Measuring forest aboveground biomass:
Integrating lidar and Landsat data to quantify amount and uncertainty

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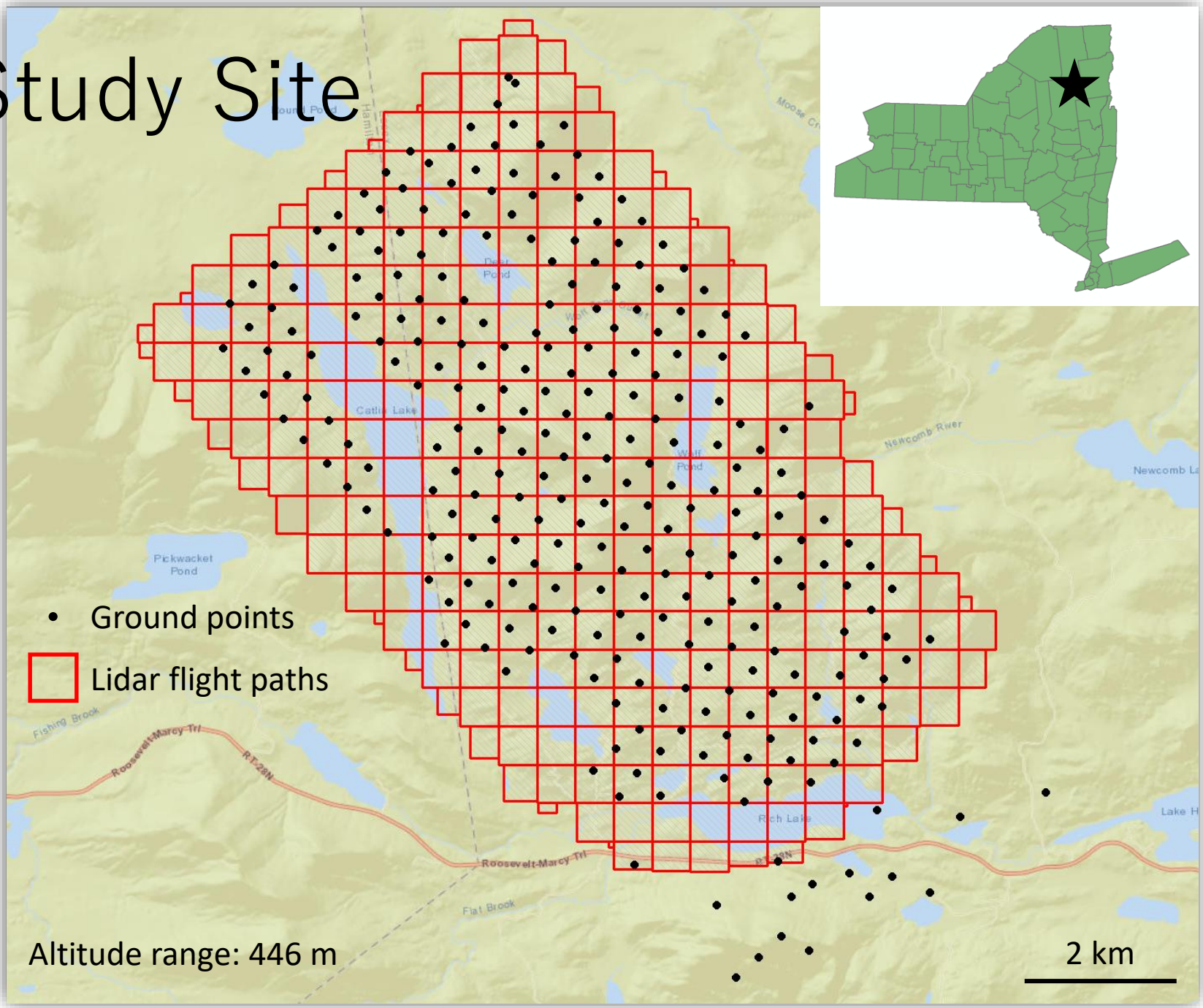
Background

- Why estimate forest aboveground biomass (AGB)?
  - Address technical and scientific questions
  - Estimate forest productivity
  - Monitor global carbon cycle over time
- Challenges

- What is needed?
  - Easy access, low cost, high precision

Study Site


Ground points
Lidar flight paths
Altitude range: 446 m
2 km
Roosevelt-Marcy Trl
Fishing Brook
Pickwacket Pond
Catlin Lake
Wolf Pond
Newcomb River
Rich Lake
Flat Brook

Methods

- Estimating AGB from Landsat

$$AGB = var_{Landsat_1} + var_{Landsat_2} + \ldots + var_{Landsat_n}$$

- Estimating AGB from lidar

$$AGB = var_{Lidar_1} + var_{Lidar_2} + \ldots + var_{Lidar_n}$$

- Estimating AGB from Landsat + lidar

$$AGB = var_{Landsat_1} + var_{Lidar_1} + \ldots + var_{Landsat_n} + var_{Lidar_n}$$

- Challenge

  What happens without full lidar coverage?

Methods

- Estimating AGB from Landsat + lidar

$$AGB_{ground} = var_{lidar_1} + \ldots + var_{lidar_n}$$
$$AGB_{lidar} = var_{Landsat_1} + \ldots + var_{Landsat_n}$$

- Estimate lidar variables from Landsat
  - Then estimate AGB from estimated lidar variables

$$AGB = var_{lidar_1} + \ldots + var_{lidar_n}$$
$$var_{lidar_1} = var_{Landsat_1} + \ldots + var_{Landsat_m}$$
$$\vdots$$
$$var_{lidar_n} = var_{Landsat_1} + \ldots + var_{Landsat_m}$$

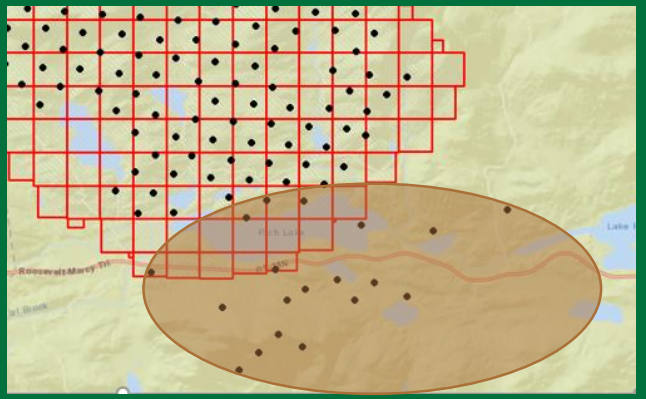
Results

Model comparison

Statistical analysis

- R^2, RMSE, AIC

Test data validation



Comparing methods

- Coverage
- Application
- Uncertainty (accuracy, precision)
- Cost
- Model efficiency

Thank you !