Continuing Project

Assessing & Mapping Regional Variation in Site Productivity

CAFS.19.75

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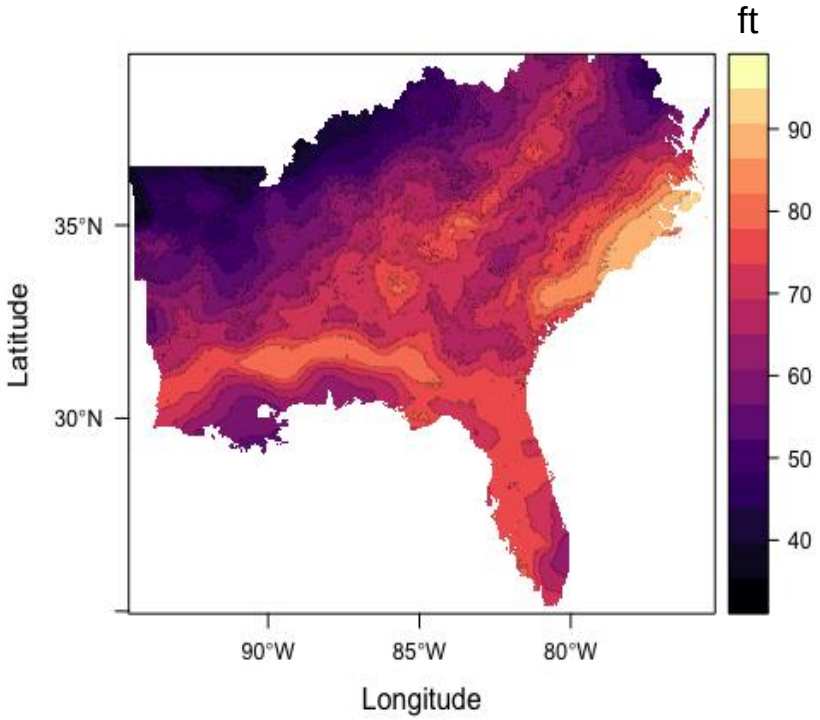
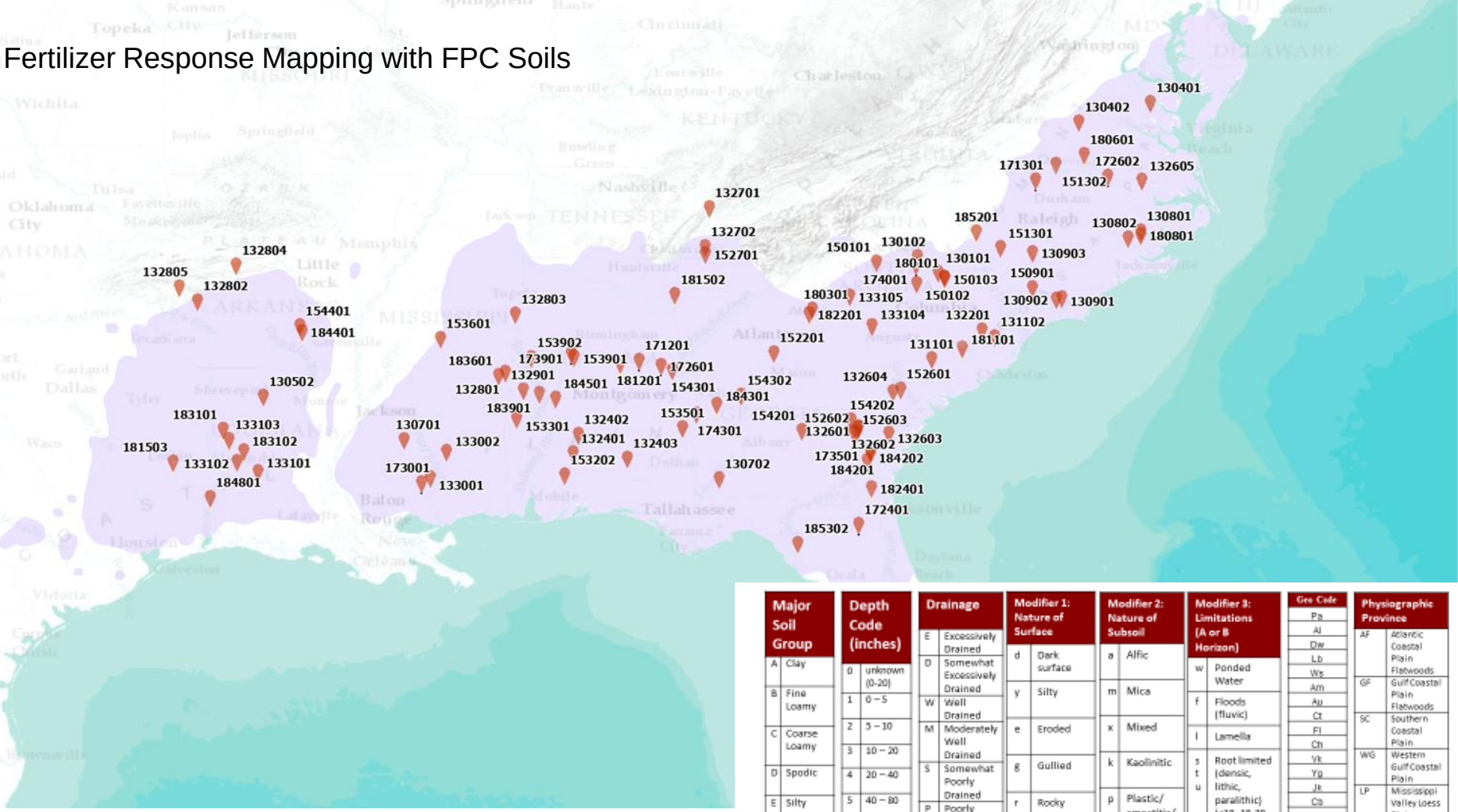
Objectives

1. Develop a consistent and biologically meaningful metric of potential site productivity
2. Relate soils, geology, and environmental variables to predict site productivity
3. Map across major forest regions

What drives site productivity and how do we make predictions?



Fertilizer Response Mapping with FPC Soils



Major Soil Group	
A	Clay
B	Fine Loamy
C	Coarse Loamy
D	Spodic
E	Silty
F	Deep Subsoil (Grossarenic, > 40 in)
G	Deep Sand (> 80 in)
H	Histosol/ Organic

Depth Code (inches)	
0	unknown (0-20)
1	0 – 5
2	5 – 10
3	10 – 20
4	20 – 40
5	40 – 80
6	None within 80 in

Drainage	
E	Excessively Drained
D	Somewhat Excessively Drained
W	Well Drained
M	Moderately Well Drained
S	Somewhat Poorly Drained
P	Poorly Drained
V	Very Poorly Drained

Modifier 1: Nature of Surface	
d	Dark surface
y	Silty
e	Eroded
g	Gullied
r	Rocky
o	Other or NA

Modifier 2: Nature of Subsoil	
a	Alfic
m	Mica
x	Mixed
k	Kaolinitic
p	Plastic/ smectitic/ vertic
i	Siliceous (sandy)
o	Other or NA

Modifier 3: Limitations (A or B Horizon)	
w	Ponded Water
f	Floods (fluvic)
l	Lamella
s t u	Root limited (densic, lithic, parallithic) (<10, 10-20, 20-40 in)
v	Root limited 40-80 in
q	Restrictions within 40 inches (fragic, cemented, plinthic)
c	Alkaline, calcareous
n	Salt affected (natric)
o	Other or NA

Geo Code
Pa
Al
Dw
Lb
Wk
Am
Au
Ct
Fl
Ch
Vk
Yg
Jk
Cb
Wx
Md
Bb
Ba
Av
Sa
Cs
Ms
Fs
Lo
Gg
Le
Sh
St
Lm
Sc
Bg
Um
Sr
Mr
Ul

Physiographic Province	
AF	Atlantic Coastal Plain Flatwoods
GF	Gulf Coastal Plain Flatwoods
SC	Southern Coastal Plain
WG	Western Gulf Coastal Plain
LP	Mississippi Valley Loess Plain
BP	Blackland Prairie
SH	Sandhills
PD	Piedmont
MT	Mountains
AA	Alluvium

How well does the FPC Soil Classification system work for predicting site index?

Predicting Site Index with +/- 3 ft for Fertilized Plots

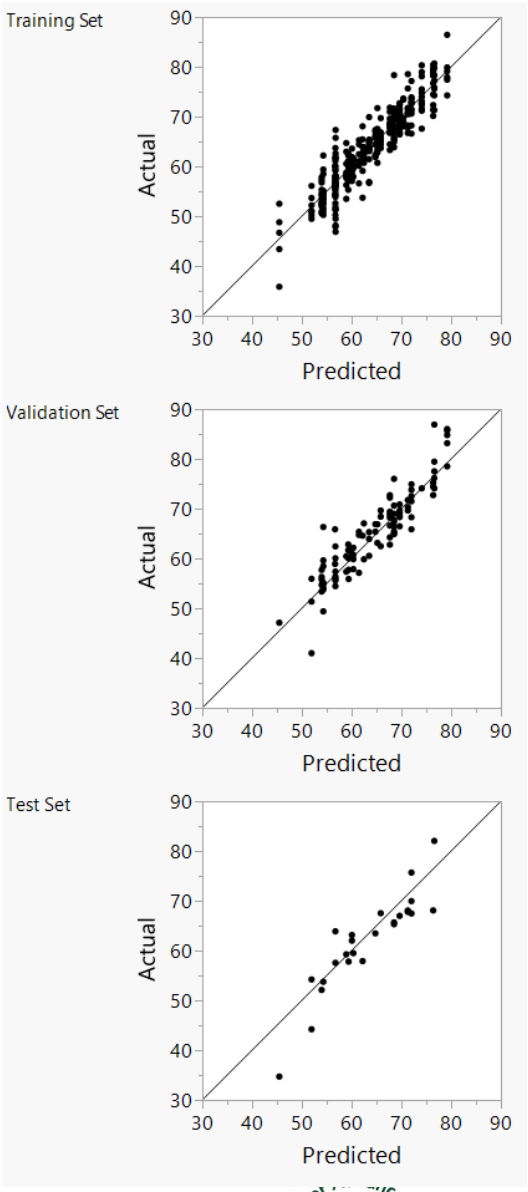
Term	Number of Splits	SS	Portion
fpc_geo	5	8774.12941	0.4712
fpc_depth	6	2876.09525	0.1545
fpc_drcode	3	2188.03917	0.1175
fpc_mjcode	6	1823.4357	0.0979
fpc_mod1	5	1499.99905	0.0806
fpc_mod2	3	1377.61909	0.0740
fpc_mod3	2	82.2072022	0.0044

Soils only

Term	Number of Splits	SS	Portion
fpc_geo	5	8500.13854	0.4541
fpc_depth	3	2673.46436	0.1428
fpc_mlra	3	2091.34628	0.1117
fpc_mod1	6	1860.43419	0.0994
fpc_mjcode	5	1498.48809	0.0801
fpc_drcode	5	1178.71816	0.0630
fpc_mod2	1	632.99817	0.0338
nrate	7	204.250379	0.0109
vegcntrl	1	54.9074802	0.0029
prate	1	14.2377007	0.0008
fpc_mod3	1	10.0963801	0.0005

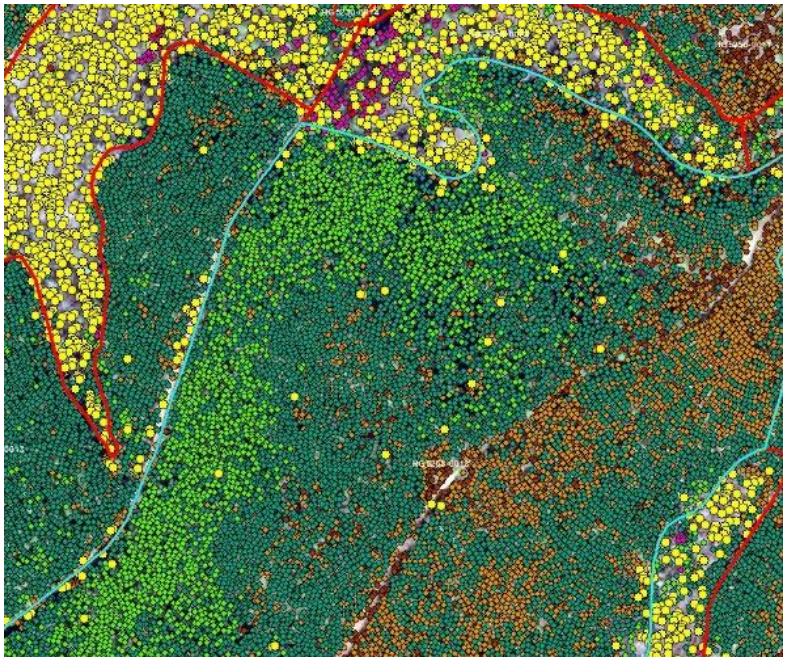
Soil+Silv

$R^2 = 0.86$



Site Index Mapping in Progress

- Operational cruise data and LiDAR to map SI ranges to soils



SI from LiDAR

SI from x,y coordinates

Operational Site Index and Soil Properties Predicts +/- 7 ft

Contribution of each to prediction

$R^2 = 0.34$

Term	Number of Splits	SS	Portion
geologic	2	188228.456	0.6307
physio_prov	4	45474.6465	0.1524
soil_mod_3	2	32628.9099	0.1093
soil_group	1	15435.7836	0.0517
fpc_geo	1	9694.45326	0.0325
drainage_class	1	6982.14189	0.0234
dept_code	0	0	0.0000
fpc_mjcode	0	0	0.0000

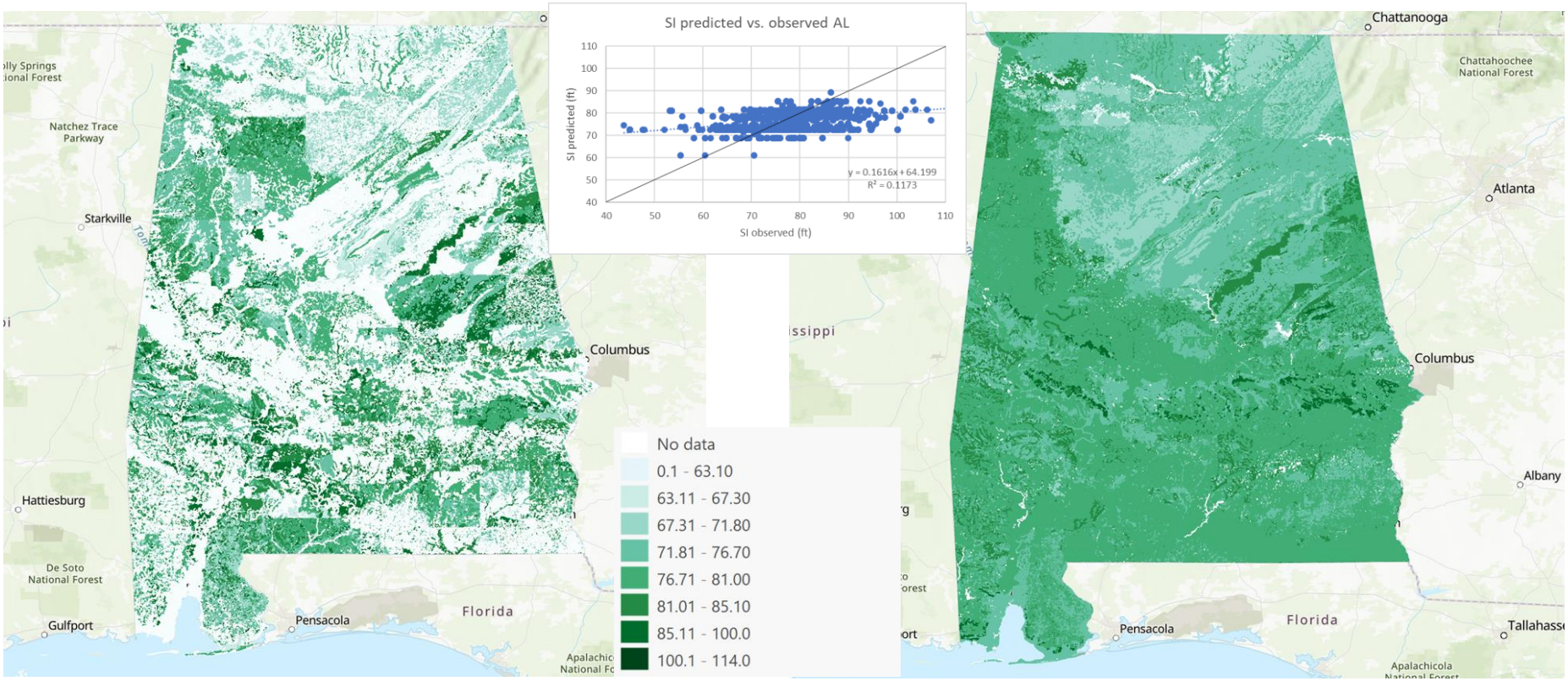
Trained on 50-110 ft SI, N+P fertilized, thinned, and with a mid rotation chemical application (4,894 observations)

Site Index Mapping

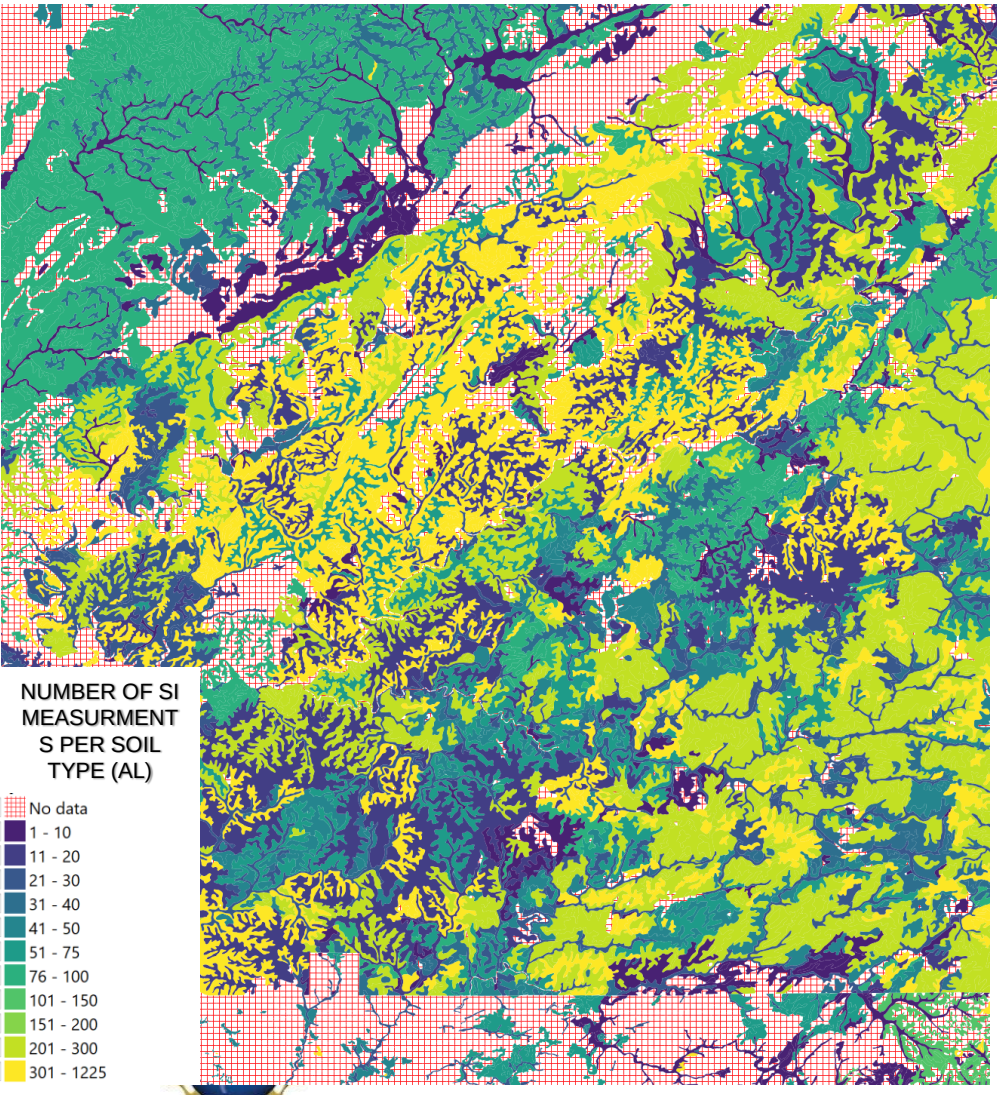
For ALL Stands +/- ~9ft
(13,622 observations, SI 50-110 ft, 10-35 yr old)

Observed

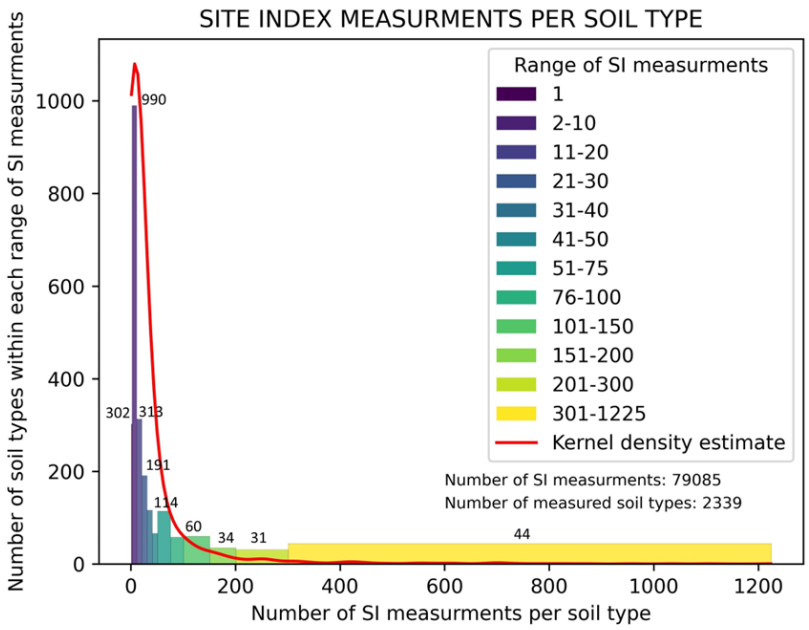
Predicted



Confidence map (number of observations) with each SI value



Will help us determine where we need more observations



Three-year Timeline - Updated

✓Year 1 (2020): Data gathering and compilation of forest soil map units and available stand data

✓ Year 2-3 (2021-2022): Spatial modeling and model comparisons of site productivity and drivers

Year 4: Develop web-based interface of base and potential site productivity (additional funding from International Paper)