Forecasting Net Forest Biomass Changes for Land Management in Interior Alaska

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Background

- Disturbances and climate change play a key role in changing boreal forest demographics.
- Changes in boreal forests, including forest productivity and biomass, are important factors in national carbon budgets and informing management decisions.
- Most models predicting changes in boreal forests are long-term (i.e., many decades) and relatively coarse-resolution, whereas most management decisions are fine-scale and short-term.
- There is a lack of shorter-term (5-20 years) biomass predictions incorporating climate change information that would help managers make more informed decisions.

Objective

Develop and apply a 5-20 year high-resolution forecast for aboveground biomass in interior Alaska boreal forests.

Methods

We developed a model based on data from about 25,000 field sites, predicting short term biomass on a coarse, site-level scale. Here, we are transitioning the site-level model into a gridded model and product, bot at 30m (stakeholder region) and 500m (across Canada and Alaska).
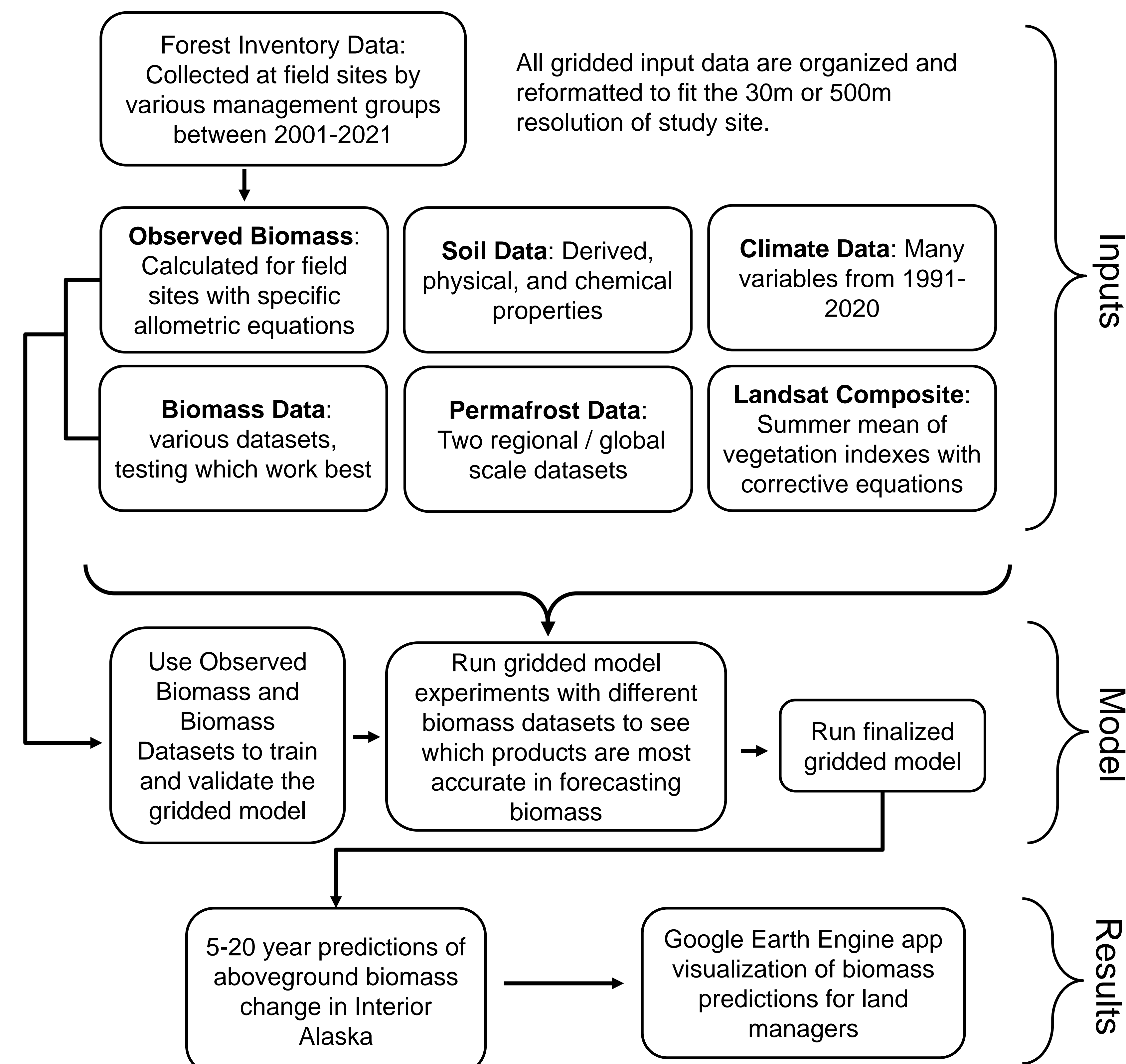
Results

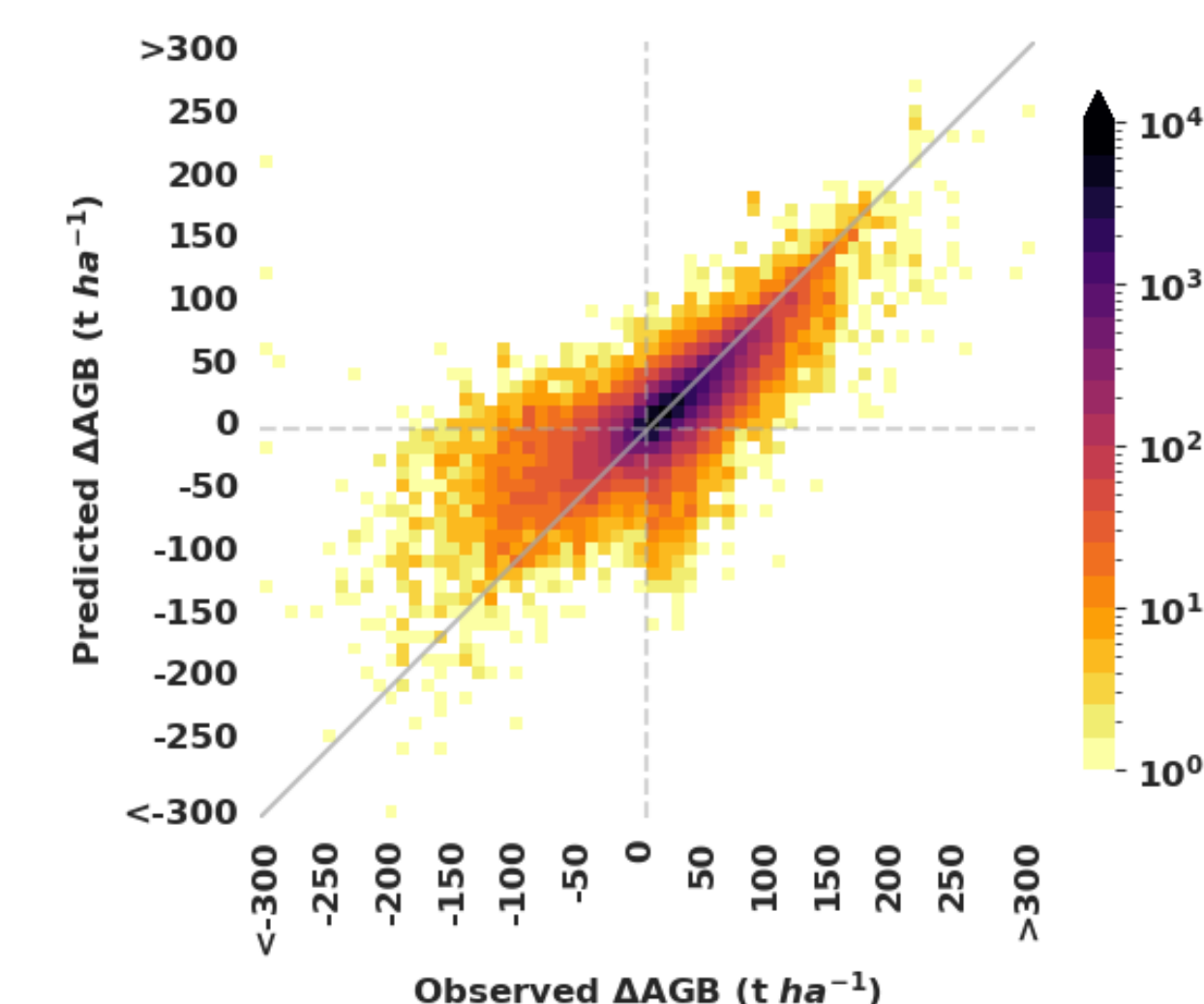Model is highly accurate in predicting the direction of biomass change across with-held validation sites

Figure 1: **Model Performance.** The heatmap shows the observed vs predicted values in the multi-model ensemble. Model ensemble has an R2 performance of ~0.63
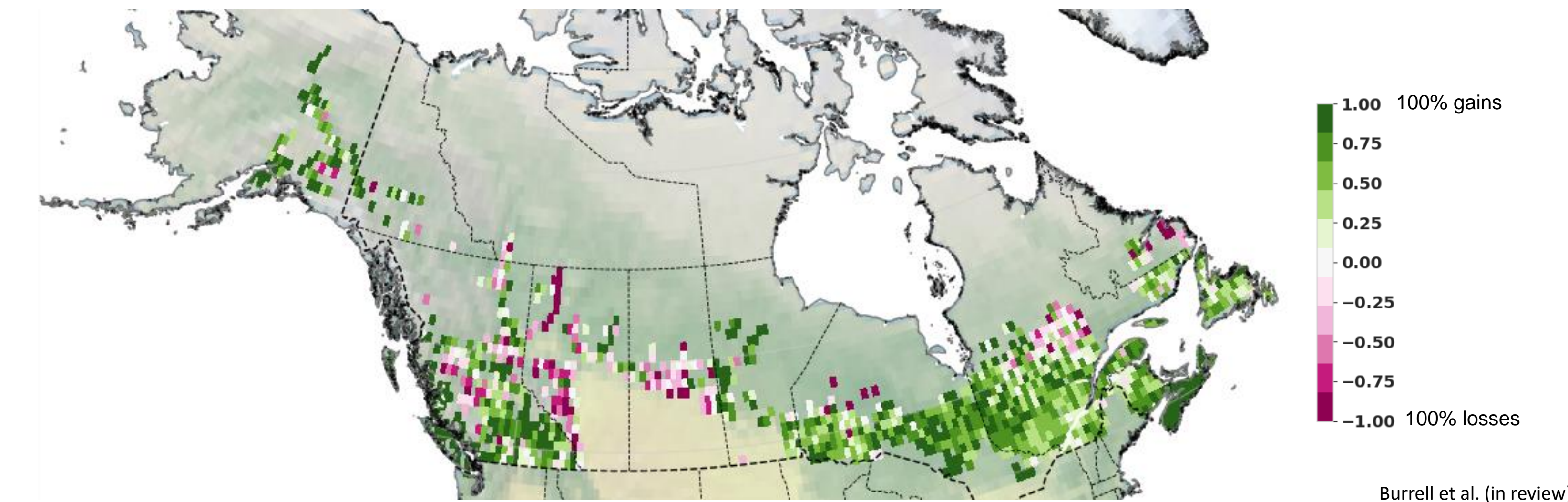

Figure 2: **Site Results.** Predicted biomass changes by 2030 at forest inventory sites.

Burrell et al. (in review)

- Model does not include the impact of disturbances such as wildfires, which are increasing in frequency and severity due to climate change
- Disturbances like wildfires may offset forecasted increases in biomass

Paper in review:
Burrell A. et al, "The predictability of near-term forest biomass change in boreal North America", 2023

Ongoing and Future Work

Question for the Reader:
*Can you recommend any **gridded species** or **biomass datasets** we could use in the 30m or 500m model?*
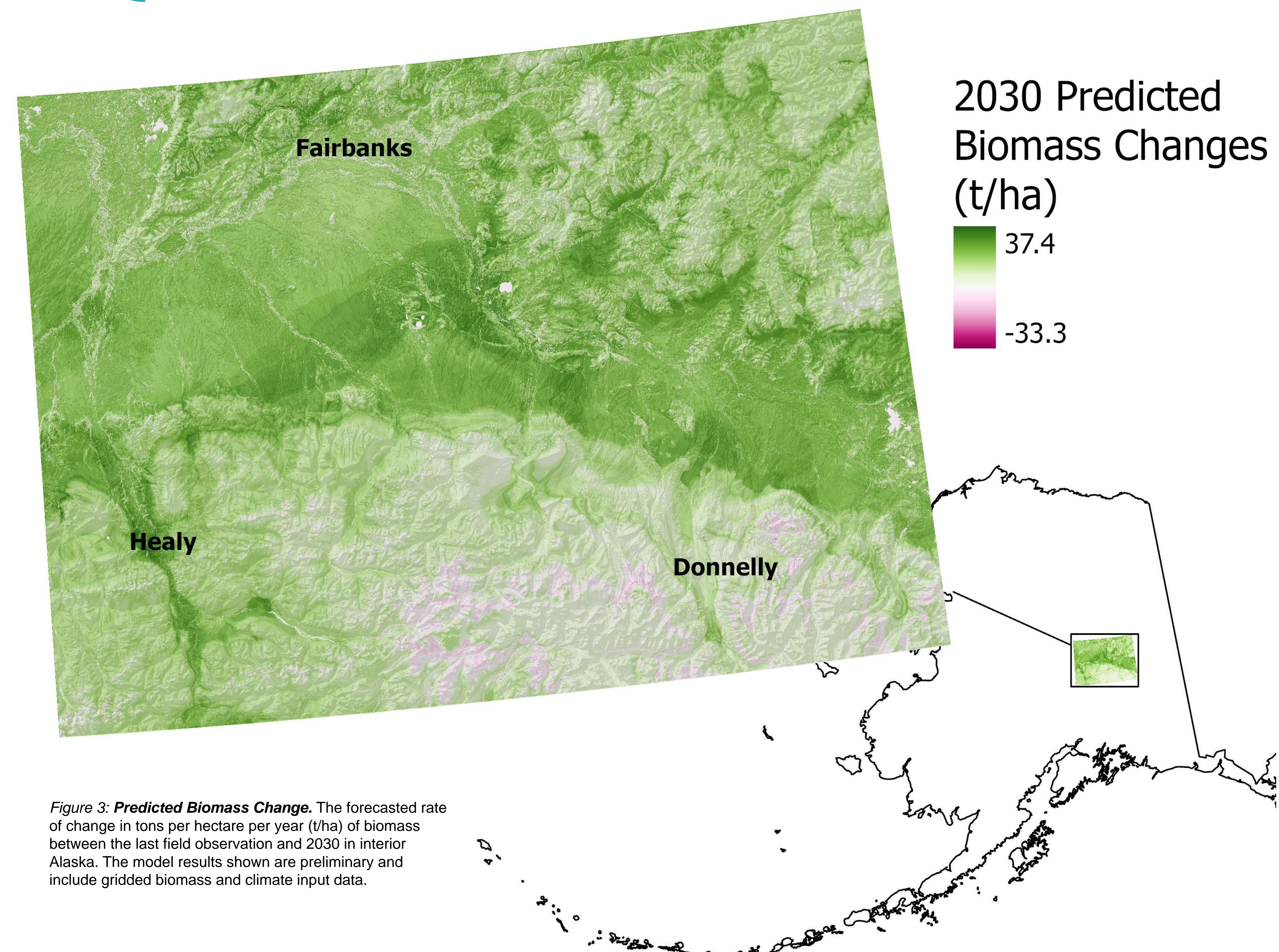

2030 Predicted Biomass Changes (t/ha)

37.4

-33.3

Figure 3: **Predicted Biomass Change.** The forecasted rate of change in tons per hectare per year (t/ha) of biomass between the last field observation and 2030 in interior Alaska. The model results shown are preliminary and include gridded biomass and climate input data.

30m Model

- Run model experiments to determine optimal predictors
- Finalize a gridded forecast for interior Alaska study area
- 30m model applications at stakeholder regions in Canada
- Create a Google Earth Engine App with biomass predictions for land managers

500m Model

- Gather gridded input data at 500m scale
- Run model at the North American scale using several gridded biomass products
- Publish and archive data

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