



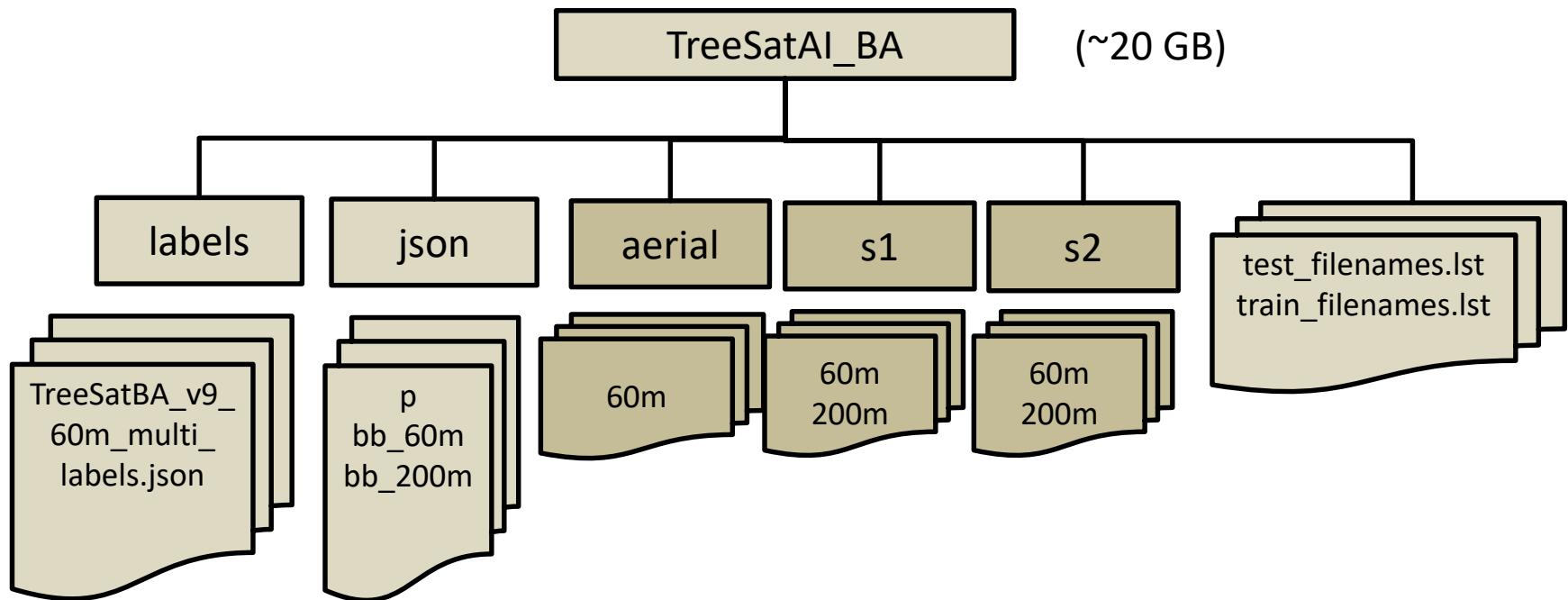
TreeSatAI Benchmark Archive

v1.0.0

2022-06-03

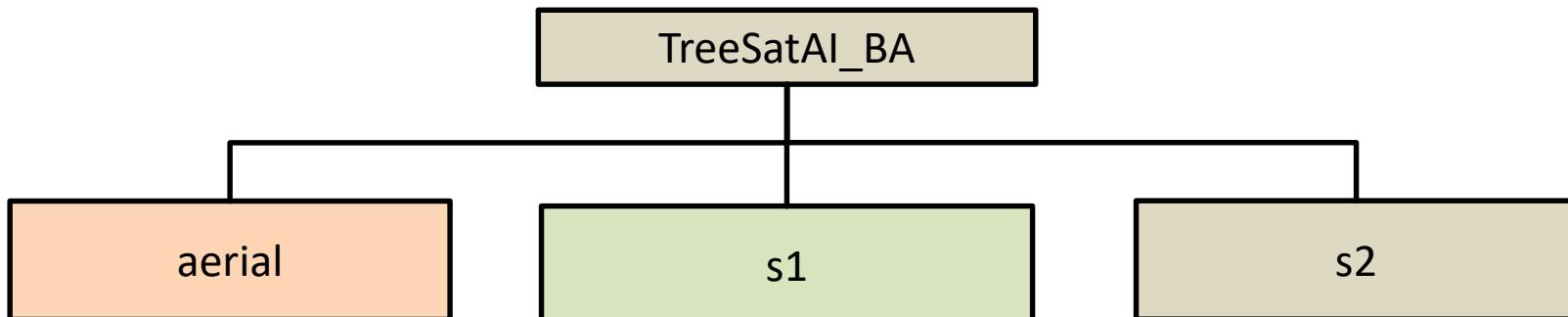


folder structure





sensor sources



aerial imagery

- orthophotos from plane
- 4 bands, 20 cm
- 2011-2020, ~Aug
- IR, R, G, B

Sentinel-1

- GRD backscatter (db)
- 3 bands, 10 m
- 2015-2020, ~Aug
- VV, VH, VV/VH

Sentinel-2

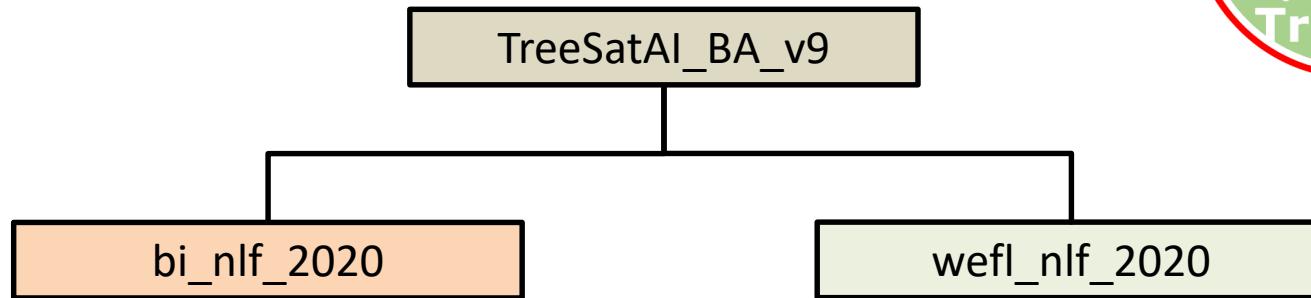
- L2A mosaics
- 12 bands, 10 m
- 2015-2020, ~Aug
- B02, B03, B04, B08, B05, B06, B07, B8A, B11, B12, B01, B09

Source: NLF 2020

Source: Vision Impulse/ESA 2021

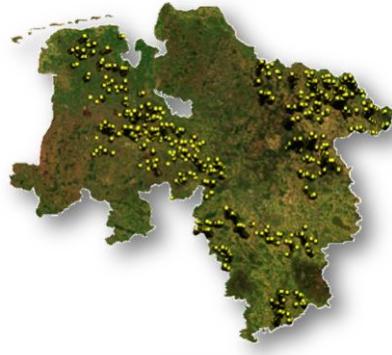
Source: Vision Impulse/ESA 2021

label sources



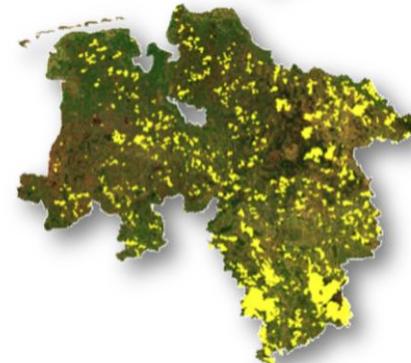
Betriebsinventur Niedersachsen (BI)

- 2015-2019
- point data from field observations
- permanently marked reference points
- revisited in ~10-year rotation



Forsteinrichtung Niedersachsen (WEFL)

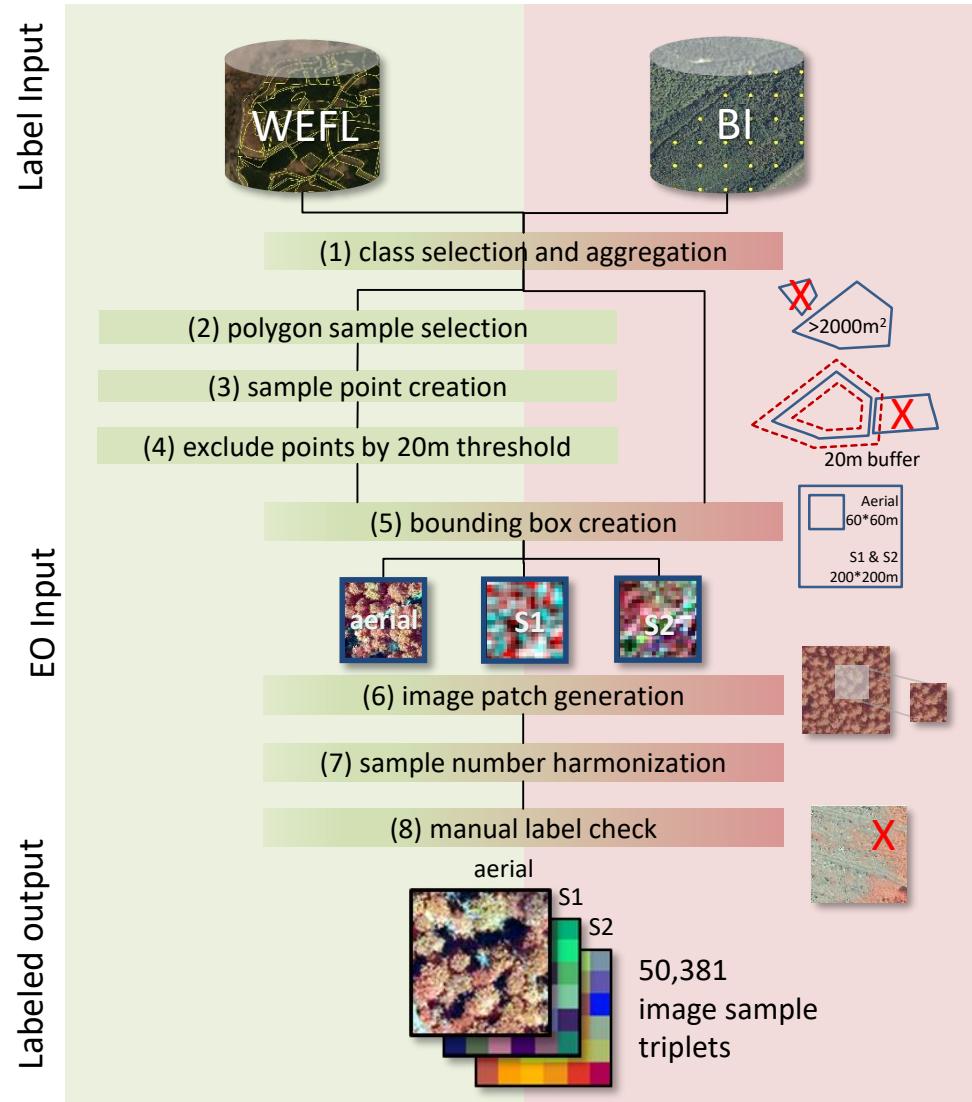
- 2011-2020
- forest parcel management data
- rolling archive with ~10-year rotation
- sequentially updated with aerial imagery



Labels: BI and WEFL data (Niedersächsische Landesforsten 2020)

Background: Sentinel-2 (Landesamt für Geoinformation und Landesvermessung Niedersachsen 2020)

sampling strategy



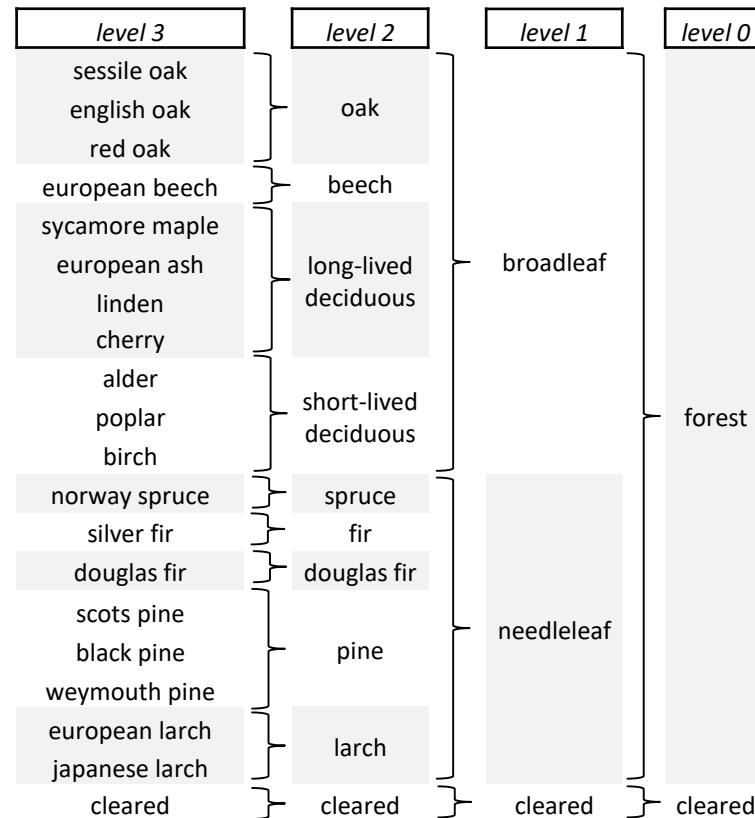


single labels

A

<i>BT_BOT</i>
<i>Quercus petraea</i>
<i>Quercus robur</i>
<i>Quercus rubra</i>
<i>Fagus sylvatica</i>
<i>Acer pseudoplatanus</i>
<i>Fraxinus excelsior</i>
<i>Tilia spec.</i>
<i>Prunus spec.</i>
<i>Alnus spec.</i>
<i>Populus spec.</i>
<i>Betula spec.</i>
<i>Picea abies</i>
<i>Abies alba</i>
<i>Pseudotsuga menziesii</i>
<i>Pinus sylvestris</i>
<i>Pinus nigra</i>
<i>Pinus strobus</i>
<i>Larix decidua</i>
<i>Larix kaempferi</i>
Cleared

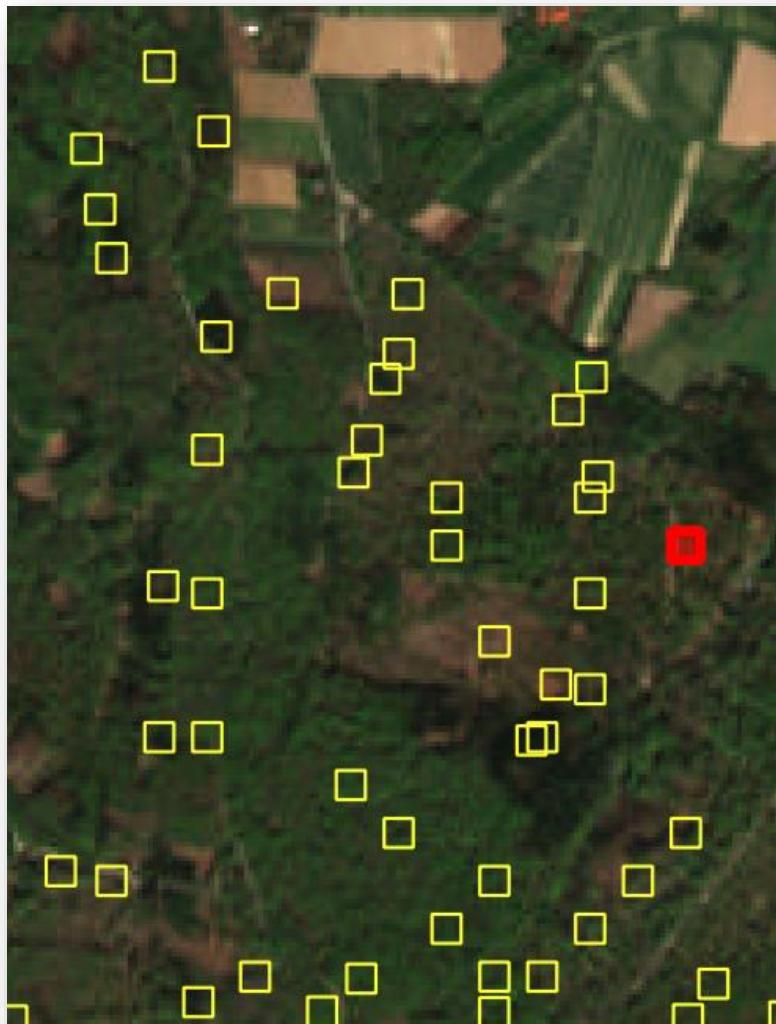
B



A = TreeSatAI_BA main species label (Botanical species names)

B = TreeSatAI_BA additional labels (English species names, forest stand type, foliage type, land cover)

GeoJSON file



Identify Results	
Feature	Value
bb_60m	
Title	
(Derived)	
(Actions)	
IMG_ID	Fagus_sylvatica_8_177719_BI_NLF
ID	177719
BT_DEU	Bu
BT_ENG	European beech
BT_BOT	Fagus sylvatica
BT_GEN	Fagus
AKL	8
SOURCE	BI_NLF
I0	forest
I1	broadleaf
I2	beech
I3	european beech
YEAR	2018
SPLIT	train
Mode	Top down, stop at first
View	Tree
	<input type="checkbox"/> Auto open form
	<input type="button"/> Help
Identify Results	<input type="button"/> Layers

Background: Sentinel-2 (Landesamt für Geoinformation und Landesvermessung Niedersachsen 2020)

GeoJSON file



Identify Results

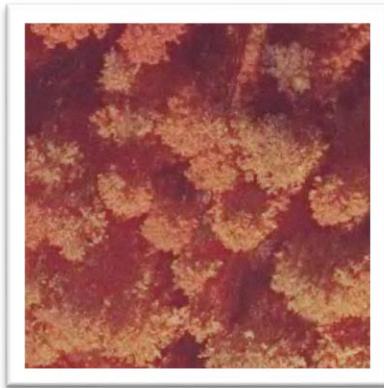
Feature	Value
bb_60m	
Title	
(Derived)	
(Actions)	
IMG_ID	Fagus_sylvatica_8_177719_BI_NLF
ID	177719
BT_DEU	Bu
BT_ENG	European beech
BT_BOT	Fagus sylvatica
BT_GEN	Fagus
AKL	8
SOURCE	BI_NLF
I0	forest
I1	broadleaf
I2	beech
I3	european beech
YEAR	2018
SPLIT	train

- Image_ID
Identification number
German forest stand type
English species name
Botanical species name
Botanical genus name
Age class
Label source
Level-0 label (land cover)
Level-1 label (foliage type)
Level-2 label (forest stand type)
Level-3 label (english name)
Year of label acquisition
Train/Test split identification

geoTIFF naming convention



genus_species_ageclass_sampleID_dataset_source.tif

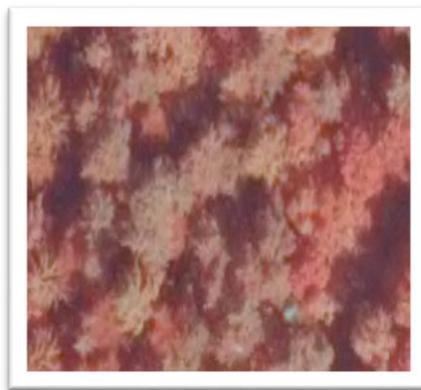


e.g., Fagus_sylvatica_6_154201_BI_NLF.tif

multi-labels JSON



- 15 genus levels
- derived from forest parcel data
- contains proportions of classes within the patch



e.g., "Abies_alba_3_834_WEFL_NLF.tif": [["Abies", 0.93771], ["Larix", 0.06229]]
→ patch #834 contains 94% of Abies and 6% of Larix.

Examples



60m patches



Fagus sylvatica (BI NLF)



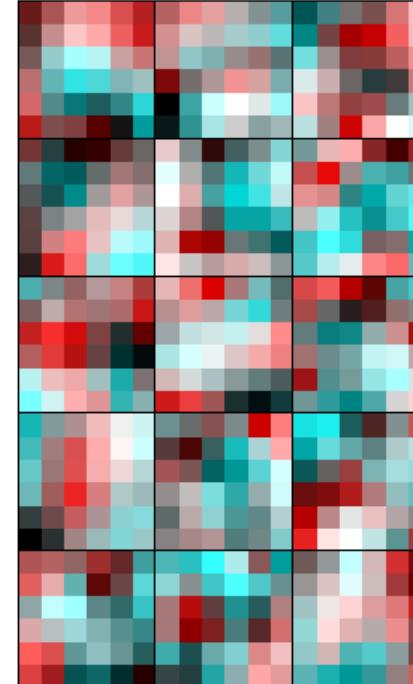
aerial

Fagus sylvatica (BI NLF)



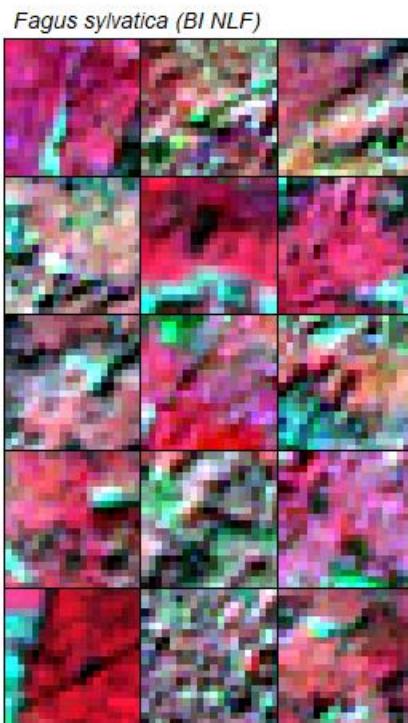
Sentinel-2

Fagus sylvatica (BI NLF)

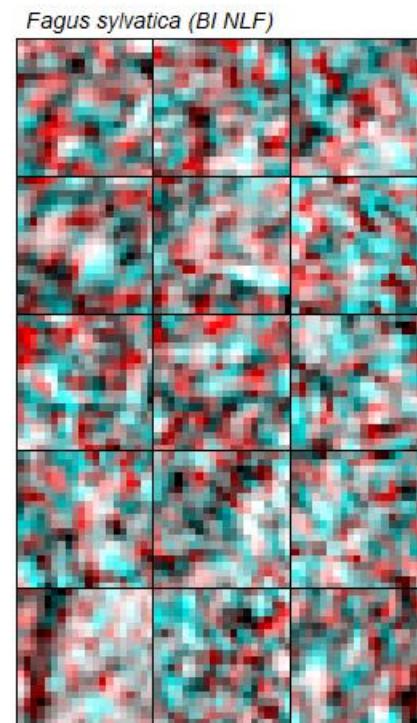


Sentinel-1

200m patches



Sentinel-2



Sentinel-1

Silver fir (*Abies alba*)



Abies alba (WEFL NLF)



CIR aerial imagery 2012-2020, Niedersächsische Landesforsten 2020

European beech (*Fagus sylvatica*)



Fagus sylvatica (WEFL NLF)



CIR aerial imagery 2012-2020, Niedersächsische Landesforsten 2020

European larch (*Larix decidua*)



Larix decidua (BI NLF)



CIR aerial imagery 2012-2020, Niedersächsische Landesforsten 2020

Norway spruce (*Picea abies*)



Picea abies (WEFL NLF)



CIR aerial imagery 2012-2020, Niedersächsische Landesforsten 2020

Scots pine (*Pinus sylvestris*)



Pinus sylvestris (WEFL NLF)



CIR aerial imagery 2012-2020, Niedersächsische Landesforsten 2020

English oak (*Quercus robur*)



Quercus robur (WEFL NLF)



CIR aerial imagery 2012-2020, Niedersächsische Landesforsten 2020

Scots pine (*Pinus sylvestris*), different age classes



Pinus sylvestris_2 (WEFL NLF)



20-40 ys

Pinus sylvestris_4 (WEFL NLF)



60-80 ys

Pinus sylvestris_5 (WEFL NLF)



80-100 ys

Pinus sylvestris_7 (WEFL NLF)



120-140 ys

Pinus sylvestris_9 (WEFL NLF)



161-180 ys