

02/04/2025

Lucile Ansaldi, Tanguy Postic, Hervé Cochard, François de Coligny, Jean-Christophe Domec, Pierig Lebigre, Sebastien Lafont, Denis Loustau, Thomas Modori, Christophe Moisy, Xavier Morin, Patrick Vallet, Gregory Gambetta, Maude Toïgo.









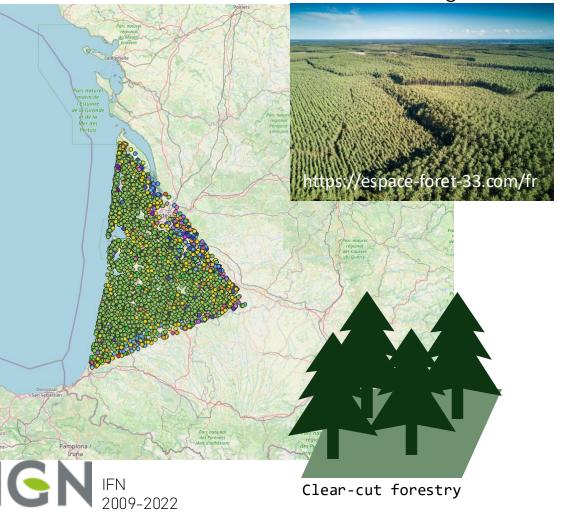








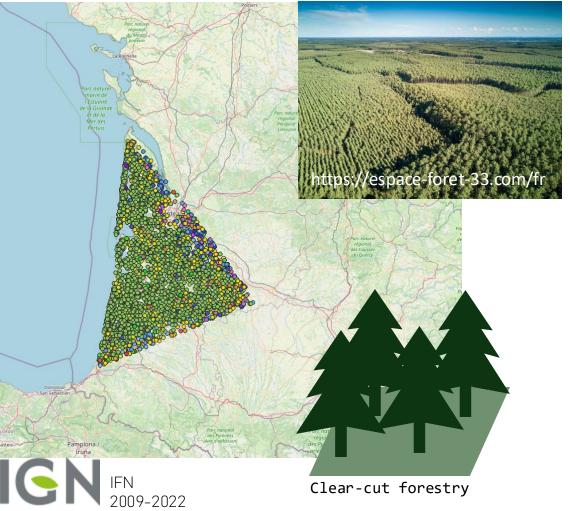
What kind of forest are we talking about?



△ context



What kind of forest are we talking about?







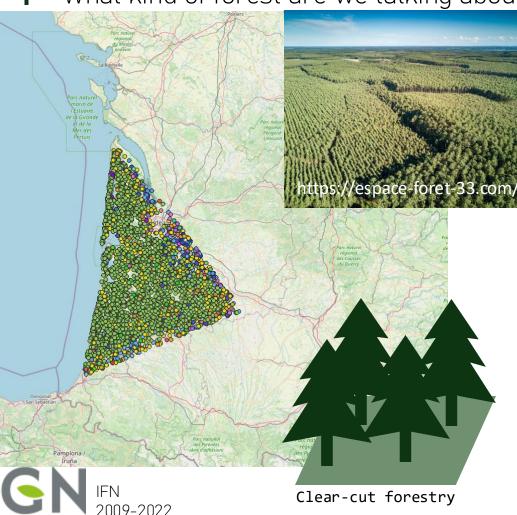


Layton et al. 2021, Pottier 2014

△ context



What kind of forest are we talking about?









Production

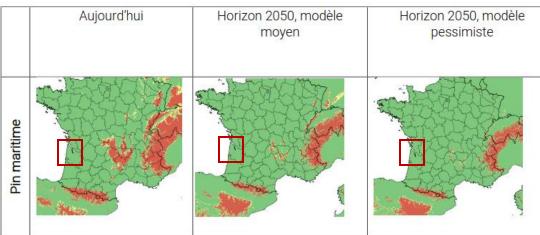
Zone Compatible

Zone Non compatible à 97,5%

Zone Non compatible à 99%

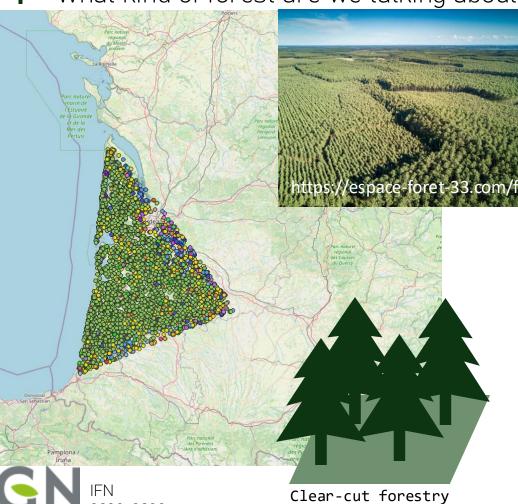
CNPF, 2022

Layton et al. 2021, Pottier 2014





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CNPF, 2022

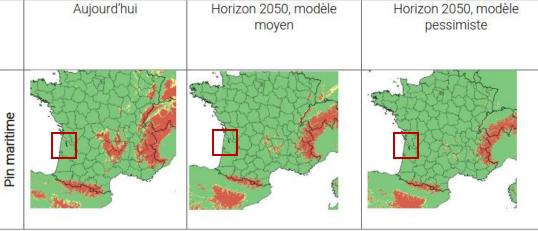


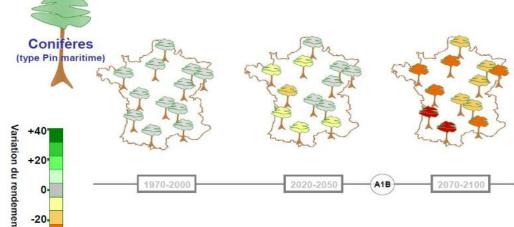




Source A. Bosc, 2011

Layton et al. 2021, Pottier 2014



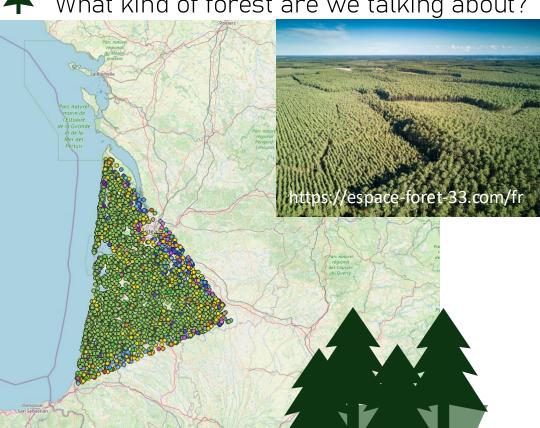


Several studies have shown a decrease in maritime pine productivity due to water stress

Prieto-Recio et al. 2015 Fernandez-Blas et al. 2024 Caminero et al. 2018 Askarieh et al. 2024



What kind of forest are we talking about?



Clear-cut forestry

Zone Compatible Zone Non compatible à 97,5%

Zone Non compatible à 99%

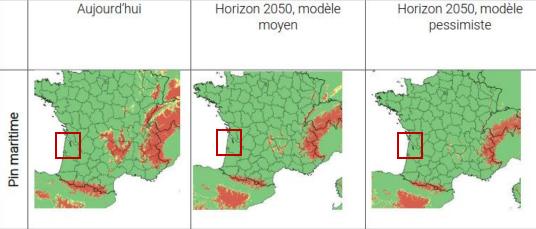
CNPF, 2022

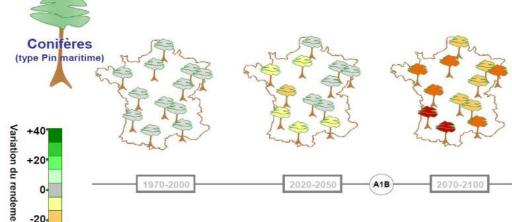






Layton et al. 2021, Pottier 2014









1999, 2009, 2010

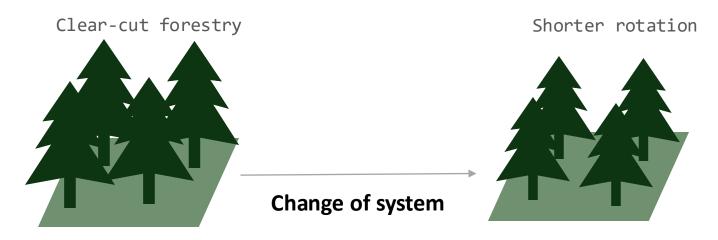
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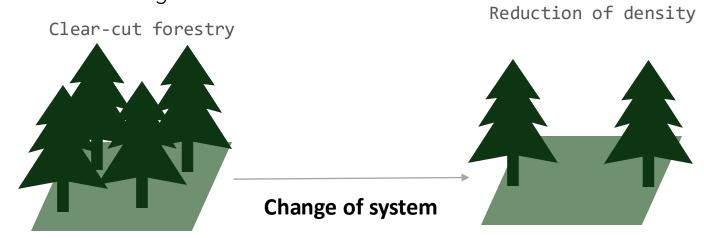






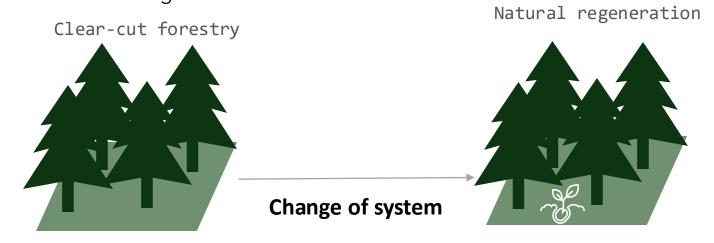






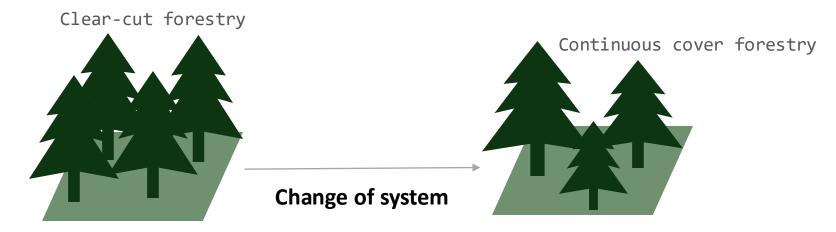








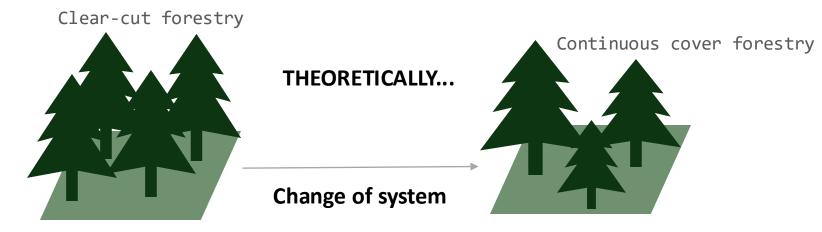




△ context



What do we expect from continuous cover?















context



What do we expect from continuous cover?



THEORETICALLY...

Continuous cover forestry

Change of system

Kuuluvainen et al. 2012, Diaz-Yànez et al. 2019, Hertog et al. 2022



Ameray et al. 2021







Orois et al. 2002, Kuuluvainen et al. 2012, Potterf et al. 2023, Pukkala 2016



Mayer et al. 2020, Ameray et al. 2021, Diaz-Yànez et al. 2020



Potterf et al. 2023, Kuuluvainen et al. 2012, Diaz-Yànez et al. 2020, Eyvindson et al. 2021

△ context



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To simulate maritime pine growth using clear-cut and continuous cover forestry



To simulate maritime pine growth using clear–cut and continuous cover forestry. To quantify the multifunctionality of these two types of management



Harvest



Carbone stock



To simulate maritime pine growth using clear–cut and continuous cover forestry. To quantify the multifunctionality of these two types of management



Harvest

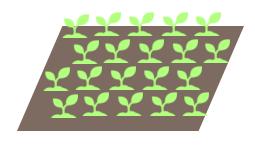


Carbone stock

Only 11 results on the Web of Science!



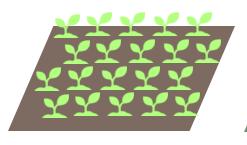
1400 trees/ha 1% mortality/yr







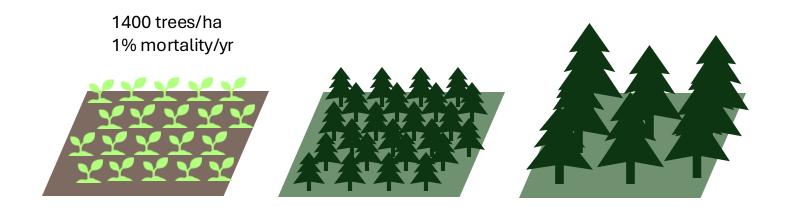
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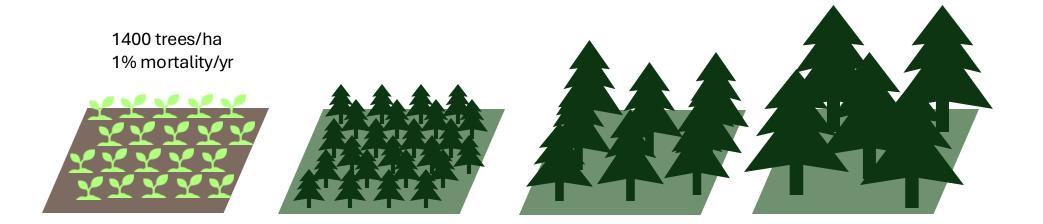






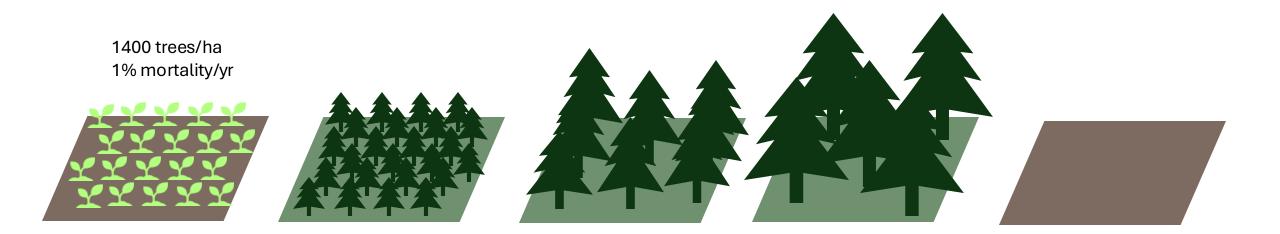




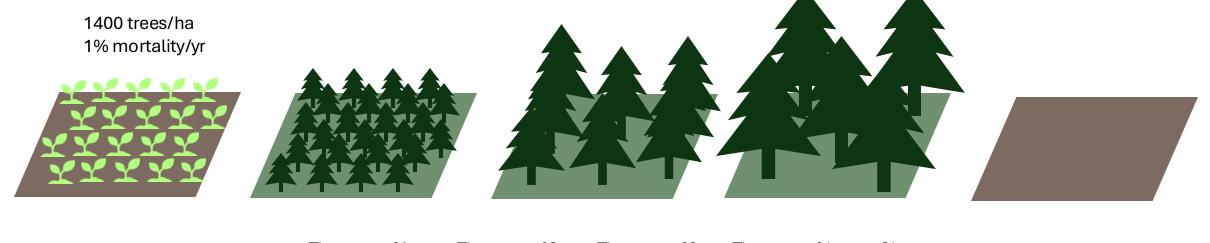












Thinning n°1 Th	inning n°2 Th	inning n°3 Thi	inning n°4 (Time
10	17	23	33	40	Time DBH (cm)

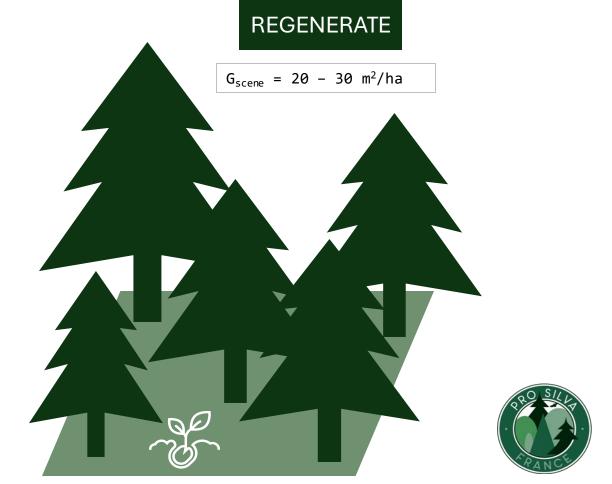
Thinning at 25% of the basal area





No thinning Thinning each 5 years ($G_{cut trees}$ 15 %) 10

Time after initial regeneration





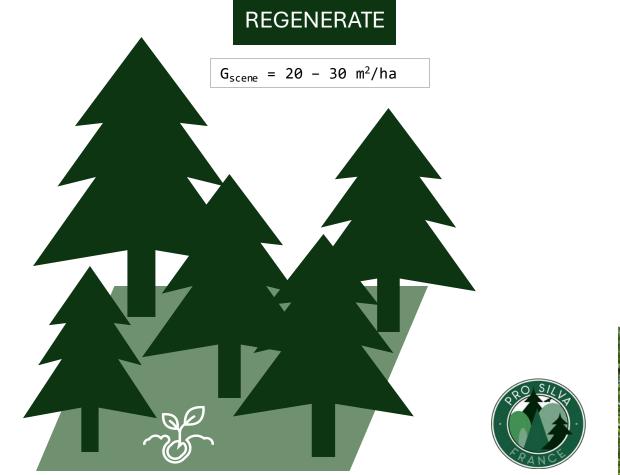
Time after initial regeneration



How did we code continuous cover management with ForCEEPS?

No thinning Thinning each 5 years ($G_{cut trees}$ 15 %) 10

Transition toward continuous-cover





Guide technique



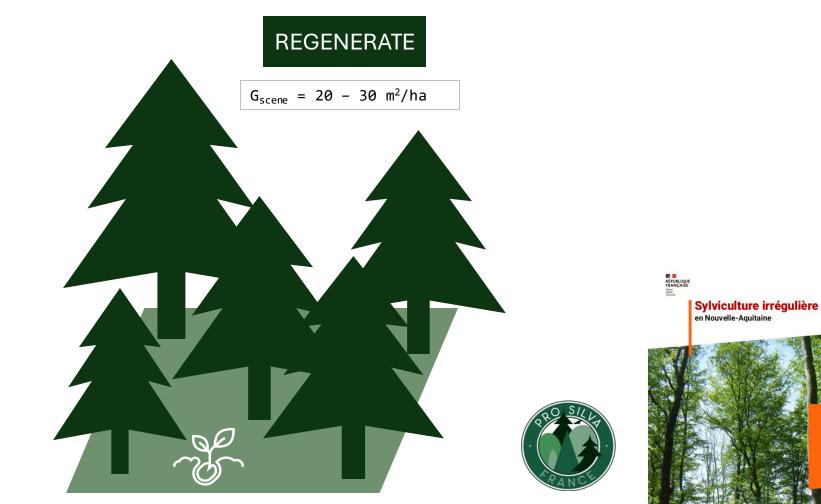
How did we code continuous cover management with ForCEEPS?

Thinning each 5 years ($G_{cut\ trees}$ 15 %) No thinning 10

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Transition toward continuous-cover

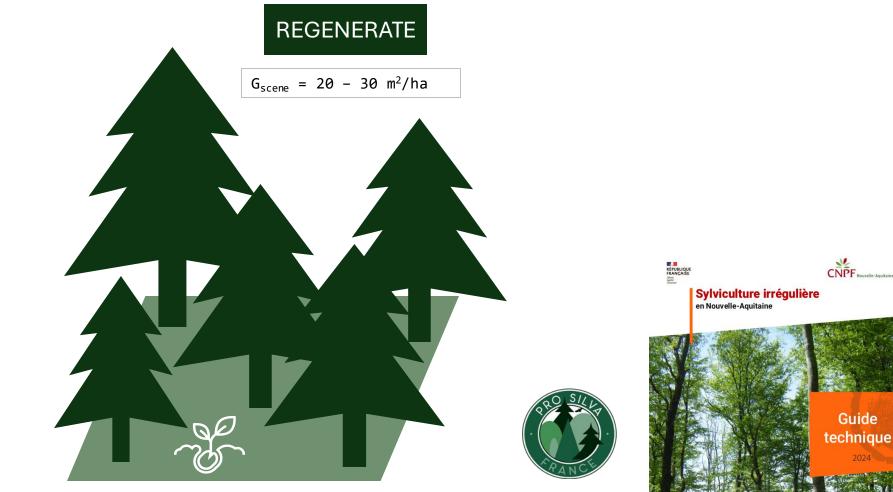
Continuous-cover management





Thinning each 5 years ($G_{cut\ trees}$ 15 %) No thinning 10 Time after initial regeneration

> DBH_{qualityTrees} > 60 cm Continuous-cover management Transition toward continuous-cover



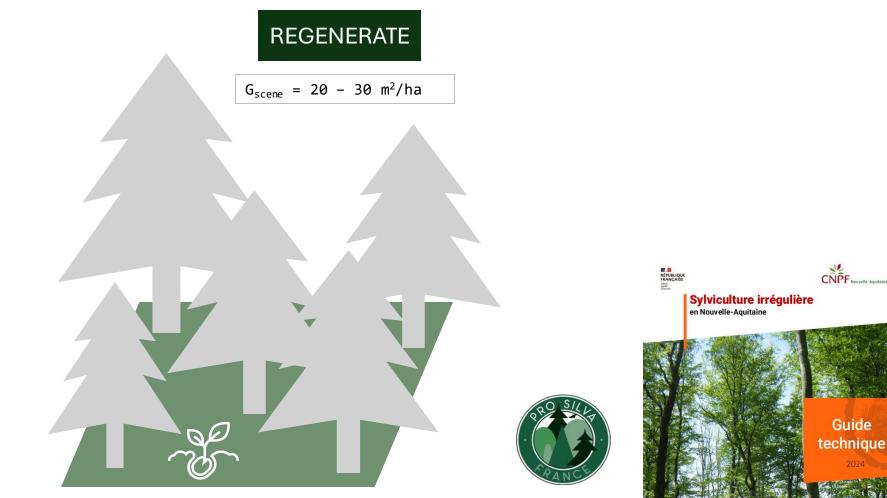
Guide



How did we code continuous cover management with ForCEEPS?

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No thinning $_{10}$ Thinning each 5 years ($G_{cut\,trees}\,15\,\%$)

Time after initial regeneration

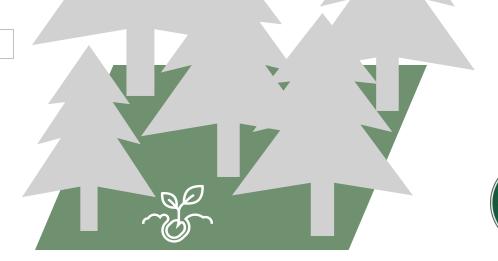
Transition toward continuous-cover DBH_{qualityTrees} > 60 cm Continuous-cover management



Biggest trees of the stand, 50 trees/ha

REGENERATE

 $G_{\text{scene}} = 20 - 30 \text{ m}^2/\text{ha}$









No thinning

10

Thinning each 5 years (G_{cut trees} 15 %)

Time after initial regeneration

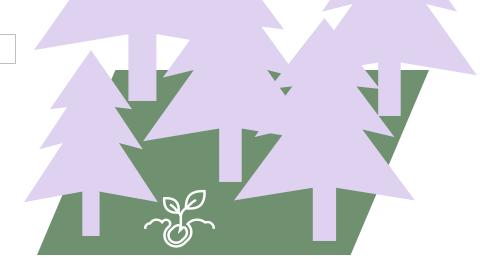
DBH_{qualityTrees} > 60 cm Continuous-cover management Transition toward continuous-cover



REGENERATE

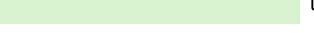
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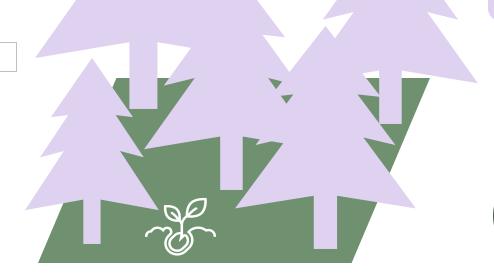
DBH_{qualityTrees} > 60 cm Continuous-cover management Transition toward continuous-cover

AMELIORATE Working for the quality trees

REGENERATE

 $G_{\text{scene}} = 20 - 30 \text{ m}^2/\text{ha}$

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Transition toward continuous-cover DBH_{aualityTrees} > 60 cm Continuous-cover management

AMELIORATE
Working for the quality trees

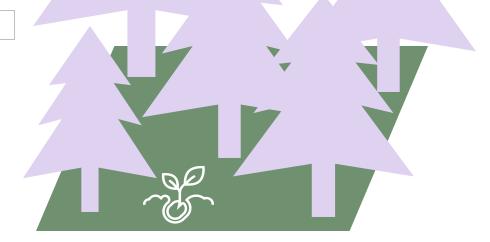
Biggest trees of the stand, 50 trees/ha

REGENERATE

 $G_{\text{scene}} = 20 - 30 \text{ m}^2/\text{ha}$

Cut the quality trees

Working for the quality trees







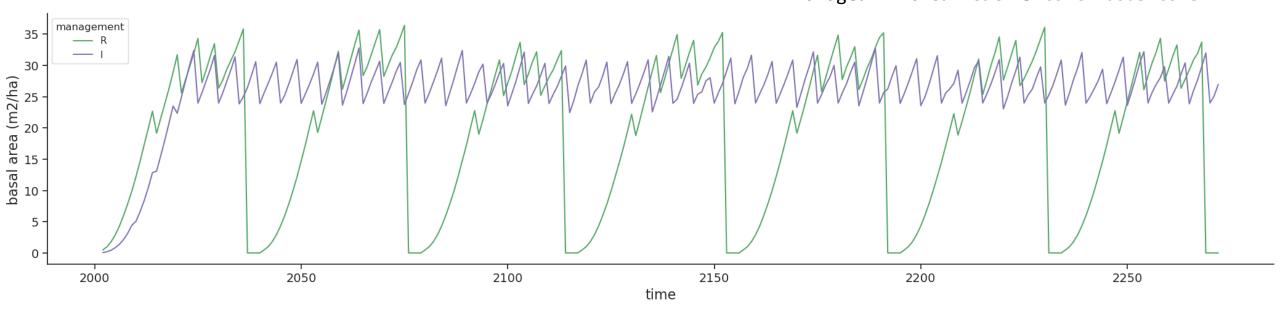








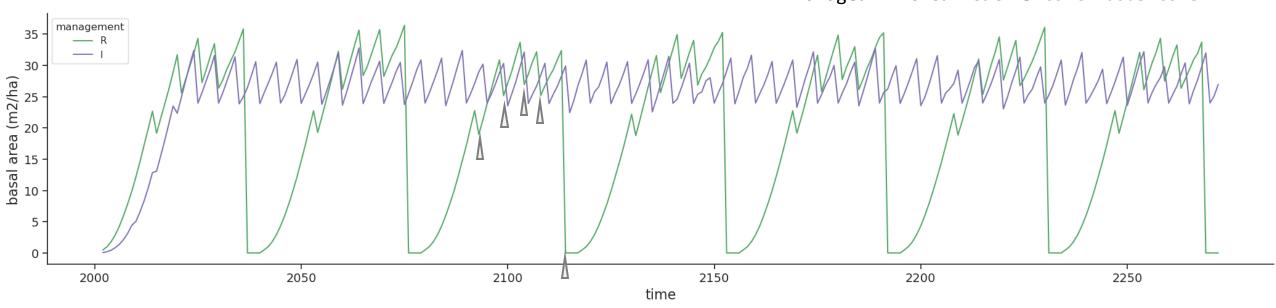
Does the model work?







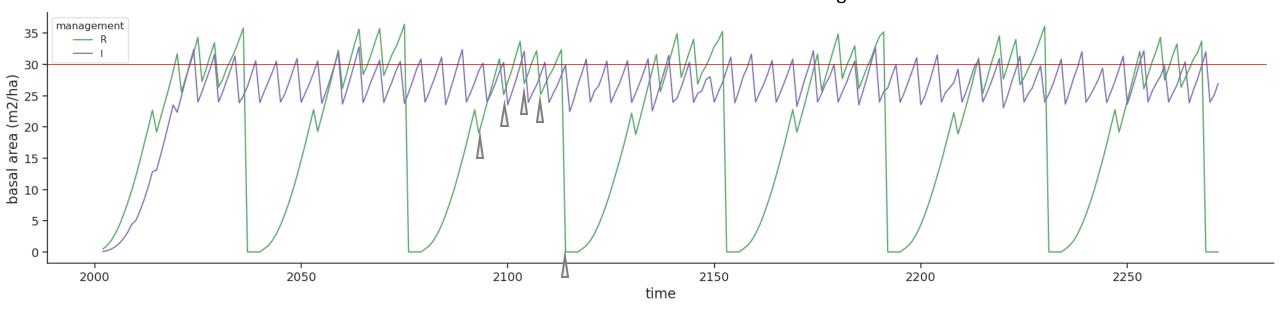
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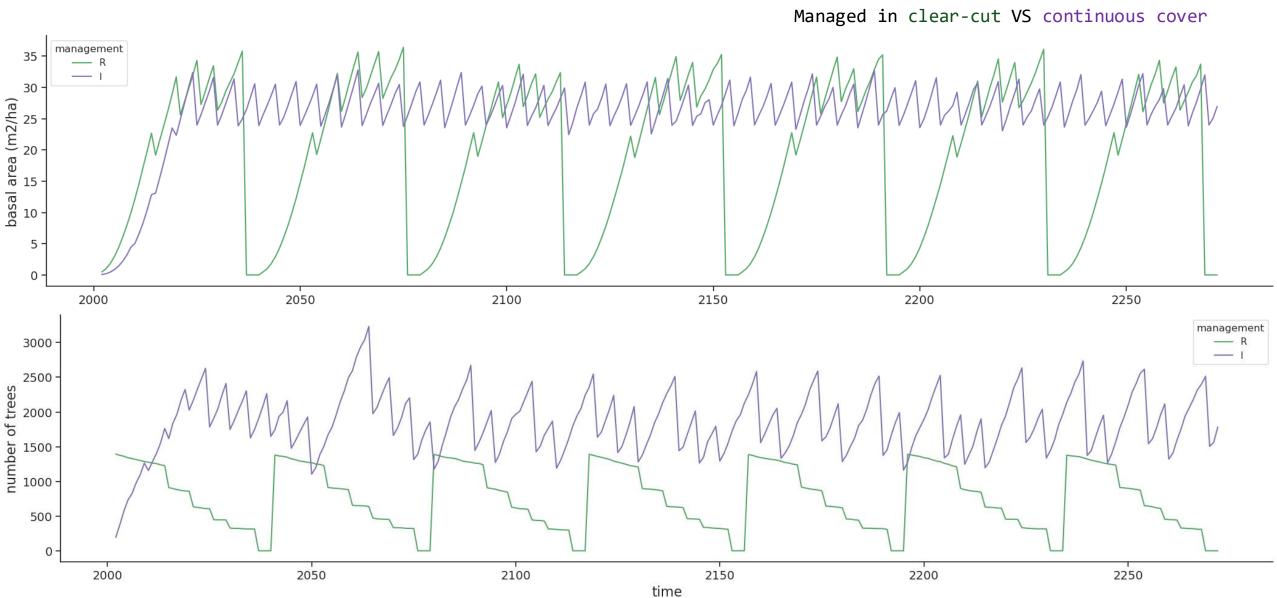


Does the model work?





273 years of simulation From bare soil In historic climate Nanaged in clear-cut VS continuous cover



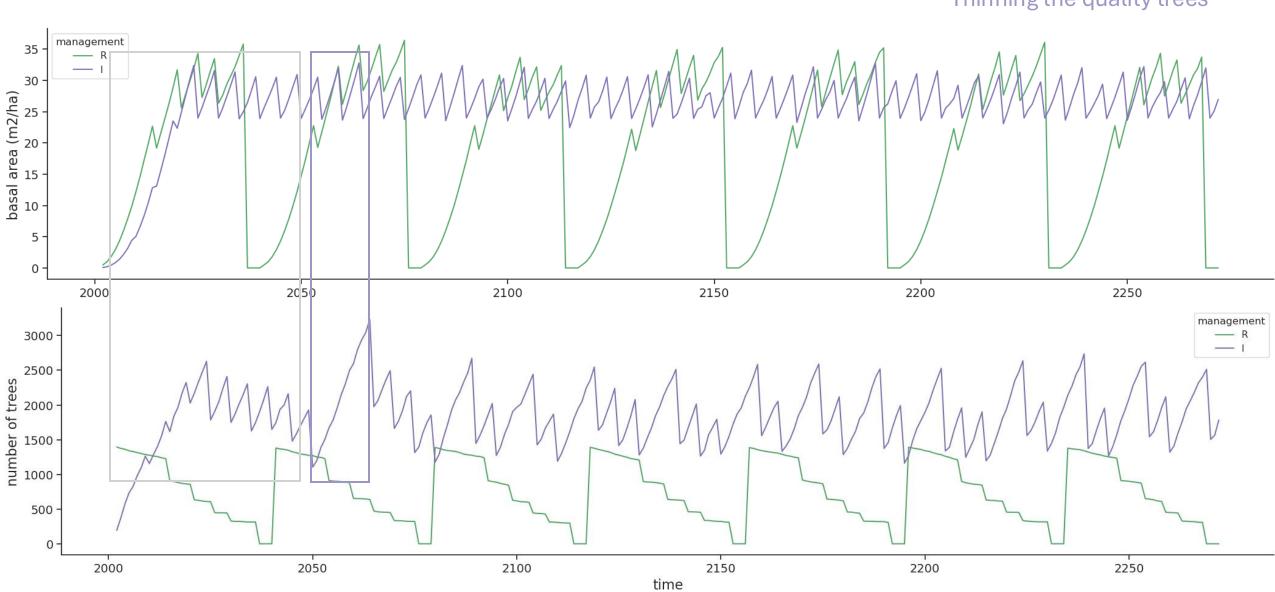
First Results

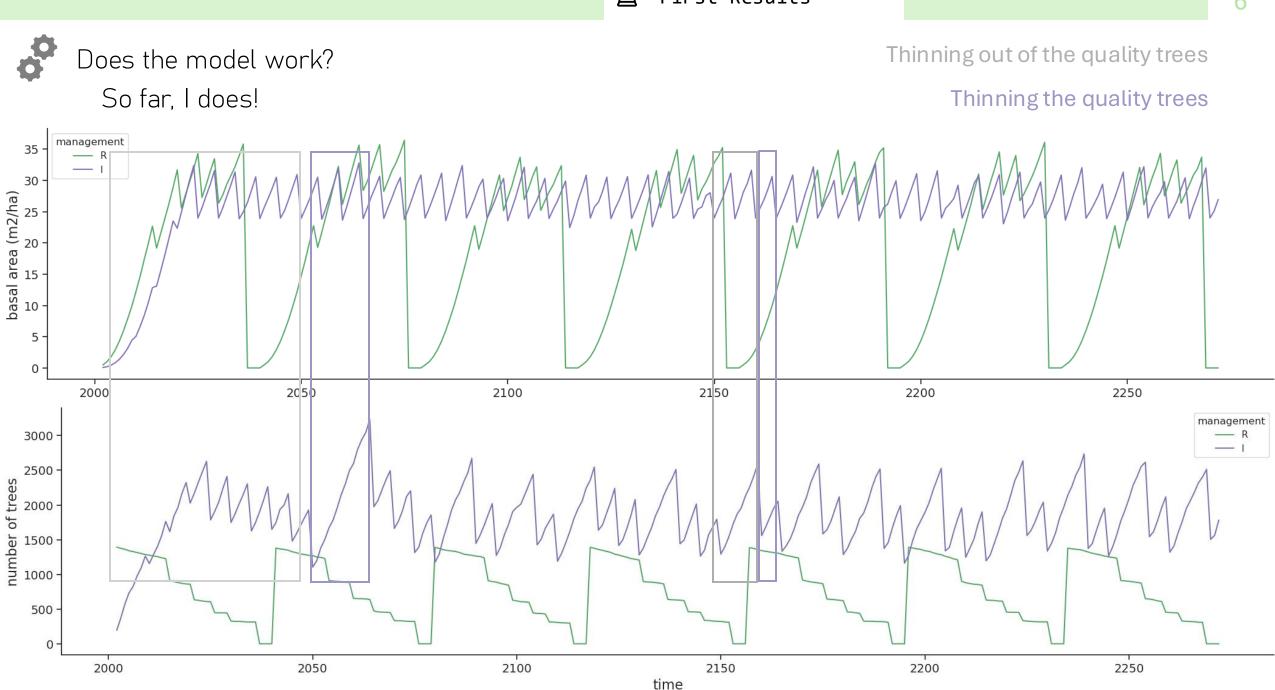


Does the model work?

Thinning out of the quality trees

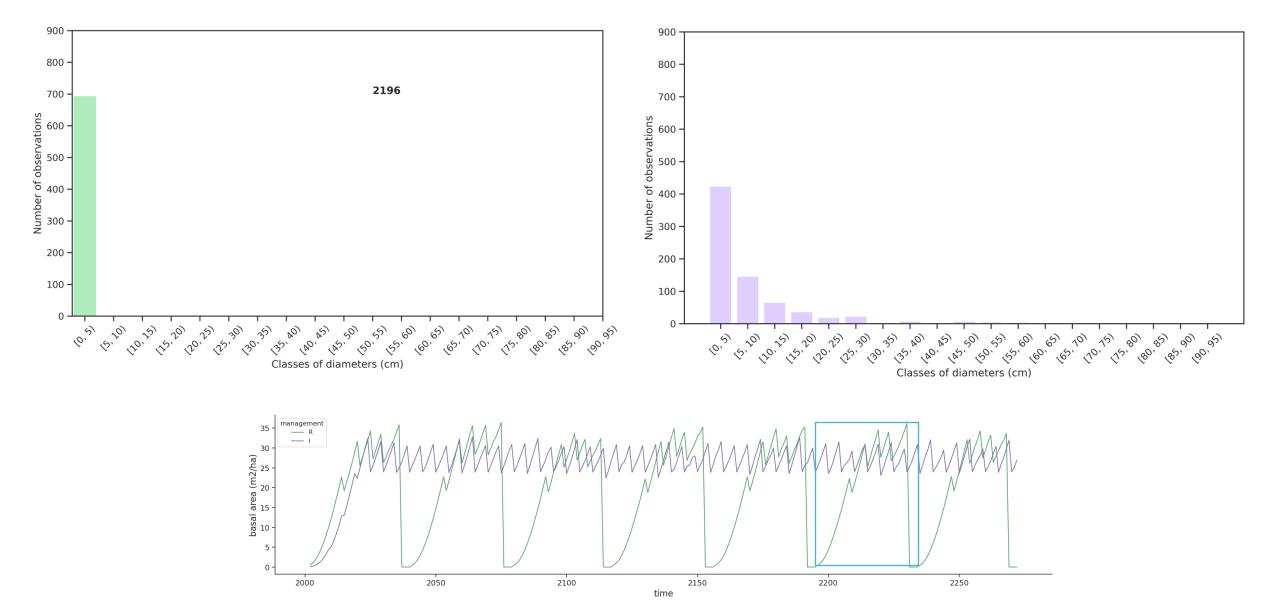
Thinning the quality trees





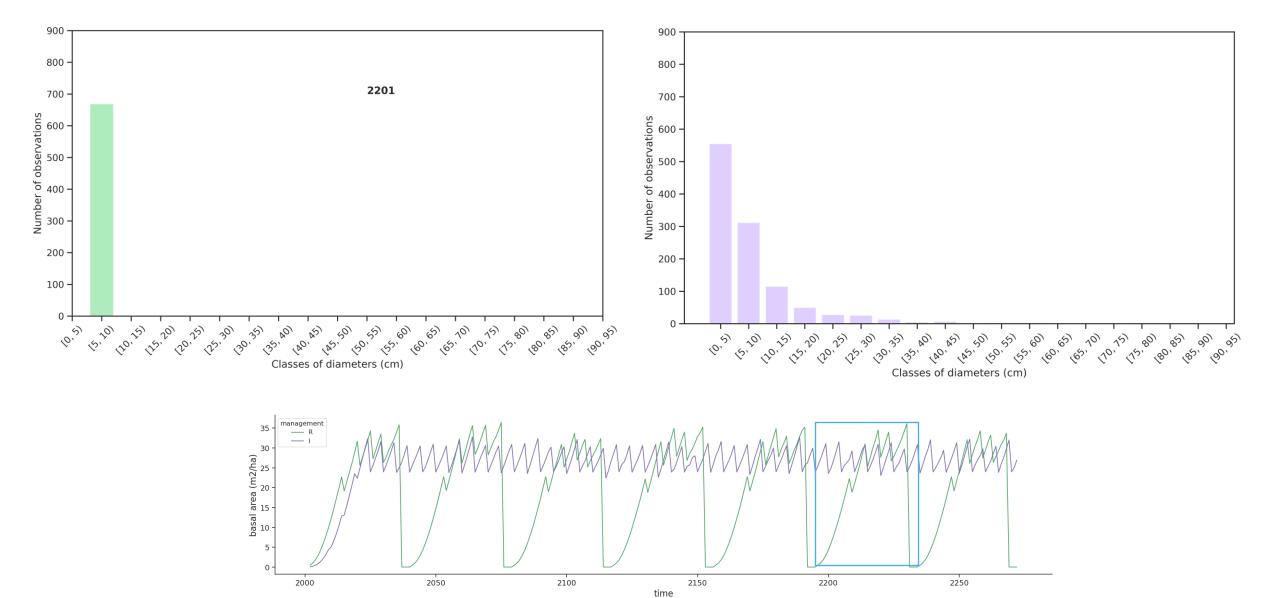






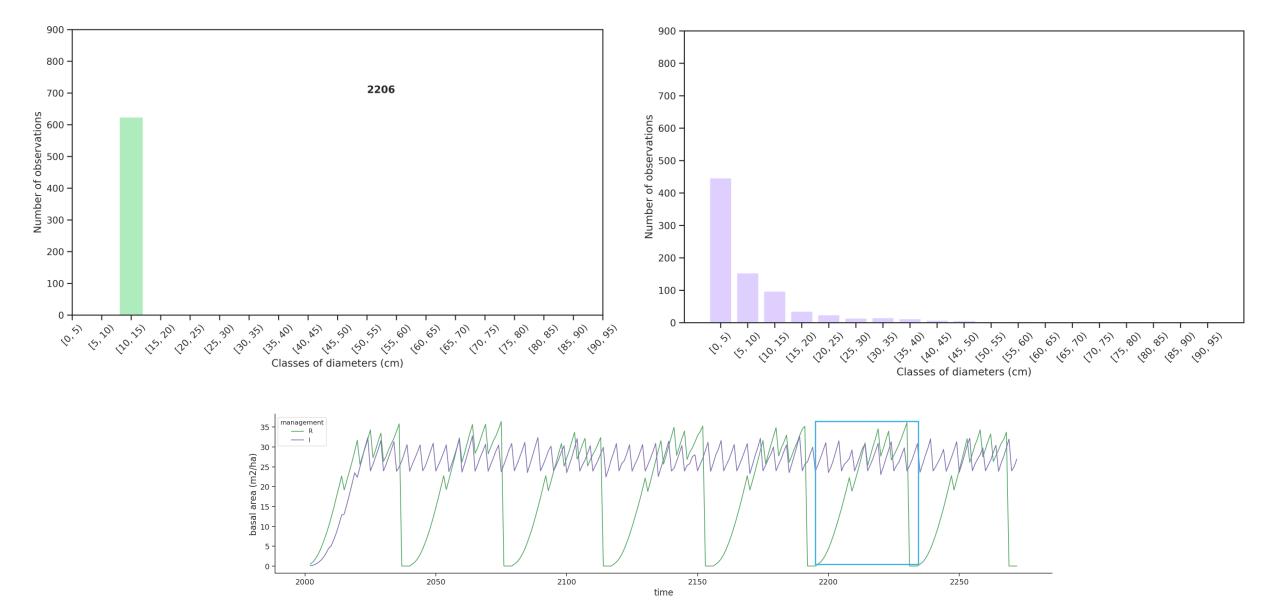






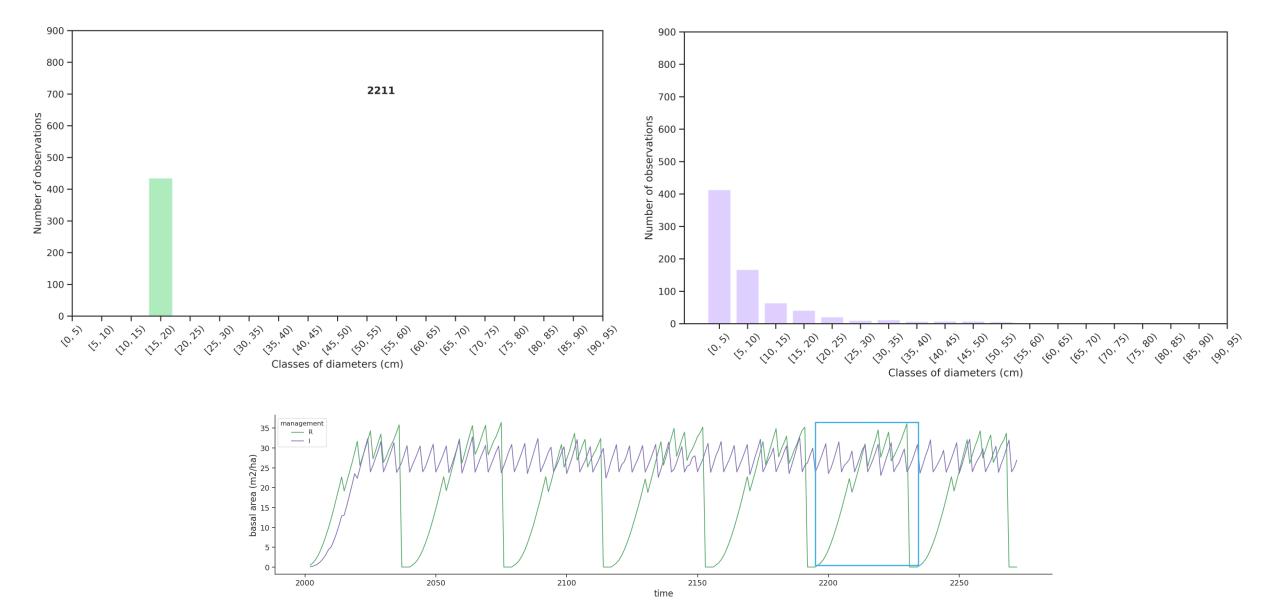






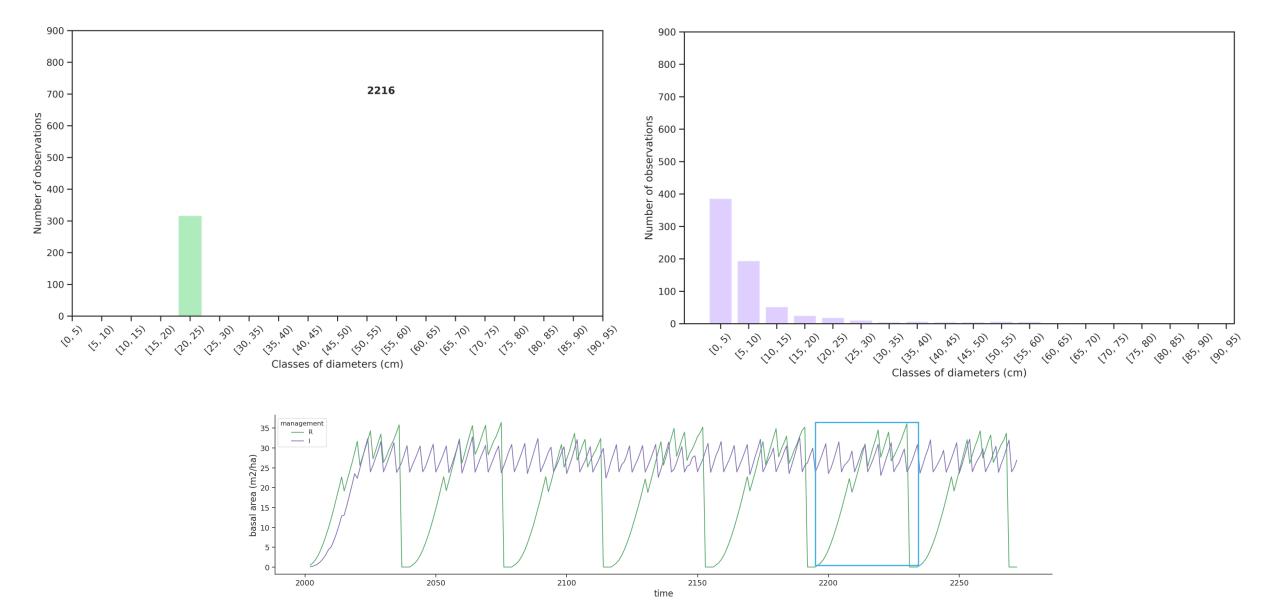






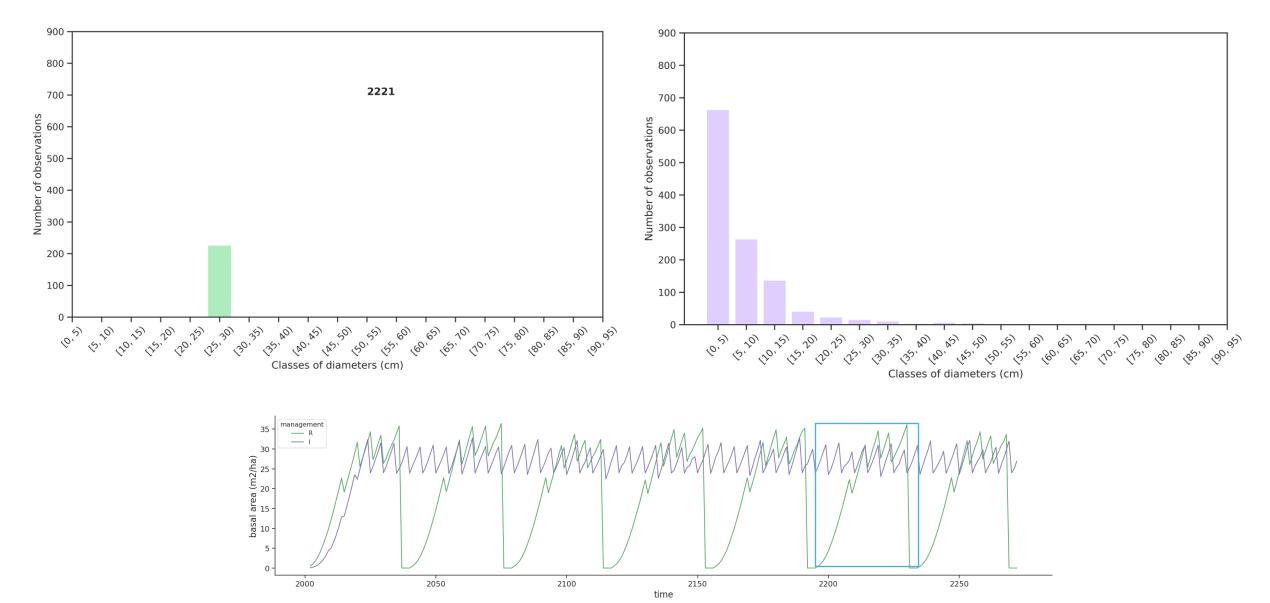






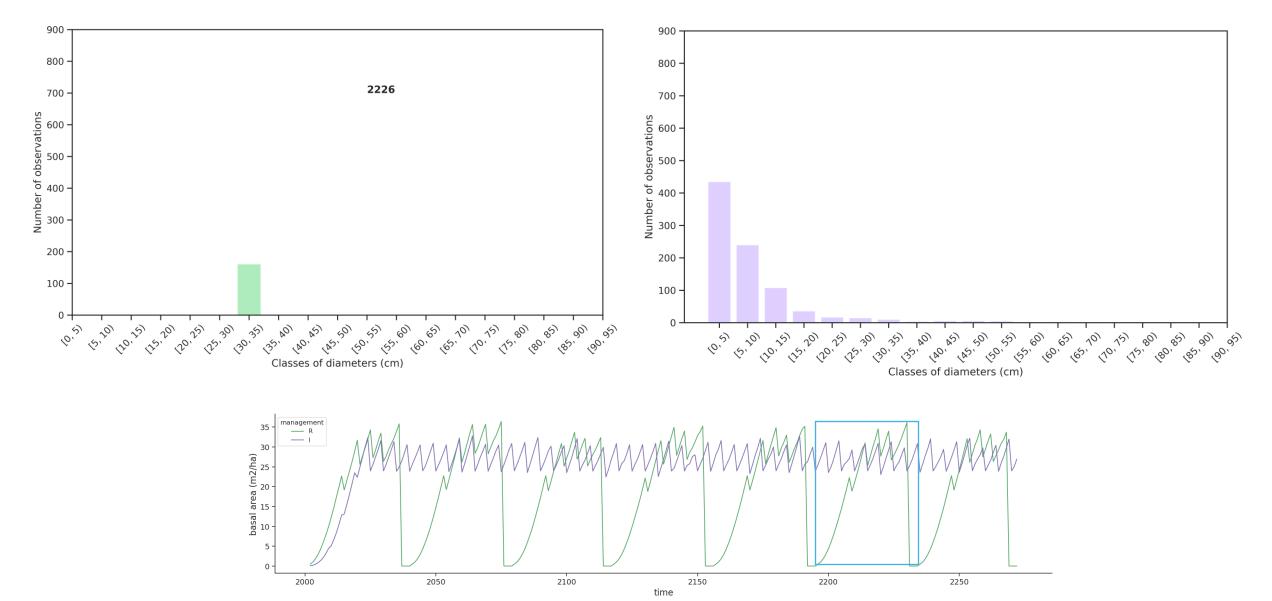






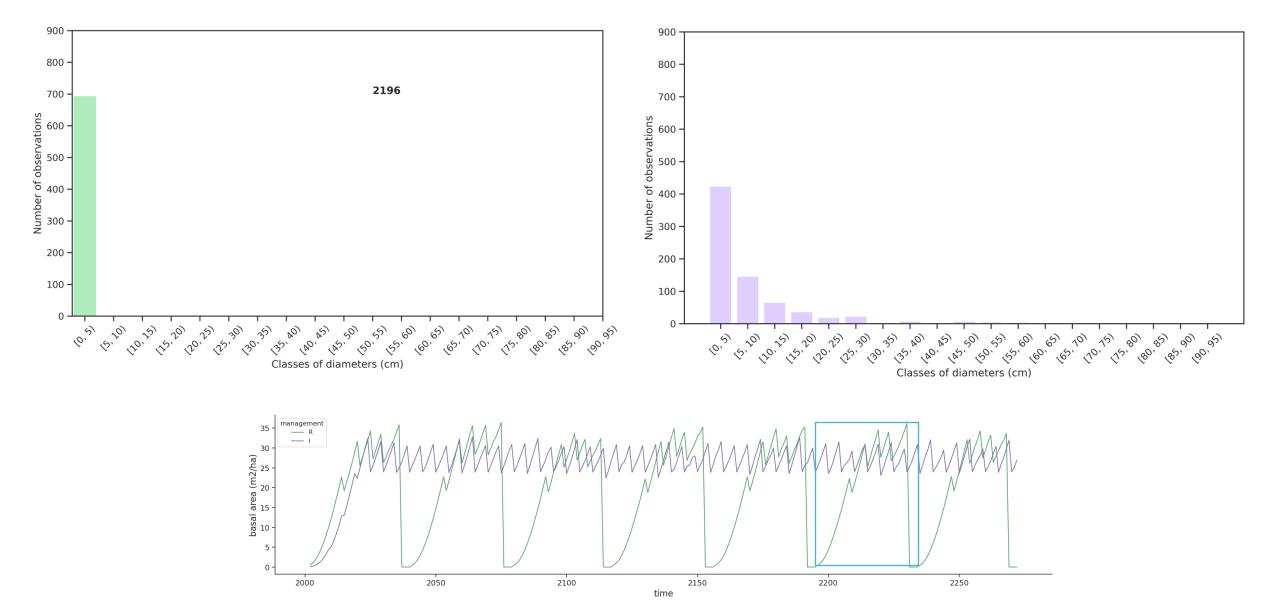






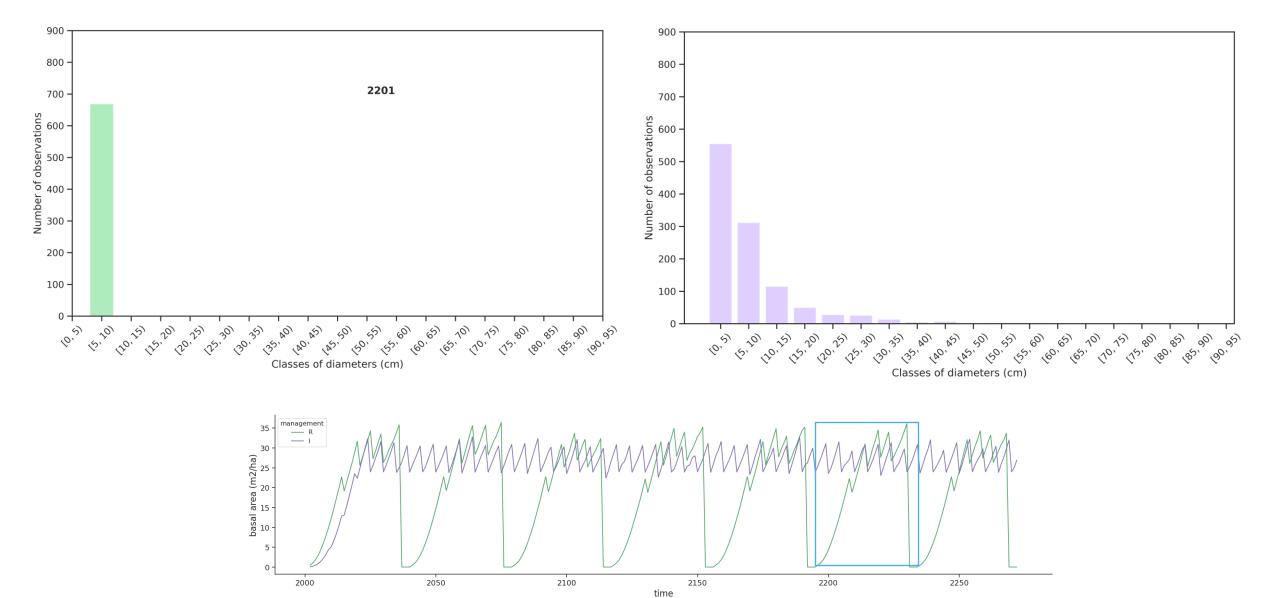






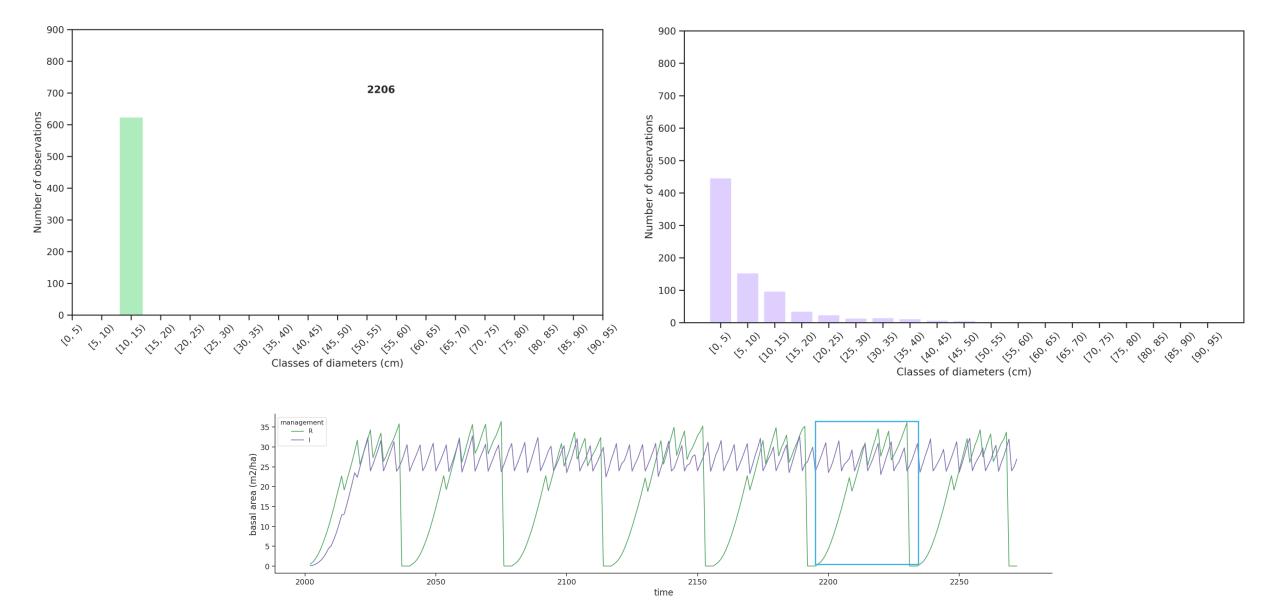






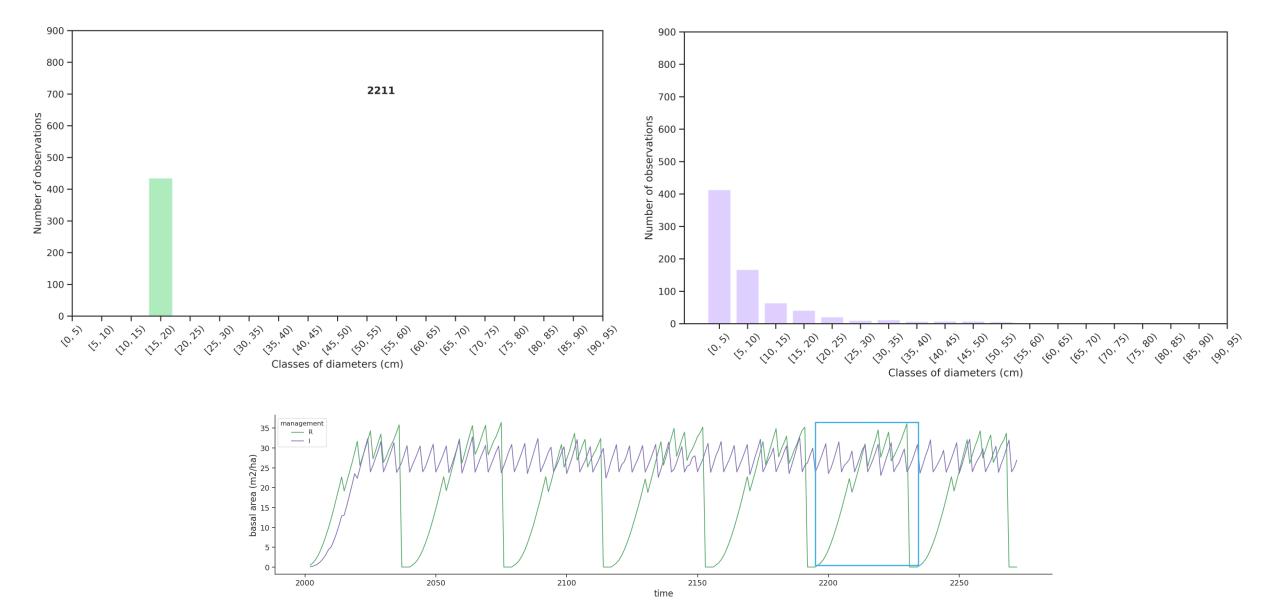






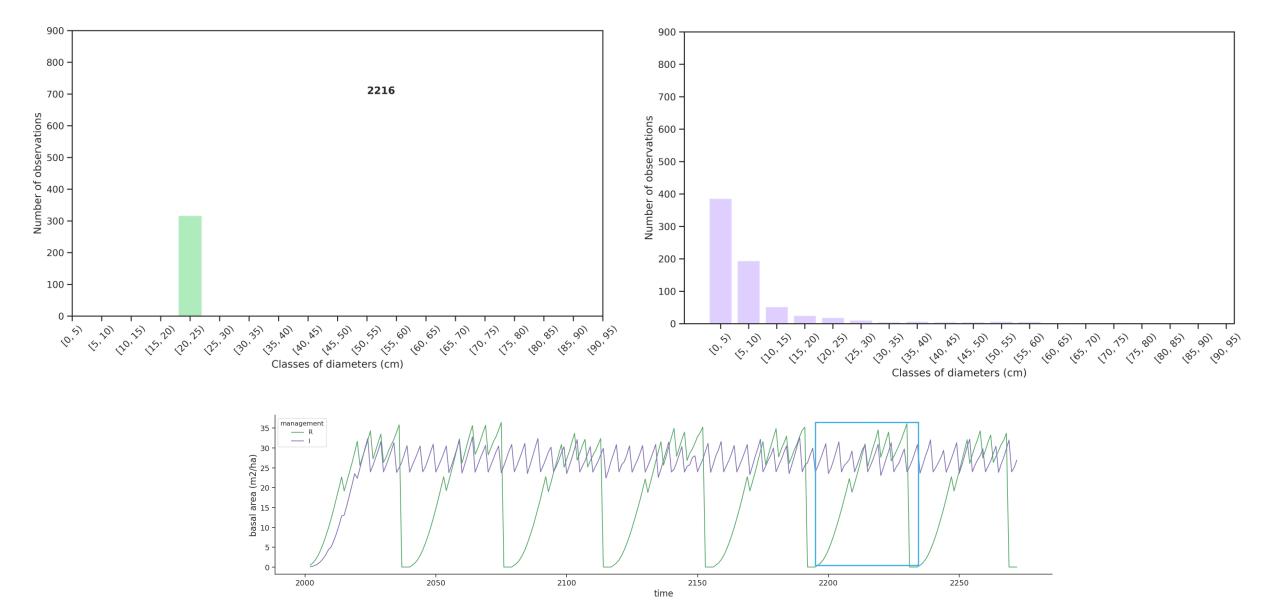






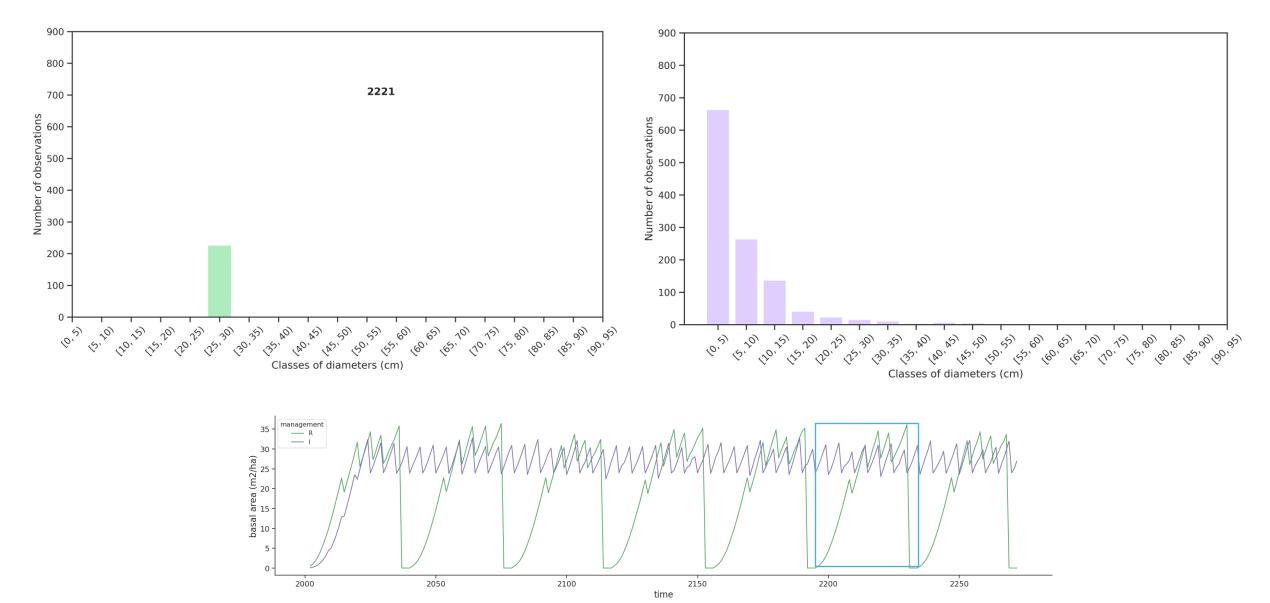






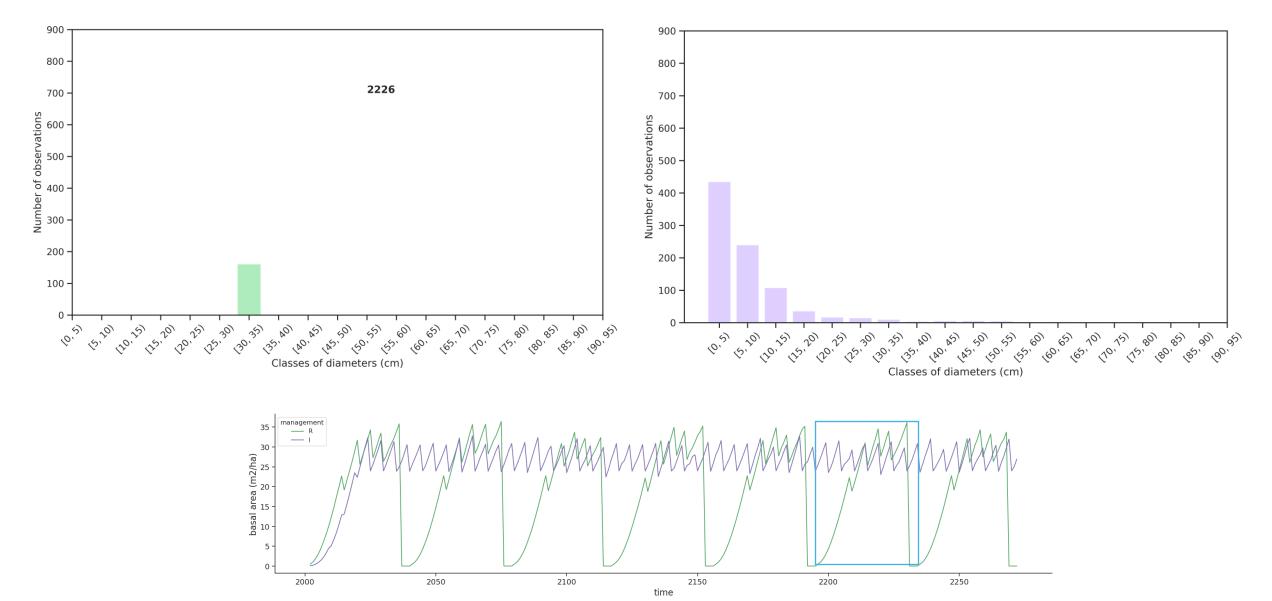




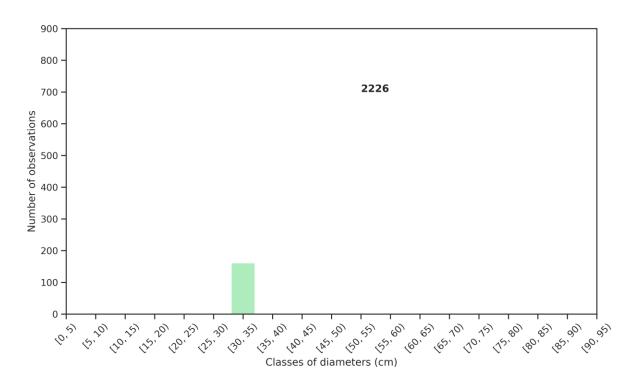


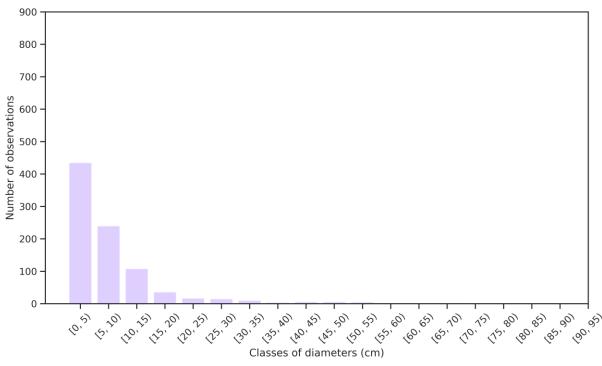










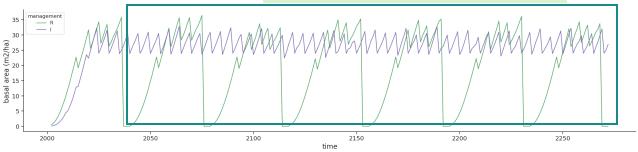




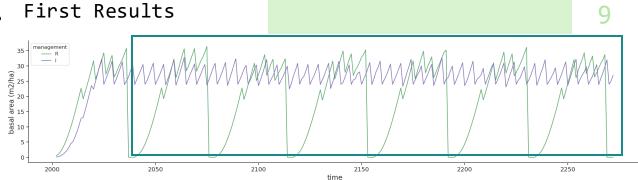
The distribution of diameters of living trees confirm a successful continuous cover management

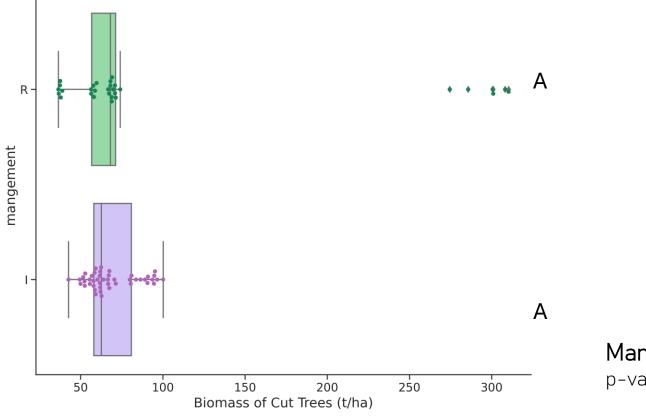


☐ First Results 9

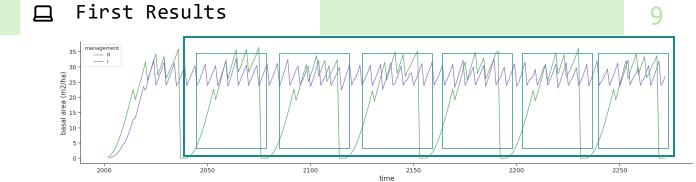


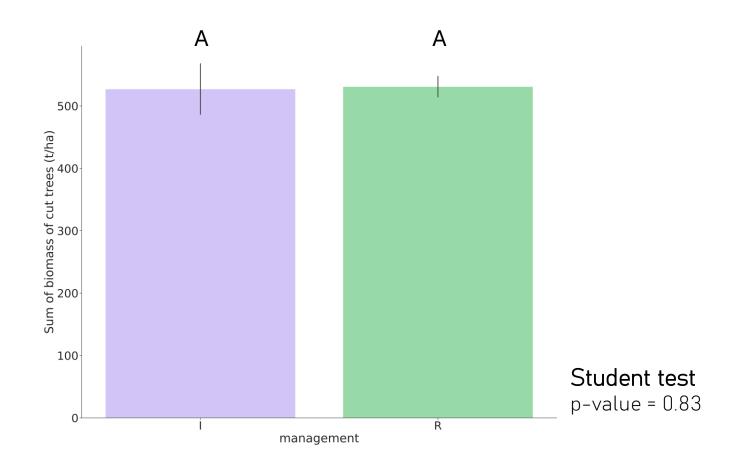


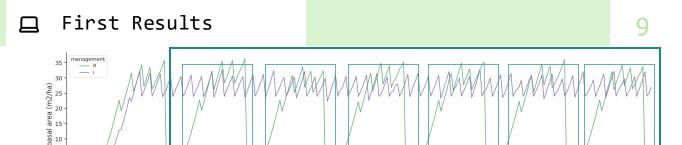


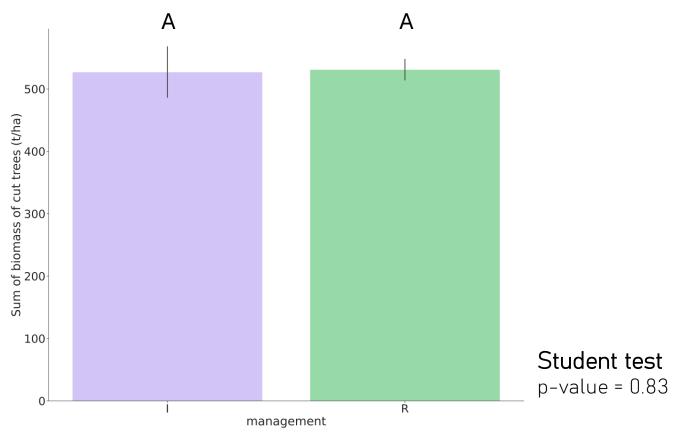


Mann-Whitney test p-value = 0.52









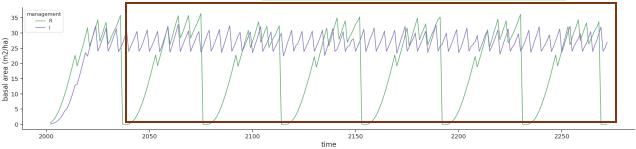


No difference in harvest between continuous cover and clear-cut forestry



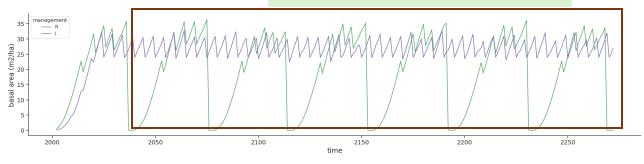
Is there a difference in the carbon stock of the living aerian biomass?

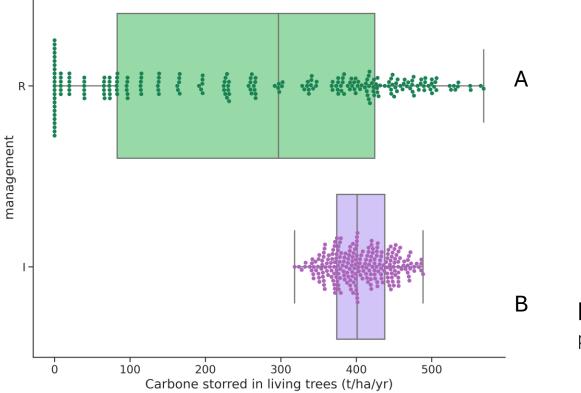






Is there a difference in the **carbon stock** of the living aerian biomass?



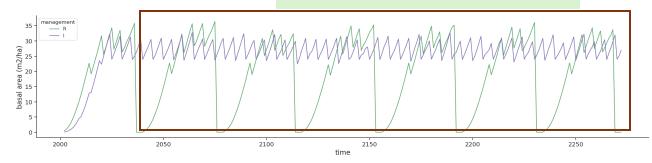


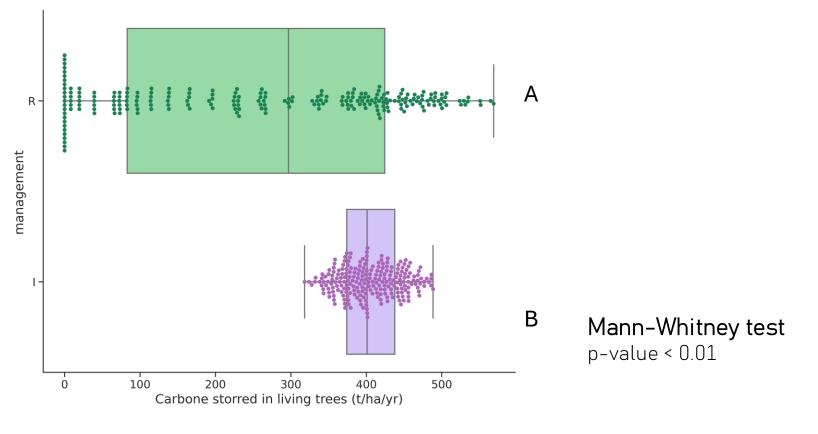
Mann-Whitney test p-value < 0.01

] First Results



Is there a difference in the **carbon stock** of the living aerian biomass?





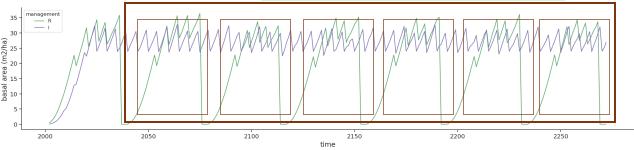


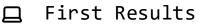
The carbon stock of the living aerian biomass is higher for continuous cover forestry



Is there a difference in the **sequestration** of carbon in living aerian biomass?

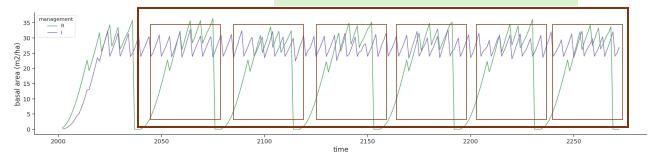


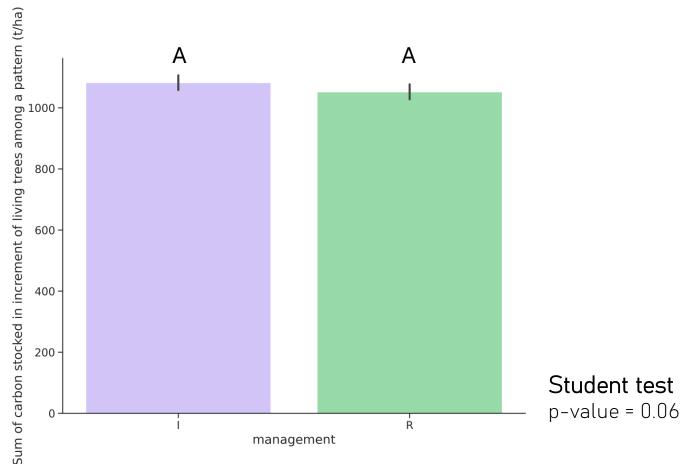






Is there a difference in the **sequestration** of carbon in living aerian biomass?

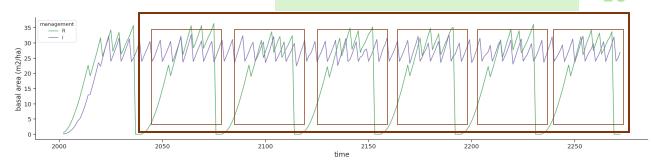


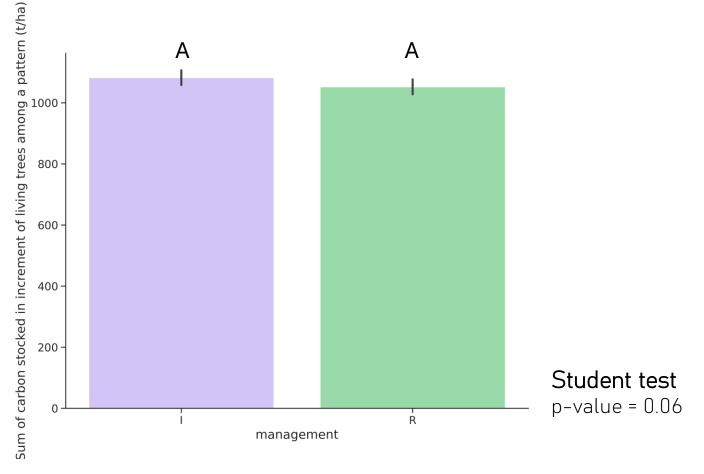






Is there a difference in the **sequestration** of carbon in living aerian biomass?







There is no differences in the sequestration of carbon in the living aerian biomass among a pattern

What did we do, so far?

To simulate maritime pine growth using clear-cut and continuous cover forestry



Satisfying... but can be ameliorated!

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Satisfying... but can be ameliorated!

PRELIMINARY RESULTS

To quantify the multifunctionality of these two types of management

Harvest

Carbone stock



No differences Kuuluvainen et al. 2012



Carbon stock is higher in continuouscover forestry No differences in carbon sequestration

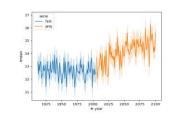
Ameray et al. 2021

What is coming next?

Integrate climate change in the model

Simulate the pedo-climatic context of the Landes de Gascogne

Model validation



DRIAS les futurs du climat

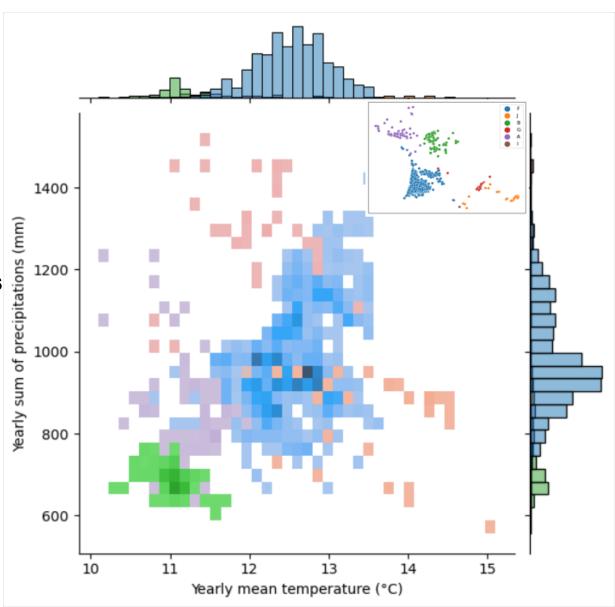
CNRM-CM5 ALADIN63 EC-EARTH RACM022E CNRM-CM5 RACM022E CLIMATE
Daily
2006-2100
RCP 4.5-8.5

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Thank you for your attention!

Any questions?

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