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BIOECONOMY RESEARCH

DECAY FREQUENCY MODELS FOR NORWAY SPRUCE USING NATIONAL FOREST INVENTORY DATA - PRELIMINARY RESULTS

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Is tree decay predictable?

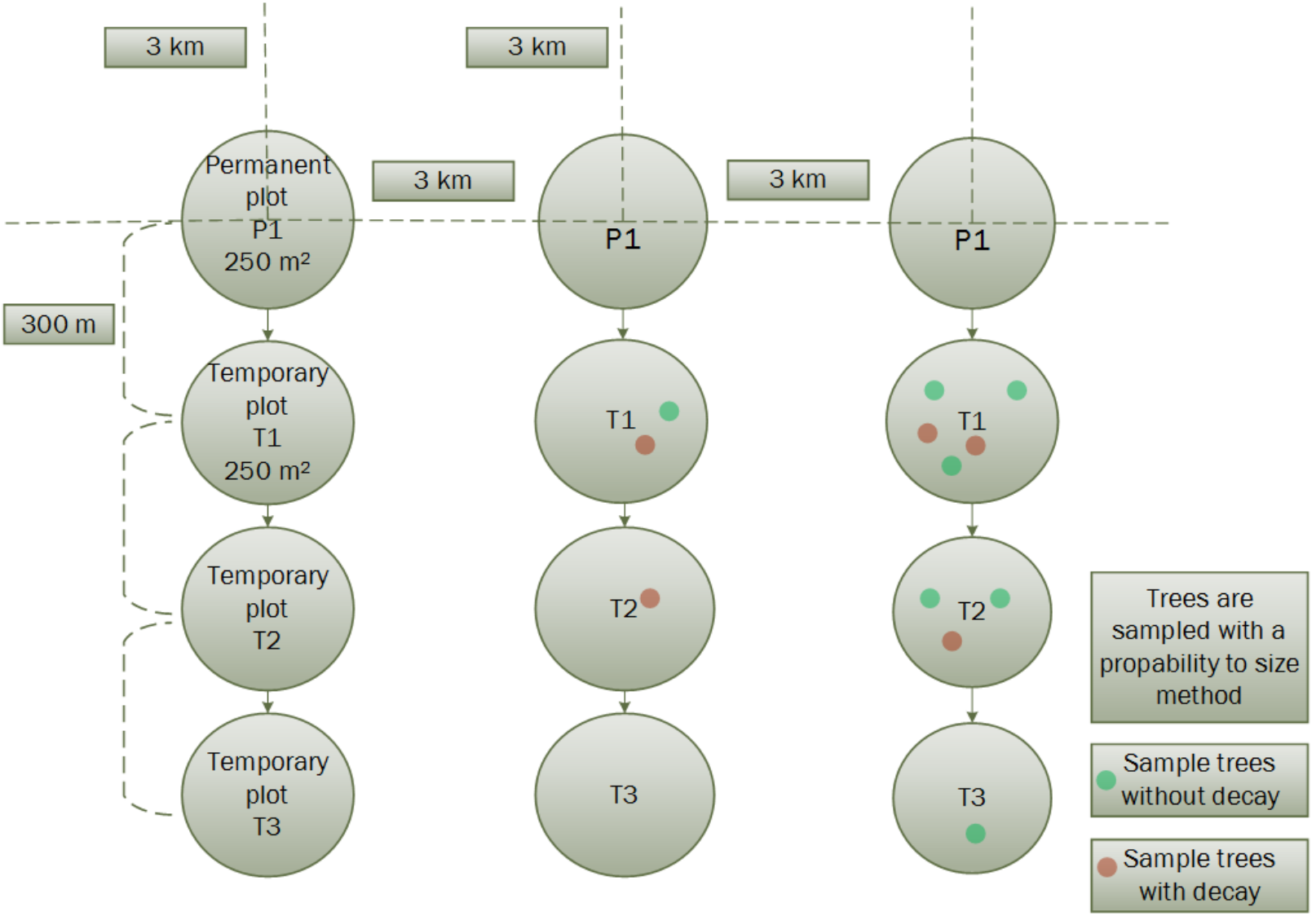
Is it possible to use NFI data to construct a reliable prediction model for use in forest management planning?

MATERIAL and METHODS

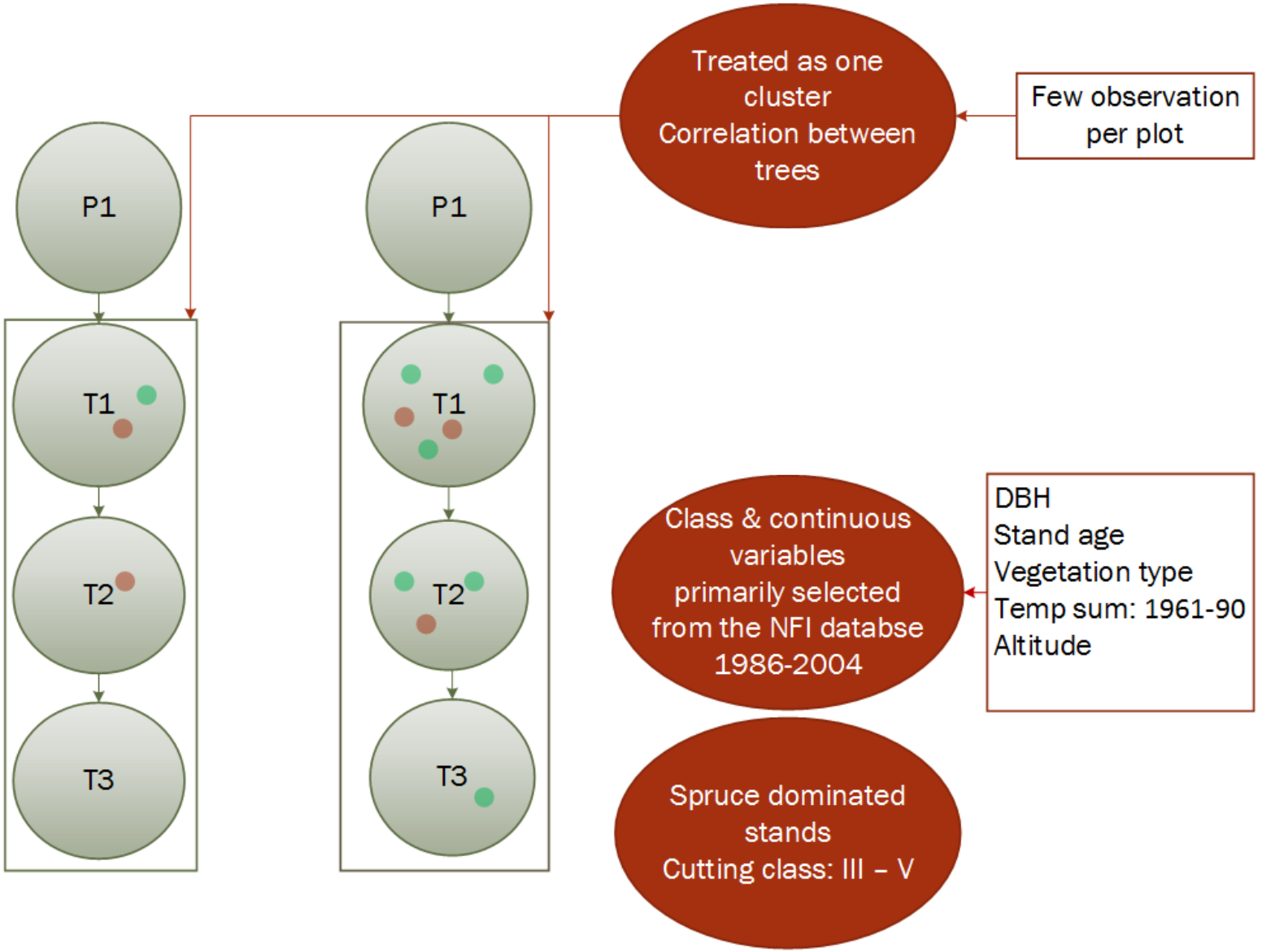
DECAY ASSESSMENTS - TEMPORARY PLOTS

County	NFI 1986-1993	NFI 1994-1998	NFI 2000-2004	Included
Østfold	X	X		X
Akershus/Oslo	X	X		X
Hedmark	X			X
Oppland	X		X	X
Buskerud	X		X	X
Vestfold	X		X	X
Telemark	X		X	X
Aust-Agder	X	X		X
Vest-Agder	X	X		
Rogaland	X			
Hordaland	X			
Sogn og Fjordane	X			
Møre og Romsdal	X		X	
Sør-Trøndelag	X		X	X
Nord-Trøndelag	X	X		X
Nordland	X			X
Troms	X			

SAMPLING DESIGN



MODEL OVERVIEW



PROBIT MODEL

Pr(decay|observed characteristics) = $\Phi(z)$

where

$$z = \beta_0 + \sum_{i=1}^{k} \beta_k x_k$$

Φ is the cumulative density function (CDF)

$z \sim N(0,1)$

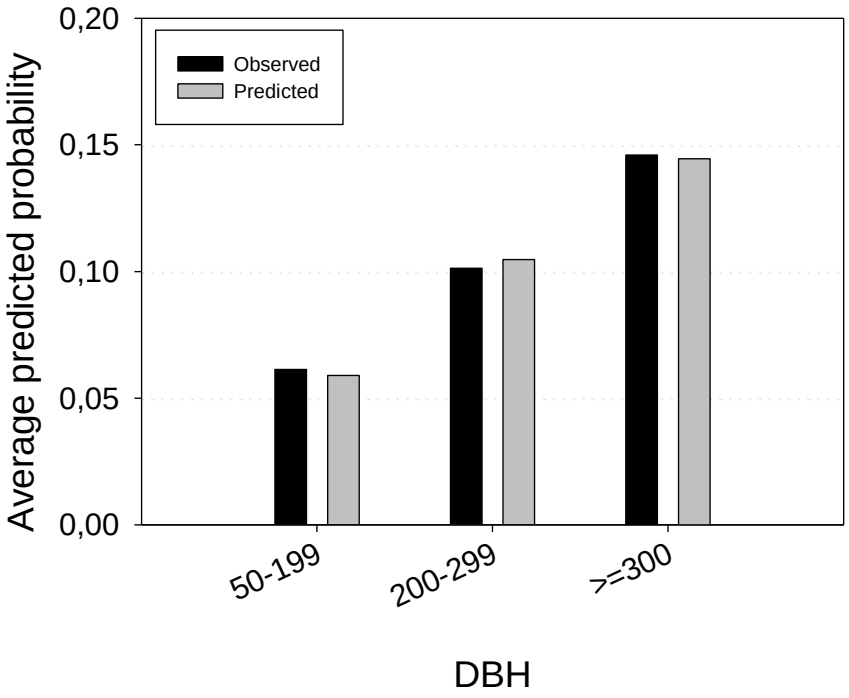
RESULTS

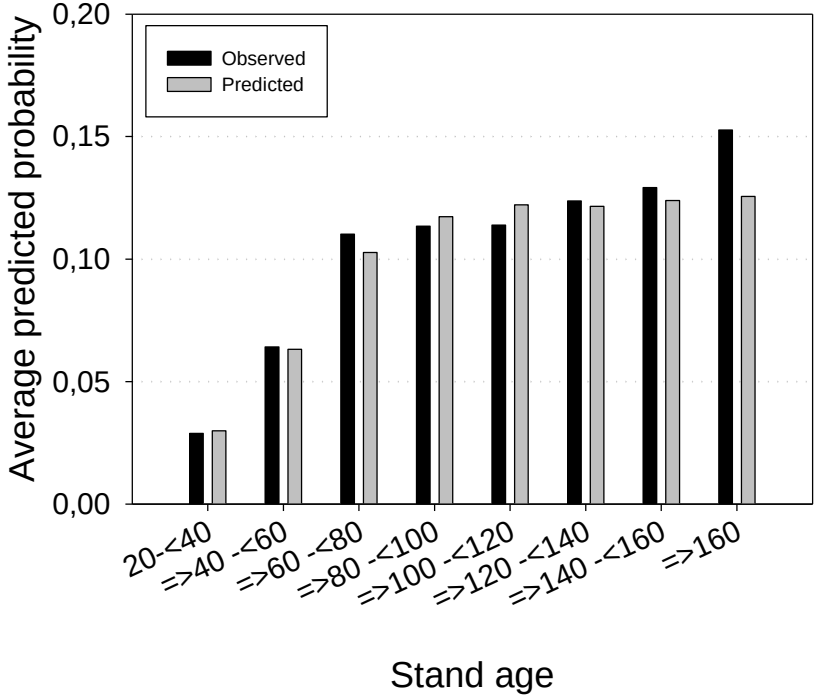
PROBIT REGRESSION MODEL

Predictors	Coefficients	Standard error
ln DBH	0,3333	0,0413
ln stand age	3,1340	0,7030
ln stand age ^{2}	-0,3169	0,0815
Temp. sum	0,5308	0,1224
Altitude	0,8738	0,2118
Altitude *temp sum	-0,6317	0,2792
Vegetation type (6 classes)		
Intercept	-11,5123	

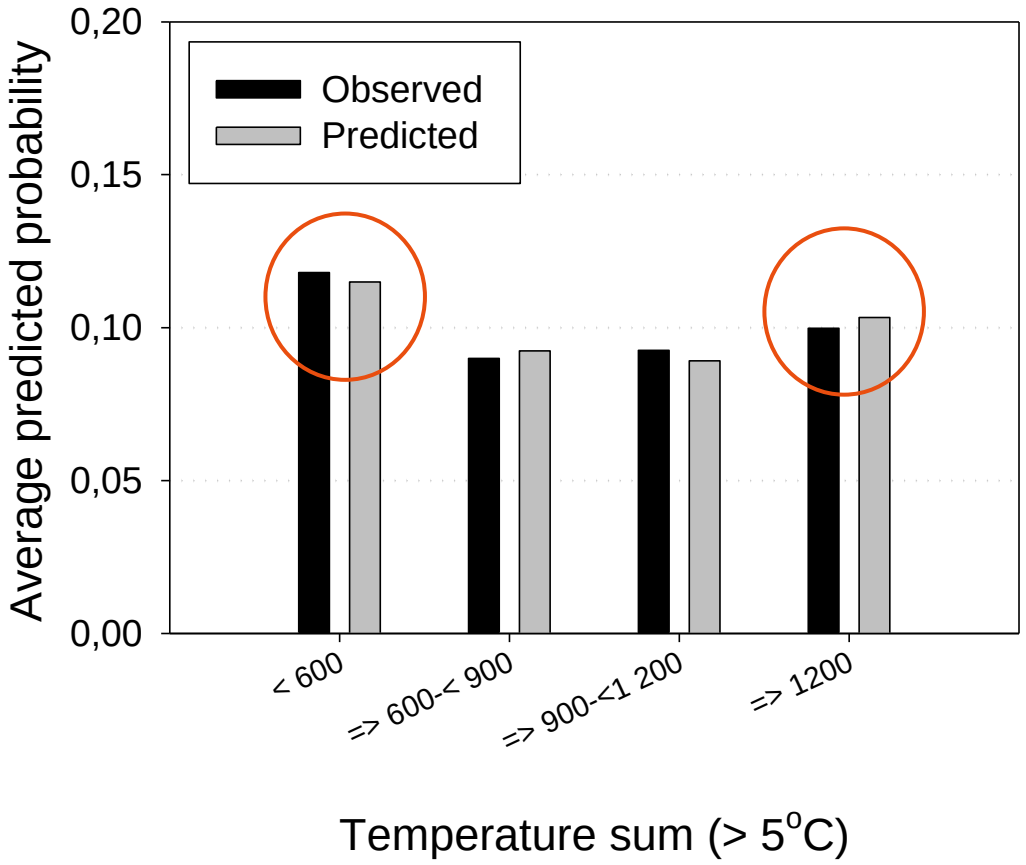
Number of observation: 16 238

DBH AND STAND AGE



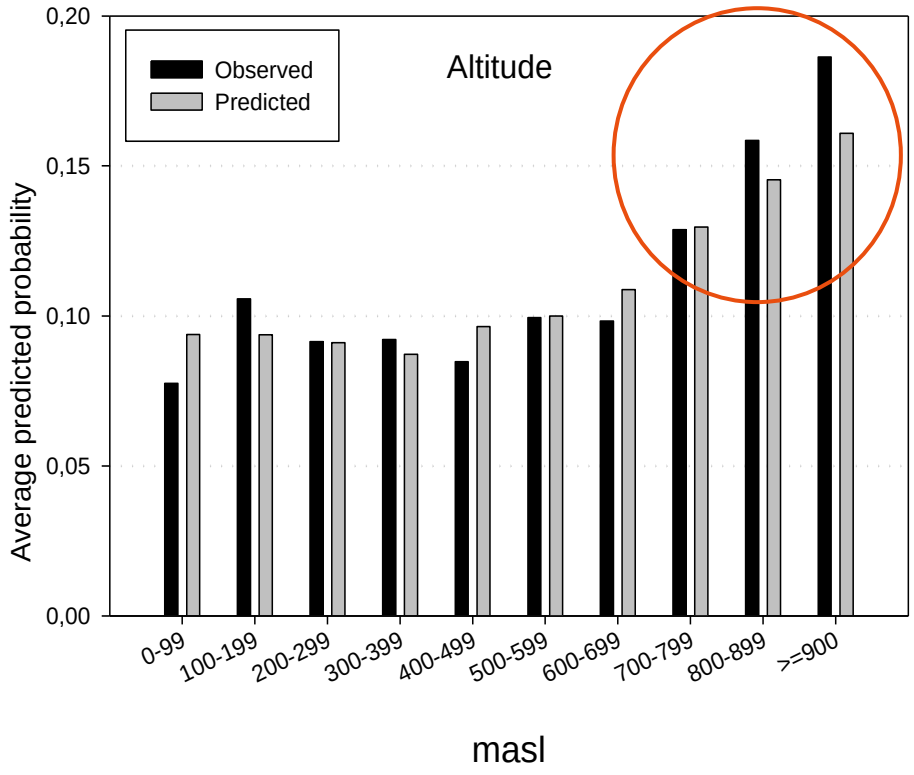


TEMPERATURE SUM > 5^0C



Higher probability for decay in trees in areas with very low temperature sum
and in areas with high temperature sum.

ALTITUDE



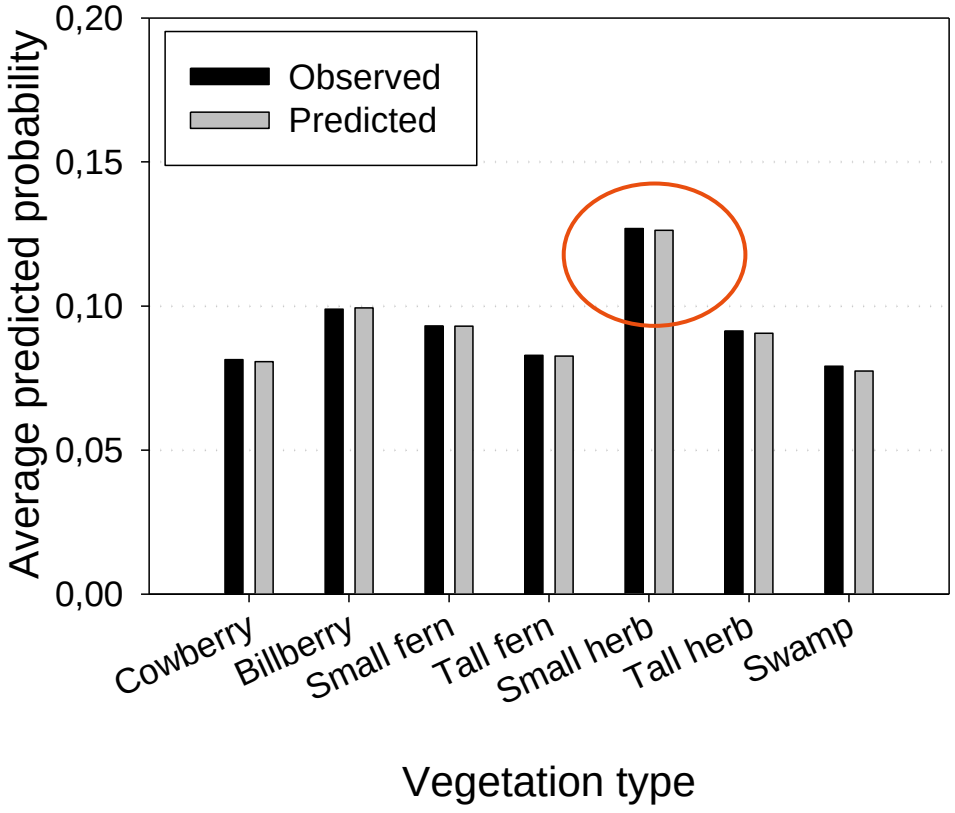
P(decay) increases with altitude:

- older trees
- other fungi (H. Solheim pers. comm.)
  - *Phellinus chrysoloma*
  - *Climacocytis borealis*
- interaction between tree age and fungi species
- more wind – more root tension

HOWEVER:

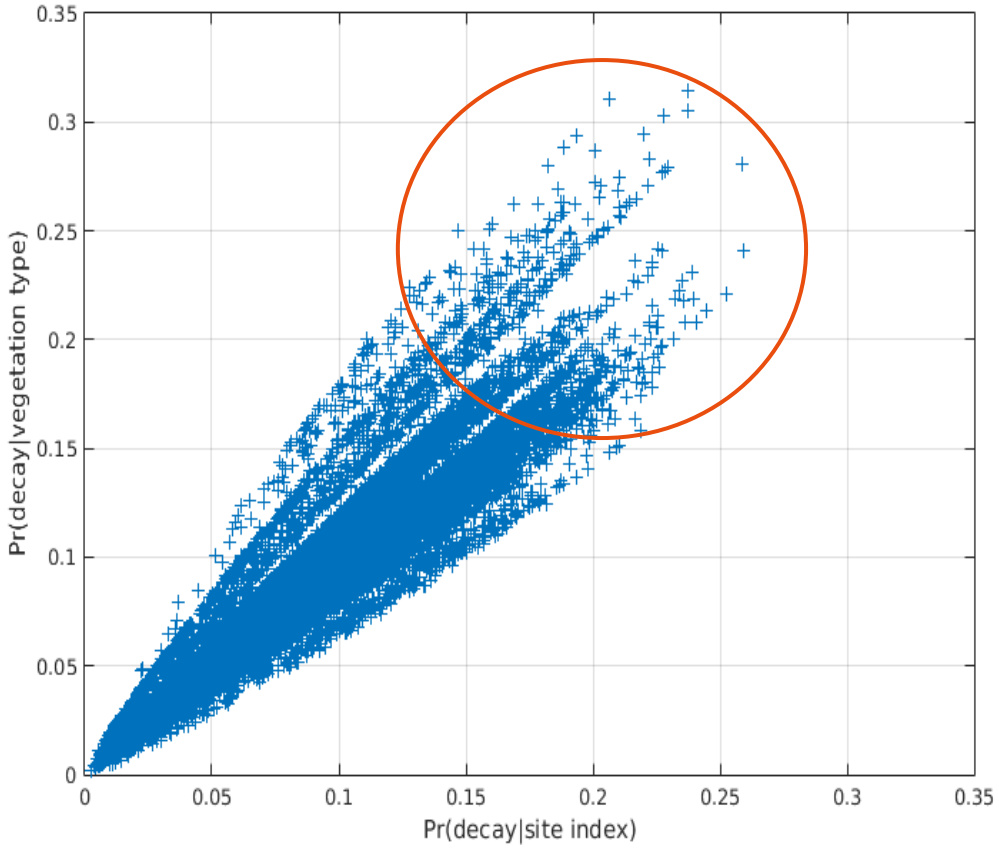
Negative interaction of altitude*temperature sum reduces the effect of altitude when temperature sum increases, but does not reverse the effect.

VEGETATION TYPE



Small herb: soils well-drained and calsium-rich

VEGETATION TYPE VERSUS SITE INDEX



A model with site index instead of vegetation type gave low significance level for site index

p-value = 0.1874

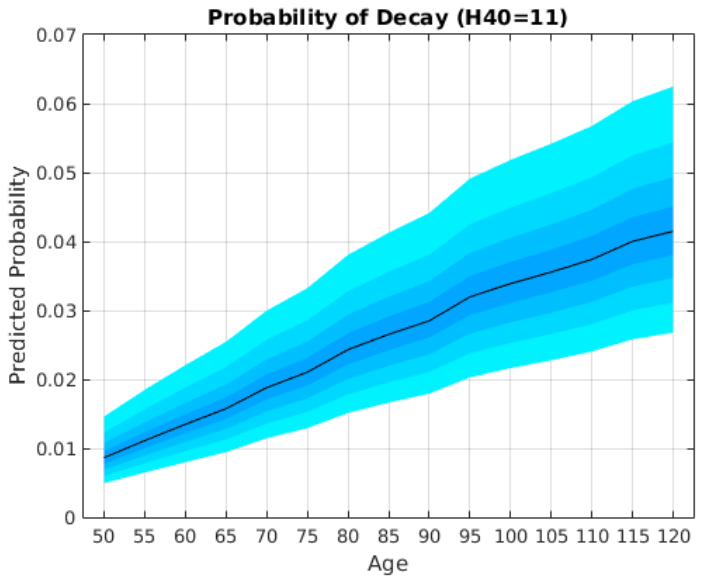
Strong correlation between predictions from these two models.

R^2 = 0,92.

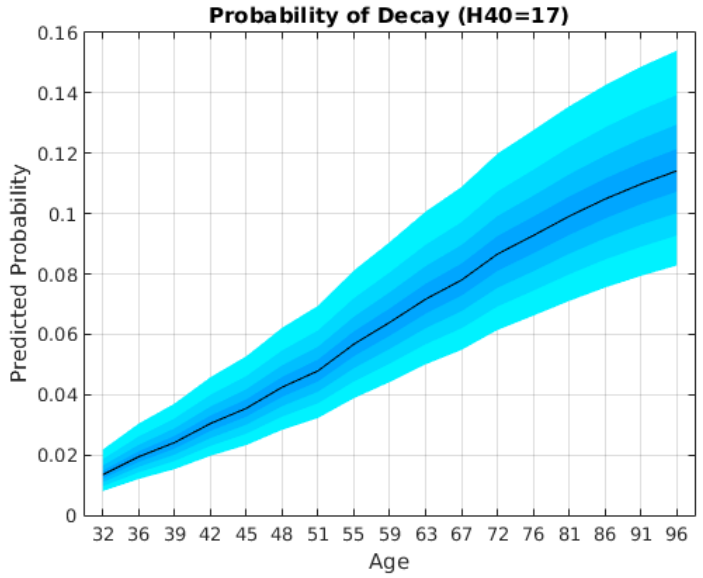
Diverse in predictions for trees with high probability of decay (where it matters the most)

UNCERTAINTY IN PREDICTED PROBABILITIES

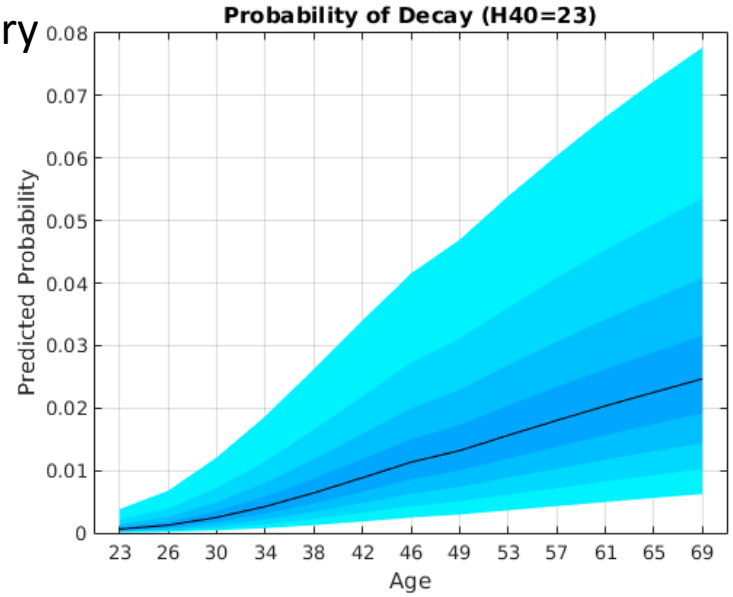
Bayesian estimation: MCMC
10% quantiles - dark line: 50%
Standard growth models



H40=11
100 masl
Temp. sum: 850
Veg. type: bilberry



H40=17
925 masl
Temp. sum: 400
Veg. type: small herb



H40=23
125 masl
Temp. sum: 1400
Veg. type: small herb

The model uncertainty increases with higher predicted probability and with increases in age. Uncertainty differ between different sites.

CONCLUSIONS

- The decay frequency model based on NFI samples at breast height shows promise, but further work is needed to develop a model applicable in forest management planning

- Potential for improvements on spatial auto-correlation, and possibly by inclusion of soil/bedrock type in the model

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QUESTIONS?

THANK YOU FOR THE ATTENTION!