

Progress Report

Stand Response to Thinning:

Enhancing Response Prediction Through Modeling
CAFS 20.82

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- Update the existing base stand yield model (untreated stands) within the SMC Plantation Yield Calculator (SMC-PYC) given another two full cycles of data collection
- Incorporate Pre-commercial and Commercial Thinning effects using results of Bose, et al (2018) and Cross & Turnblom (2019)
- Benchmark fitted model against independent data set, adjust if necessary
- Expand technology to other commercial forest types, as appropriate



Project Overview

Eigenanalysis variables:

RANKINGS	TOTAL	RANK
INST	0.87%	27
Latitude	0.82%	28
Longitude	1.11%	23
Elevation	1.26%	16
MAT	1.04%	26
MWMT	1.36%	11
MCMT	1.34%	12
TD	1.33%	13
MAP	1.57%	2
MSP	1.21%	22
AHM	1.44%	6
SHM	1.23%	17
DD_0	1.42%	8
DD5	1.06%	25
DD_18	1.09%	24
DD18	1.28%	15
NFFD	1.40%	9
bFFP	1.57%	2
eFFP	1.51%	5
FFP	1.61%	1
PAS	1.30%	14
EMT	1.38%	10
EXT	1.43%	7
Eref	1.23%	17
CMD	1.22%	20
RH	1.23%	17
CMI	1.55%	4
DD1040	1.22%	20

Final reduced model:

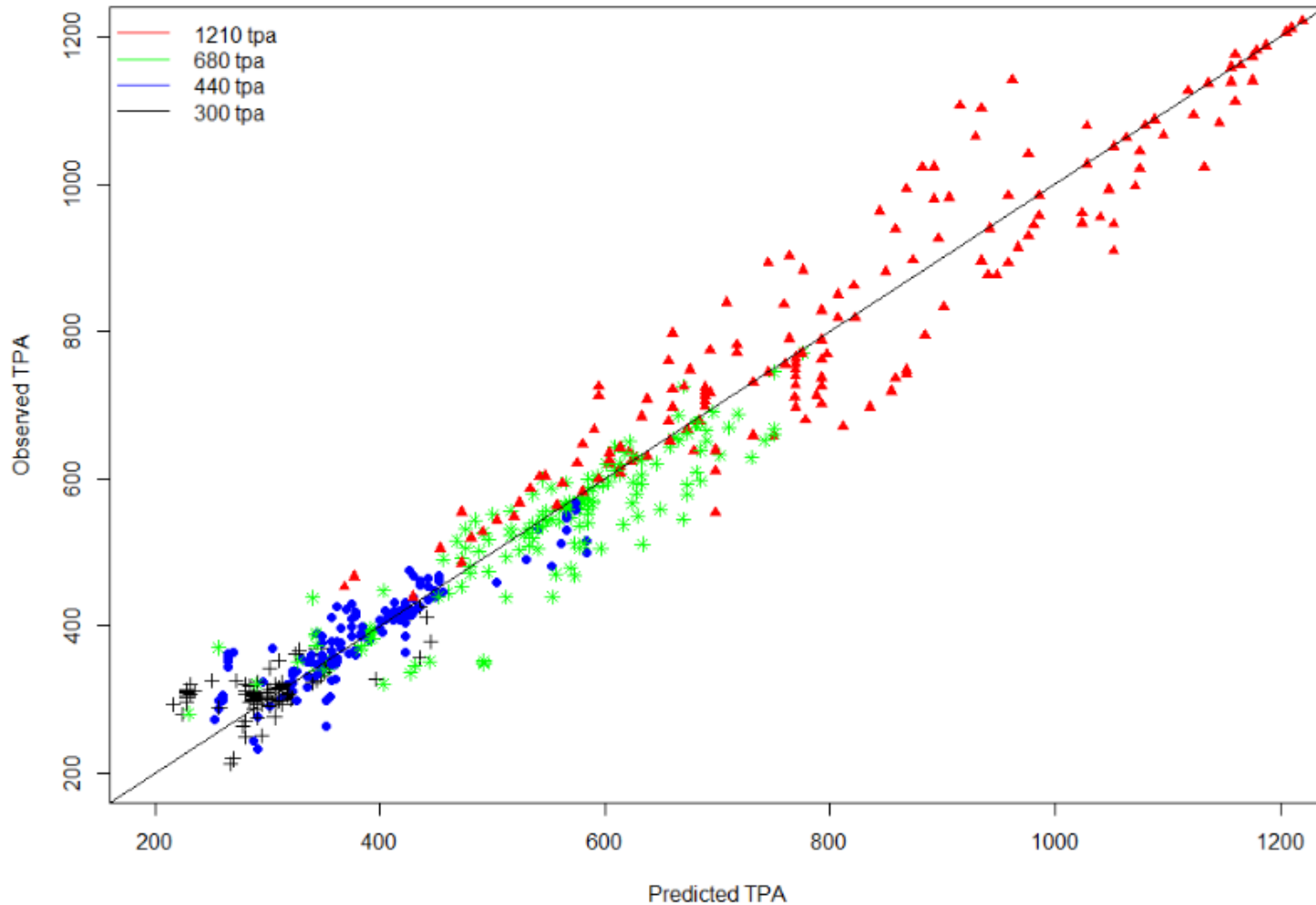
Term	Coefficient
Intercept	-15.441038000
PLDEN	1.013729974
TotAge	-10.101920000
FFP	-3.589069100
MAP	-0.003055665
bFFP	-3.517693500
eFFP	3.616440900
TotAge:FFP	-0.020659369
TotAge:eFFP	0.046427798
PLDEN:FFP	0.012634588
PLDEN:MAP	0.000008718
PLDEN:bFFP	0.012223413
PLDEN:eFFP	-0.012625290



Current Progress

Mortality model performance segmented by planting density

R-sq: 95%; RMSE: 50 tpa; MAE: 35 tpa; MAPE: 7%



Type III plots:
Full knowledge

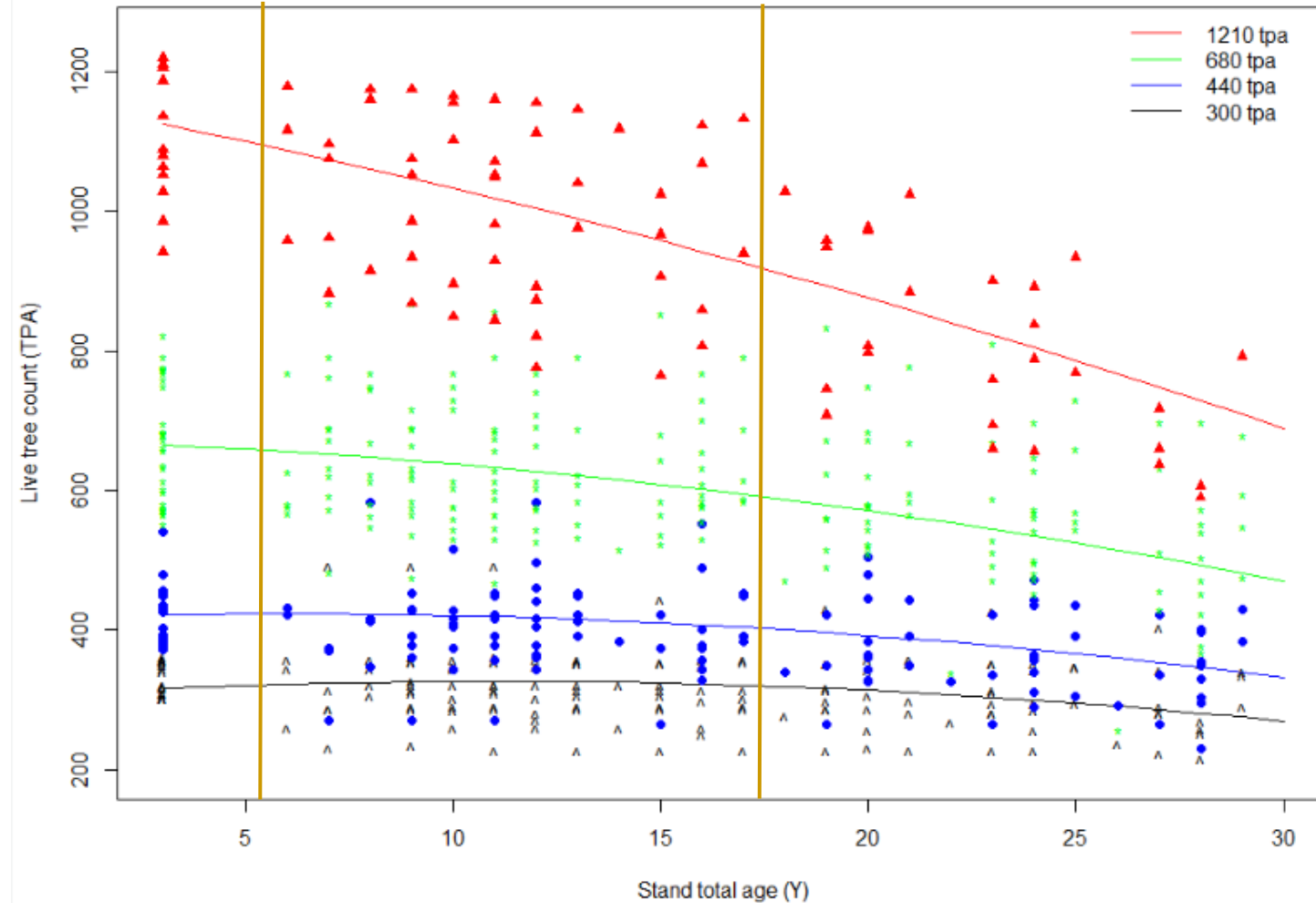
$$\text{TPA}_{\text{TotAge}} = \text{PLDEN} + \text{TotAge} + \text{Everything Else}_{\text{TotAge}}$$



Current Progress

Trees per Acre by Stand Age and planting density

With grouped-mean predictions



Type I plots:
PLDEN ?

PLDEN =

TPA_{Estab} -

$TotAge_{\text{Estab}}$ -

Everything
Else_{Estab}



Future Plans

Version 1

Version 2

Planting densities for PCT stands same as untreated	✓	Unique planting densities for every plot
No thinning effect functionality	Building into dataset	PCT effect modeled as function of timing & intensity
BA + QMD => TPA	After model fitting	TPA + BA => QMD
Board-Foot volumes modeled using Scribner rule as written	✓	Board-Foot volumes modeled as ratio to Cubic volumes via FPL-RP-616
Volumes modeled on whole and half-log lengths only.	✓	Each tree merchandized via COMBOS (sh,16',20',32',36',40')

