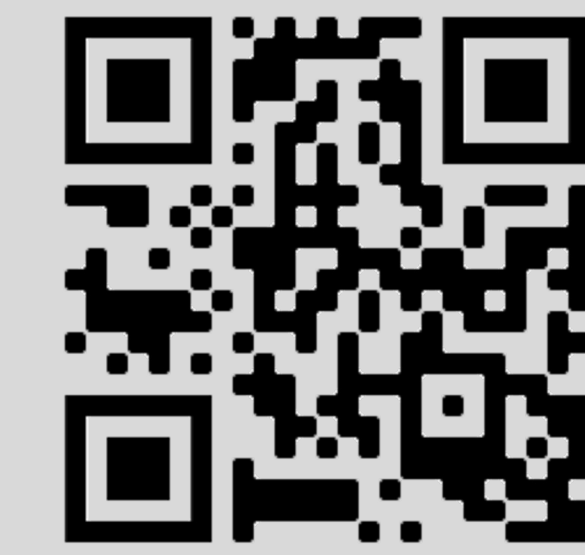
time: 1980/2015 – 2020
space: western UA (Carpathian mountains) and southwest Germany (Black forest)
extraction and standardisation of vegetation indices (NDVI / EVI)
processing by Google Earth-Engine

=> Forest Growth Adjustment

Combining remote sensing data with the sample plot increment core data, we aim at extracting information on modified forest growth
Right now, this working package is ongoing.
=> Mortality / area loss in Norway spruce
We aim at generating data with respect to mortality in Norway spruce.
Right now, this working package is ongoing.

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Funding by:
VolkswagenStiftung

Project lifetime:
February 2021
until
January 2024

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