Continuing Project

Assessing and mapping regional variation in potential site carrying capacity

CAFS 19.76

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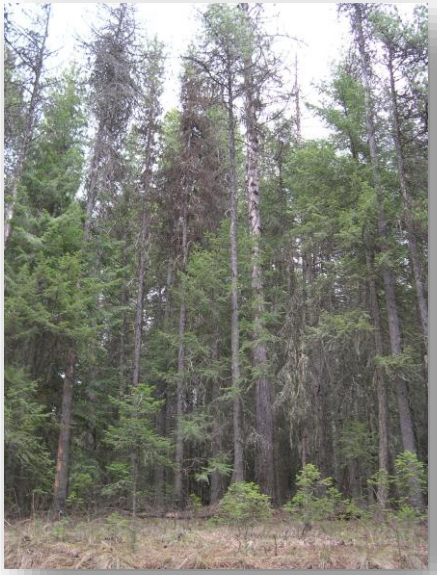
Justification

Understocked stands underutilize site resources and will not reach maximum potential productivity

Overstocked stands are slow to develop and susceptible to wildfire, drought and insect outbreaks due to competition for limited resources.



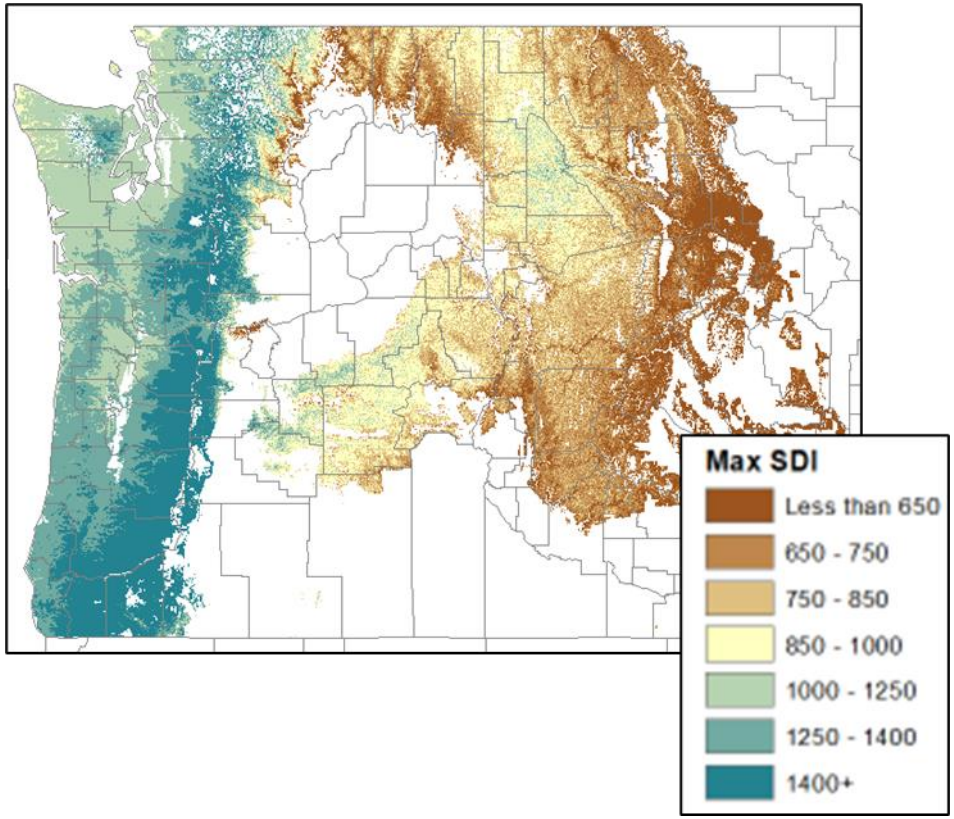
To date, forest carrying capacity research is regionalized, utilizes multiple modeling approaches, and not universally available spatially across the US .....

Objectives

1) Synthesize a nationwide forest inventory database from publicly available data and from CAFS members,

2) Standardize maximum carrying capacity modeling, and

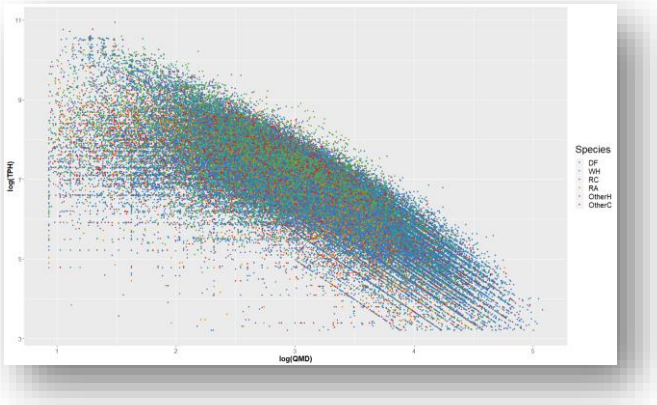
3) Create efficiencies for multi-regional forest management organizations by providing consistent, species-site-silviculturally sensitive, wall-to-wall spatial models of SDImax for commercial species of the United States.



Methods

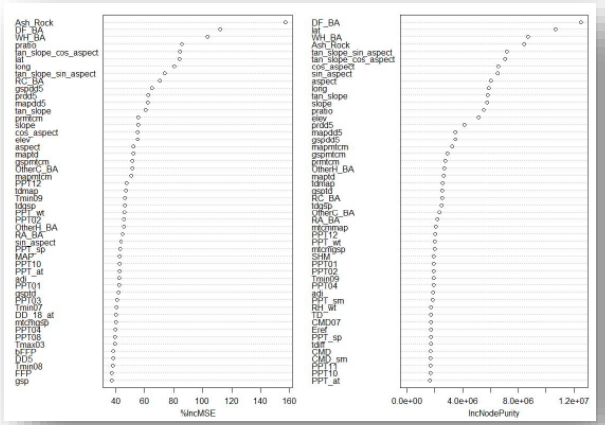
Database Development + Standardization:

- Stand: QMD, TPA, Species BA component, known silvicultural treatments
- Topography: 10m DEM extraction + transformations
- Climate: 200+ climate variables (annual, month, season) + interactions
- Geology and Soils Layers: GSSURGO, USGS, State Geology, FPC soil database



Investigating Statistical Modeling Approaches:

- Variable Selection:
  - Unsupervised and Supervised Machine learning approaches for feature selection and extraction
- Frontier Fitting
  - Linear mixed-effect model , Linear quantile mixed model , stochastic frontier regression model and Nonlinear mixed-effect model



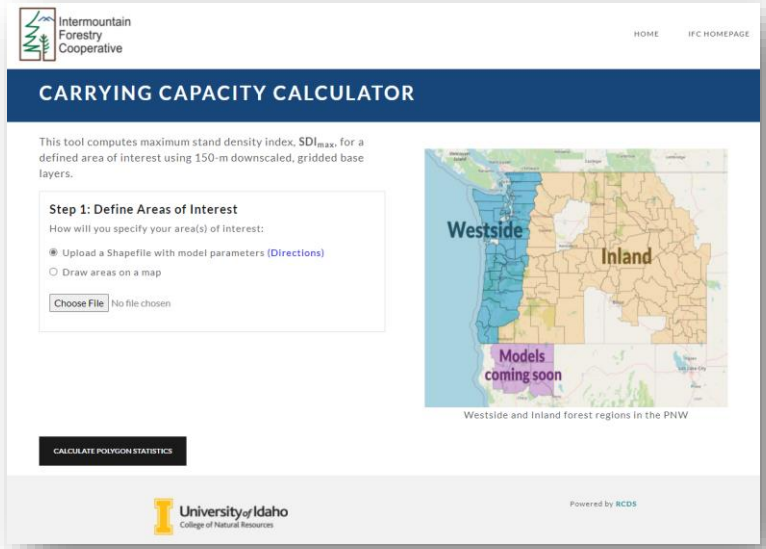
Major Findings

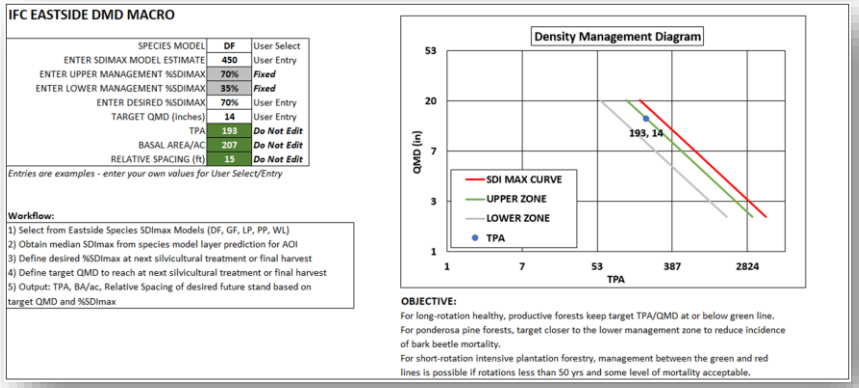
- A web based SDImax app and Excel macro were developed for managers to obtain stand SDImax and UMZ/LMZ estimates based on an input shapefile and desired stand dynamics.

- National SDImax modeling efforts are making inroads through the development of regional inventory and research datasets from the South and Northeast ownerships of PotlatchDeltic and Manulife.

- Unfuzzed FIA inventory records have been obtained from the Northeast and Pacific Northwest FIA programs.

- A post-doctoral research scientist (Dr. Jaslam Poolakkal) was hired April 2022 and is currently harmonizing industry/FIA datasets and associating site characteristics to these stand inventory records.





Deliverables

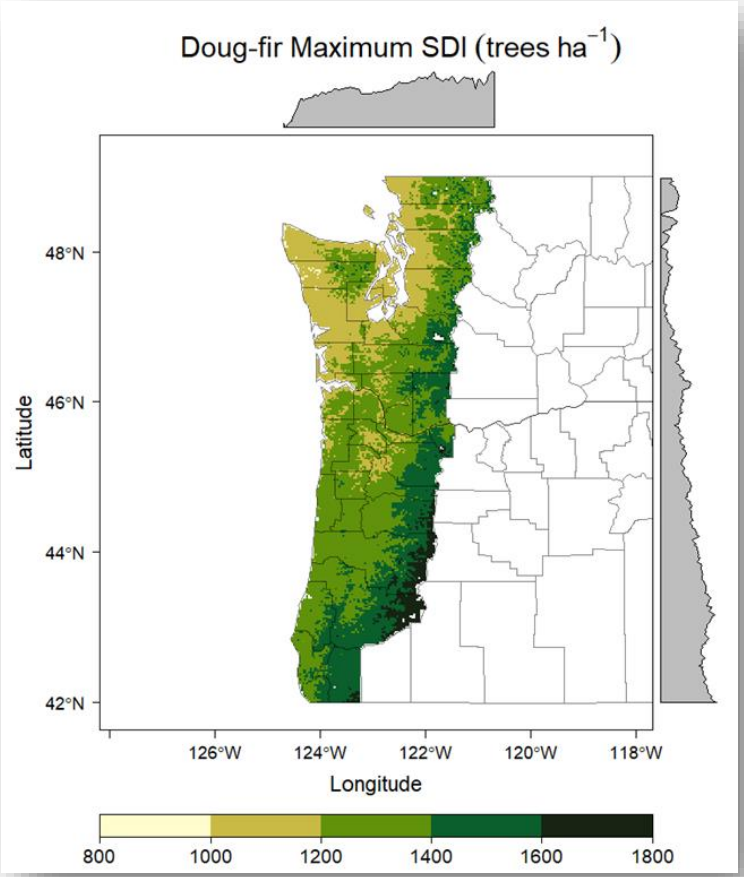
The primary deliverables will include:

1) Harmonized dataset for major commercial species throughout US forestlands;

2) Machine learning models relating SDImax to various species functional traits, stand attributes (e.g., structure, diameter distribution, site index), and environmental factors (e.g., soils, topography, climate);

3) High-resolution (10-30 m) raster maps of predicted SDImax for use in multiple digital platforms;

4) Annual progress reports and presentations and a final report and presentation + peer-review publications and conference presentations.

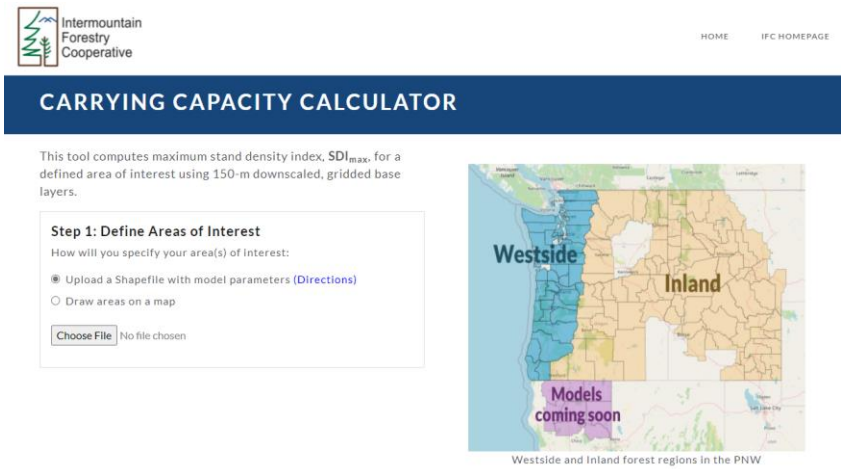


Company Benefits

Identification of optimal planting or thinning residual densities as a function of:

- Species composition
- Site resources
- Silvicultural treatments

Consistent methodology/platform for identifying and managing forest density across multi-regional land holdings



Westside and Inland forest regions in the PNW

Recommendations

Forthcoming ……...

Summary

Dr. Jaslam Poolakkal hired – April 2022

Database acquisition complete – summer 2022

Standardized forest inventory dataset – late summer 2022

Begin regional SDImax modeling – early fall 2022

Draft regional SDImax models review by IAB members – winter 2022/23