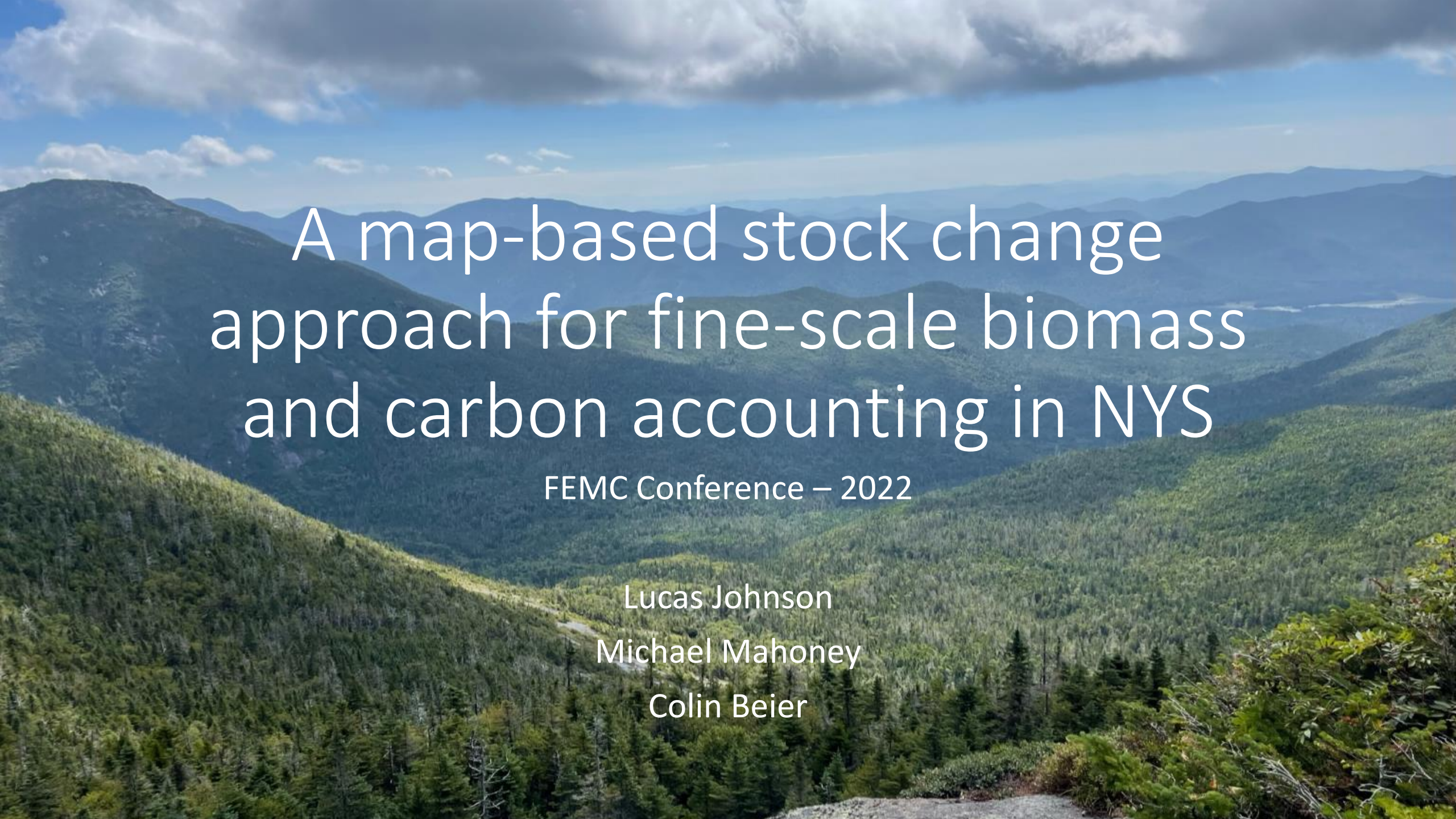


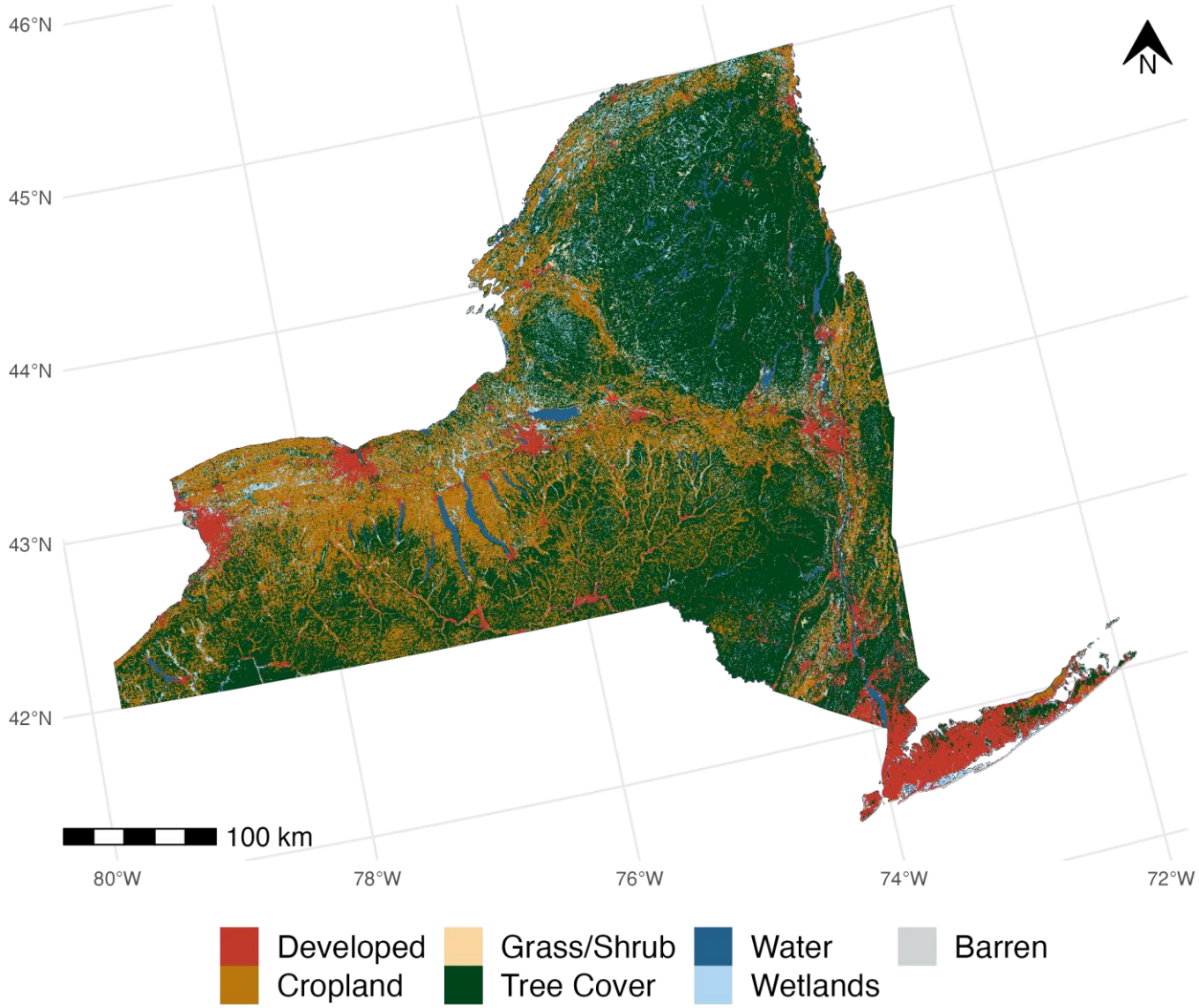
A map-based stock change approach for fine-scale biomass and carbon accounting in NYS

FEMC Conference – 2022

Lucas Johnson
Michael Mahoney
Colin Beier

Context & motivation

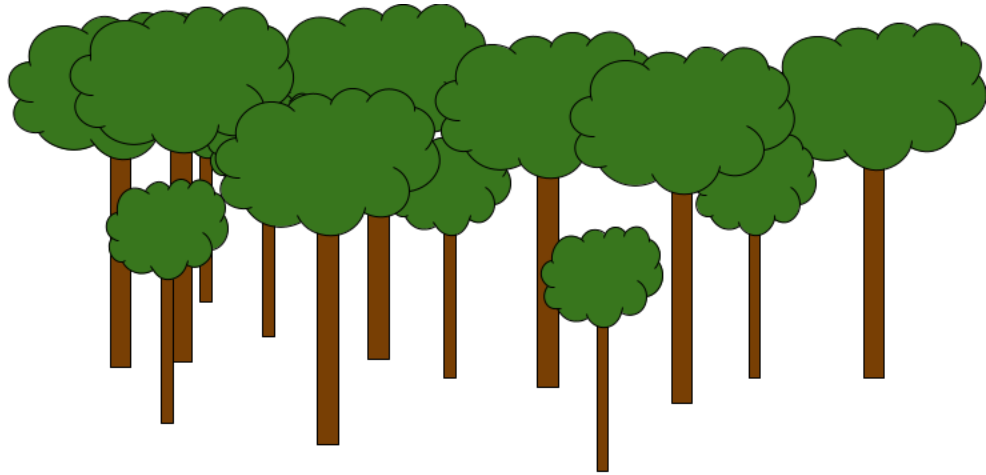
- NYS's Climate Leadership and Community Protection Act.
- 85% of emissions eliminated.
- Forest carbon sink in NYS expected to double in the next 30 years.



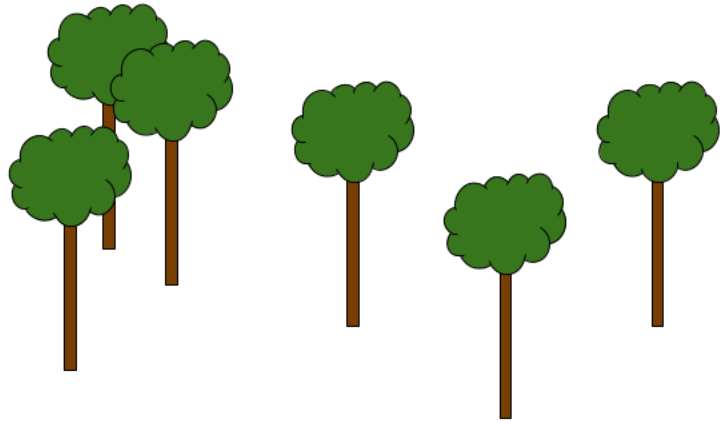
Stock change

- Changes in AGB/C between t1 and t2.
  - Gains = removals.
  - Losses = emissions.
- Translating FIA measurements into maps.
- Historical time series mapping -> spatially explicit stock change information.

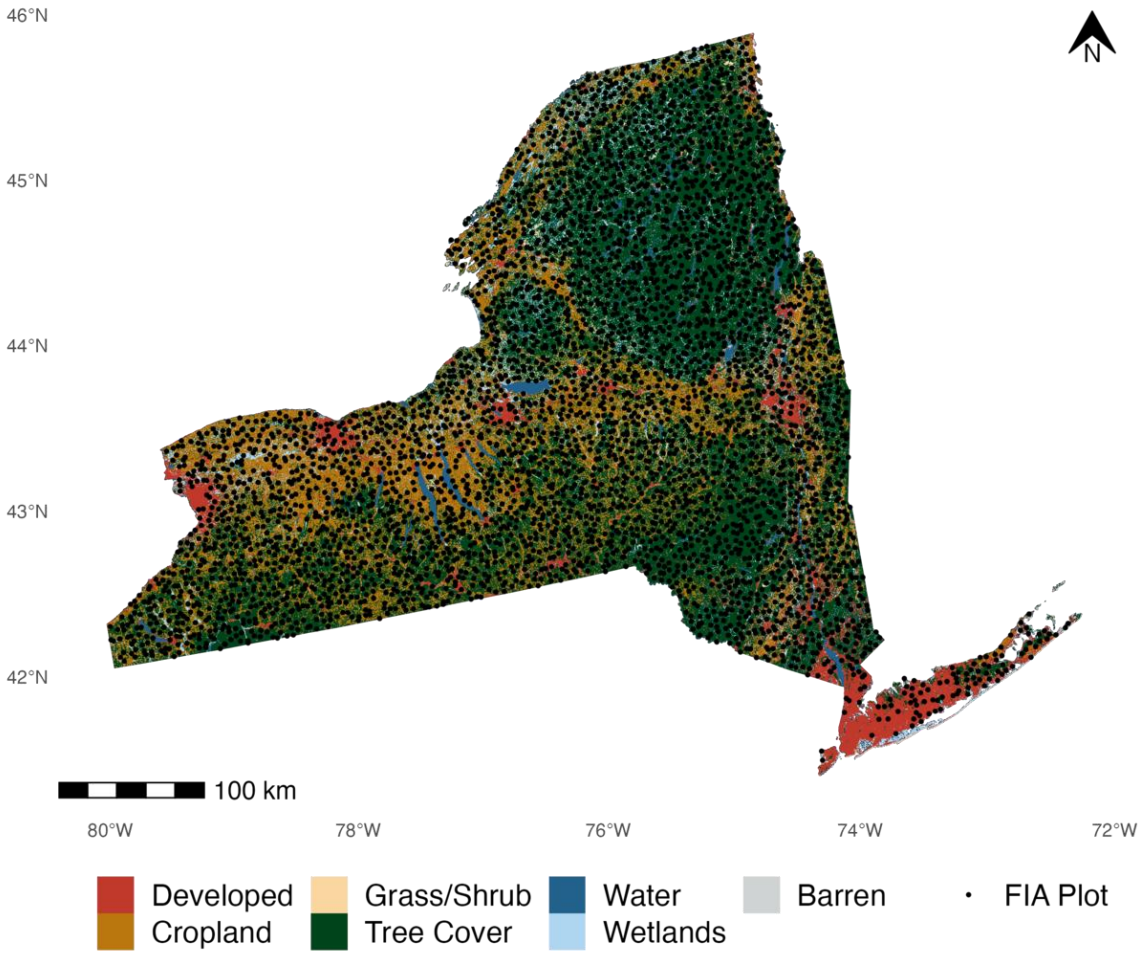
t1

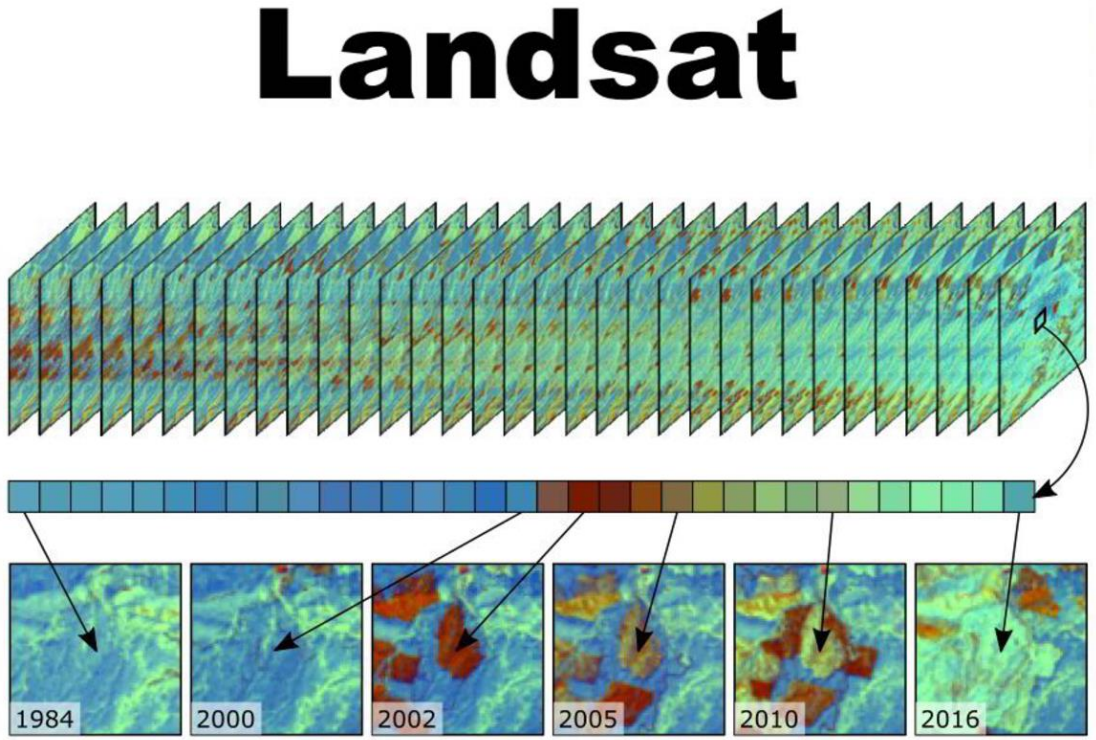


t2



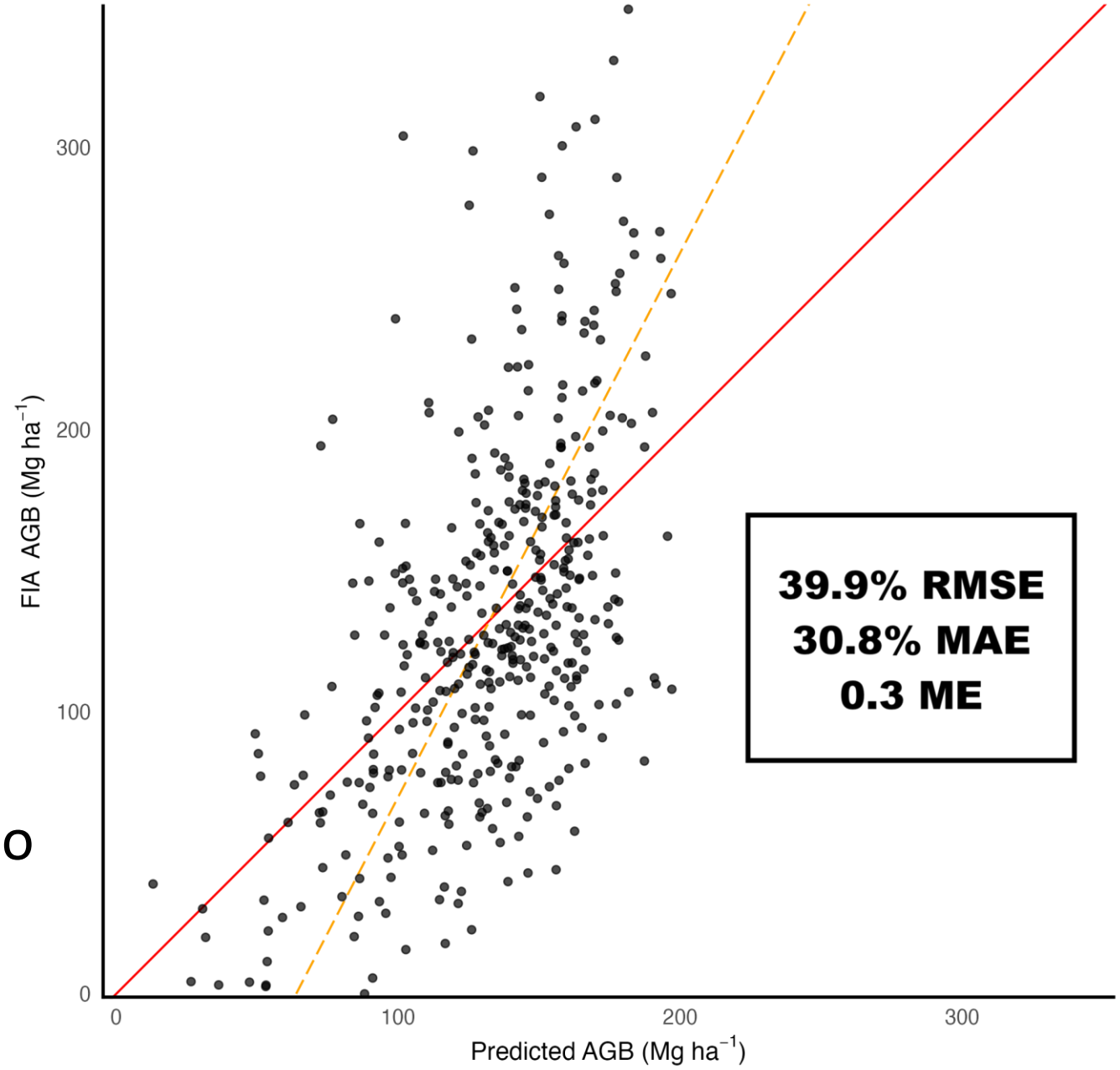
Our approach

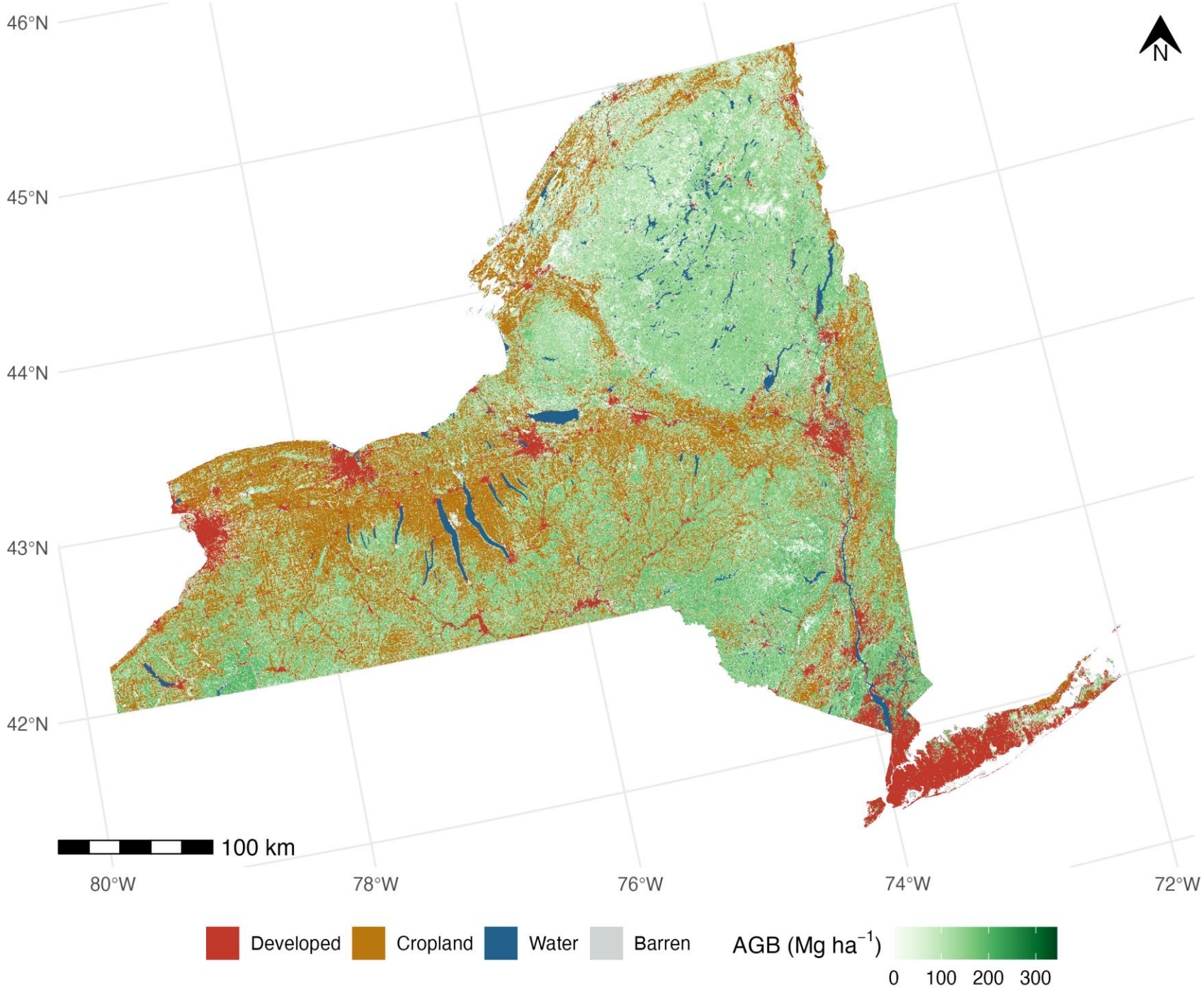


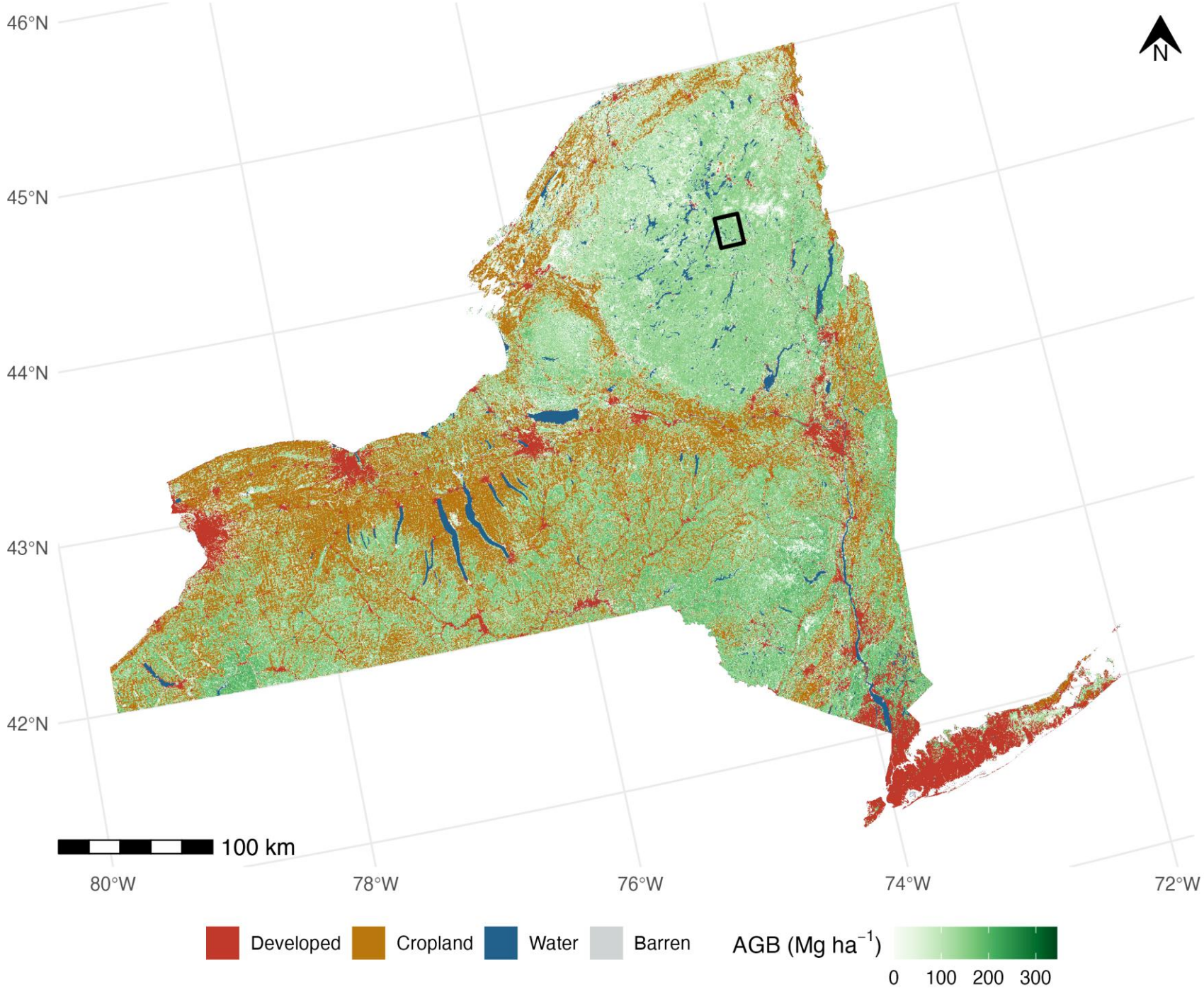


Modeling framework

- ~2000 FIA plots.
- Landsat spectral indices, topo, climate predictors.
- ML ensemble models:
  - Random forest
  - Gradient boosting machines
  - Support vector machines
- Mapped predictions compared to holdout plots.




46°N
45°N
44°N
43°N
42°N
N
100 km
80°W
78°W
76°W
74°W
72°W
Developed
Cropland
Water
Barren
AGB (Mg ha^{-1})
0
100
200
300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100 km
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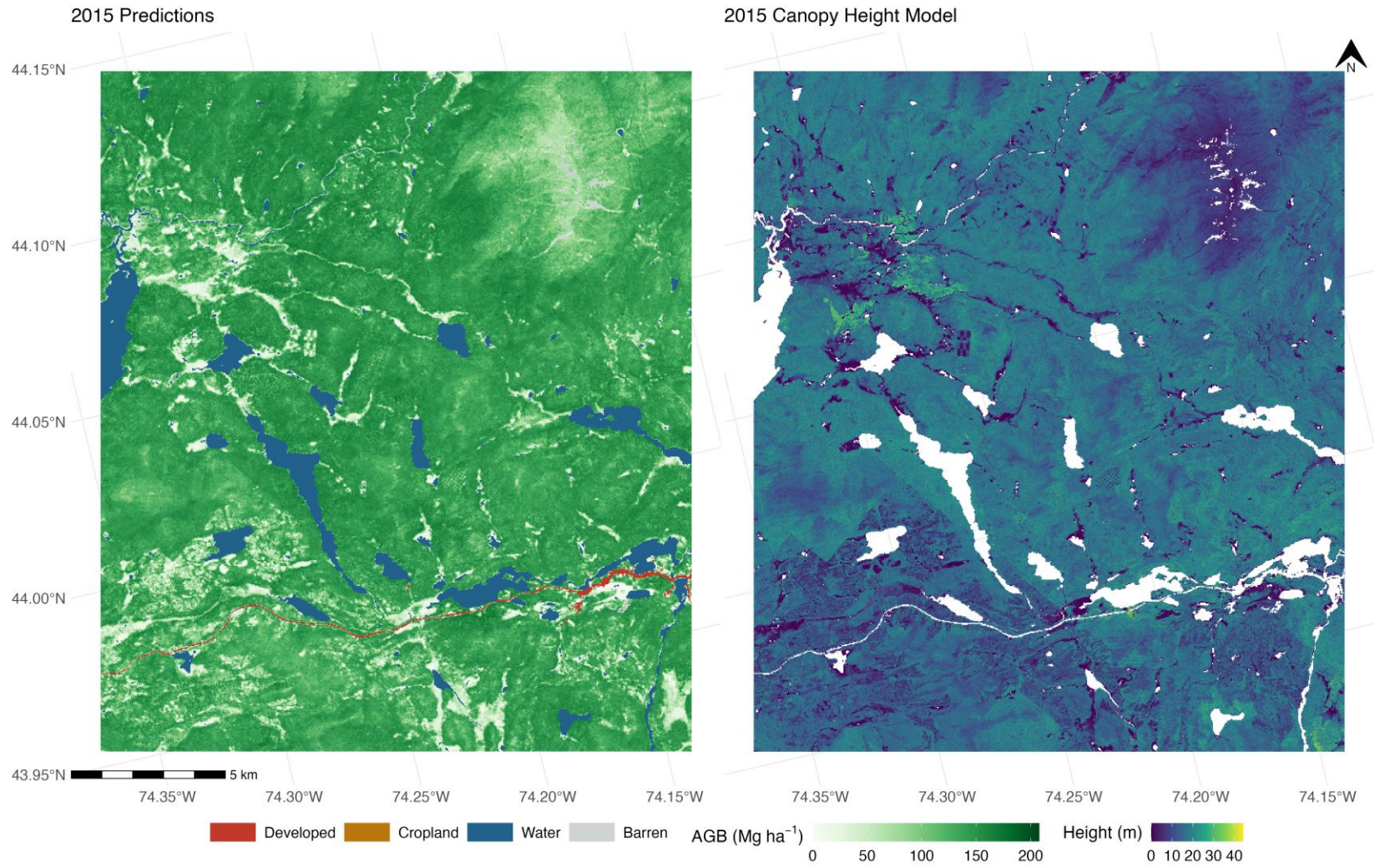
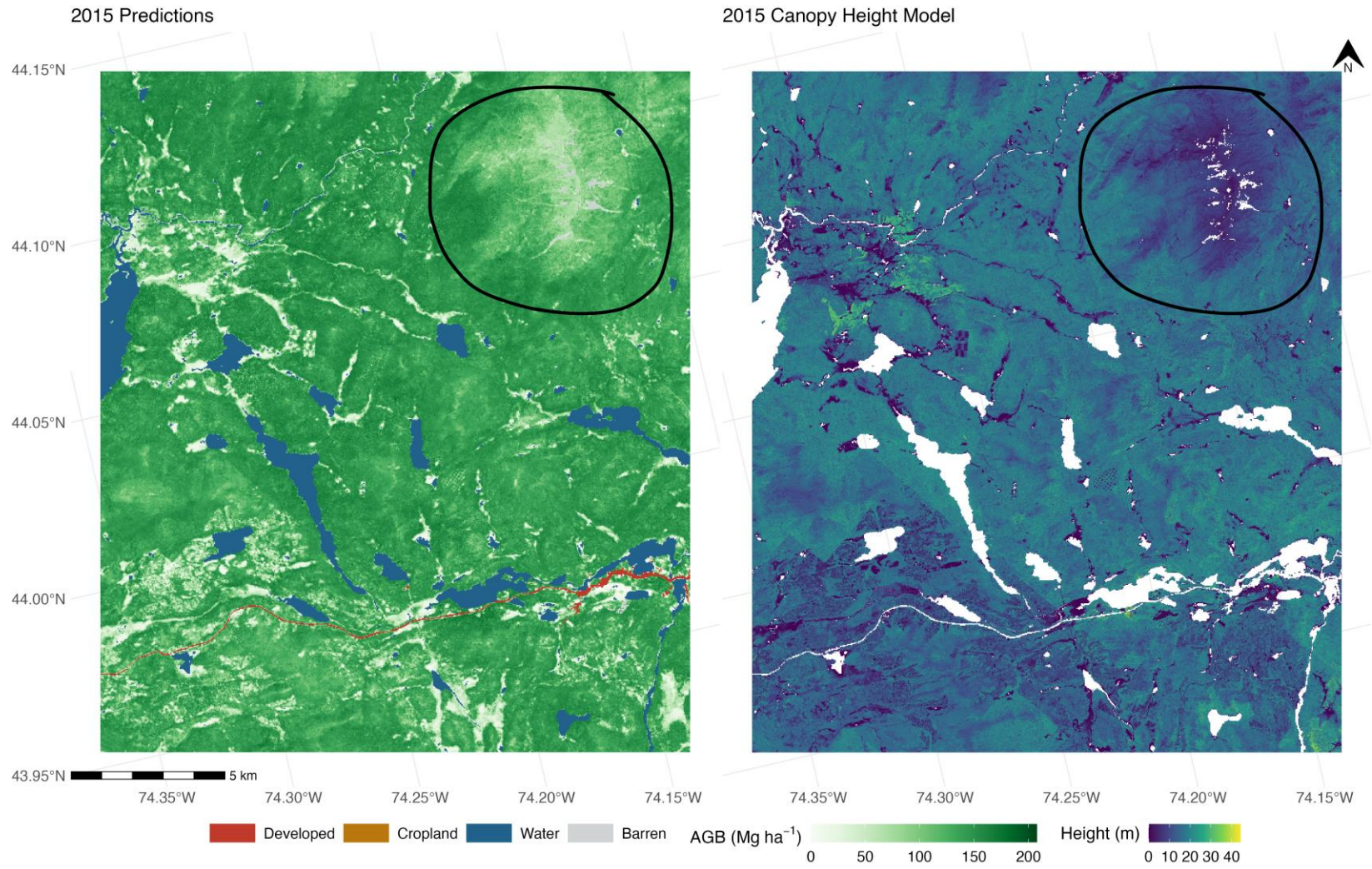
74°W
72°W
Developed
Cropland
Water
Barren
AGB (Mg ha^{-1})
0
100
200
300

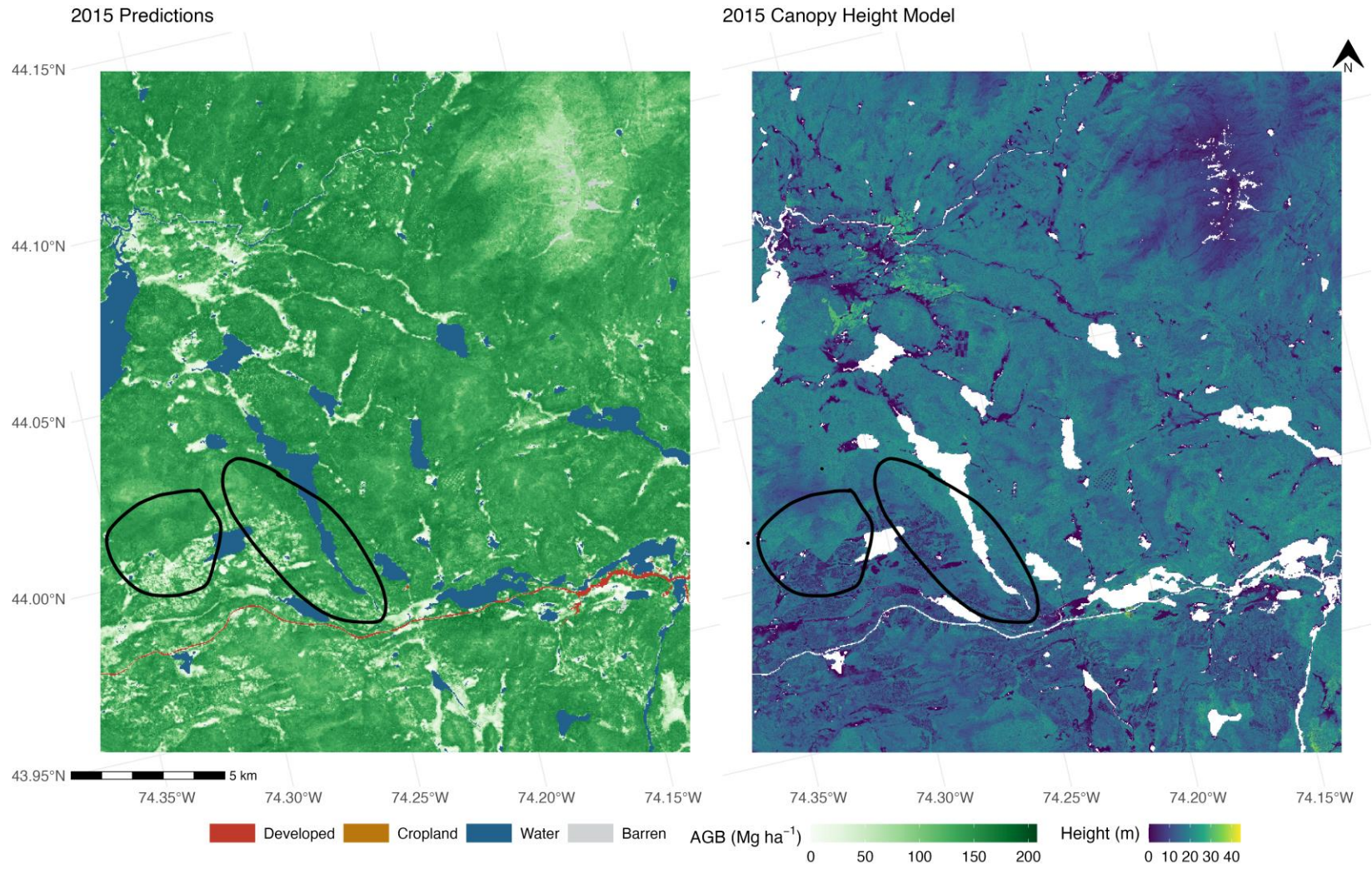
Huntington Wildlife Forest - AGB



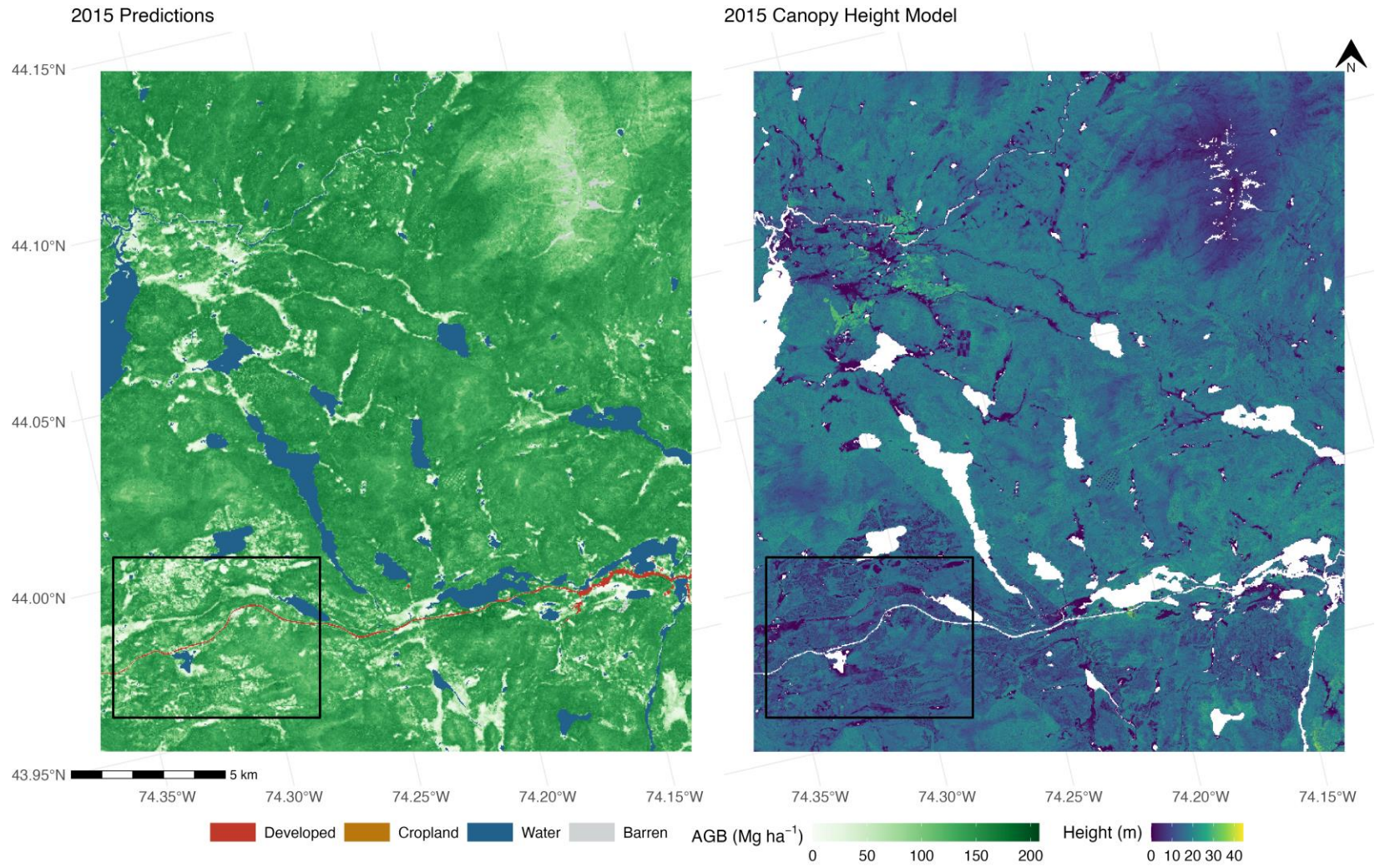
Huntington Wildlife Forest - AGB

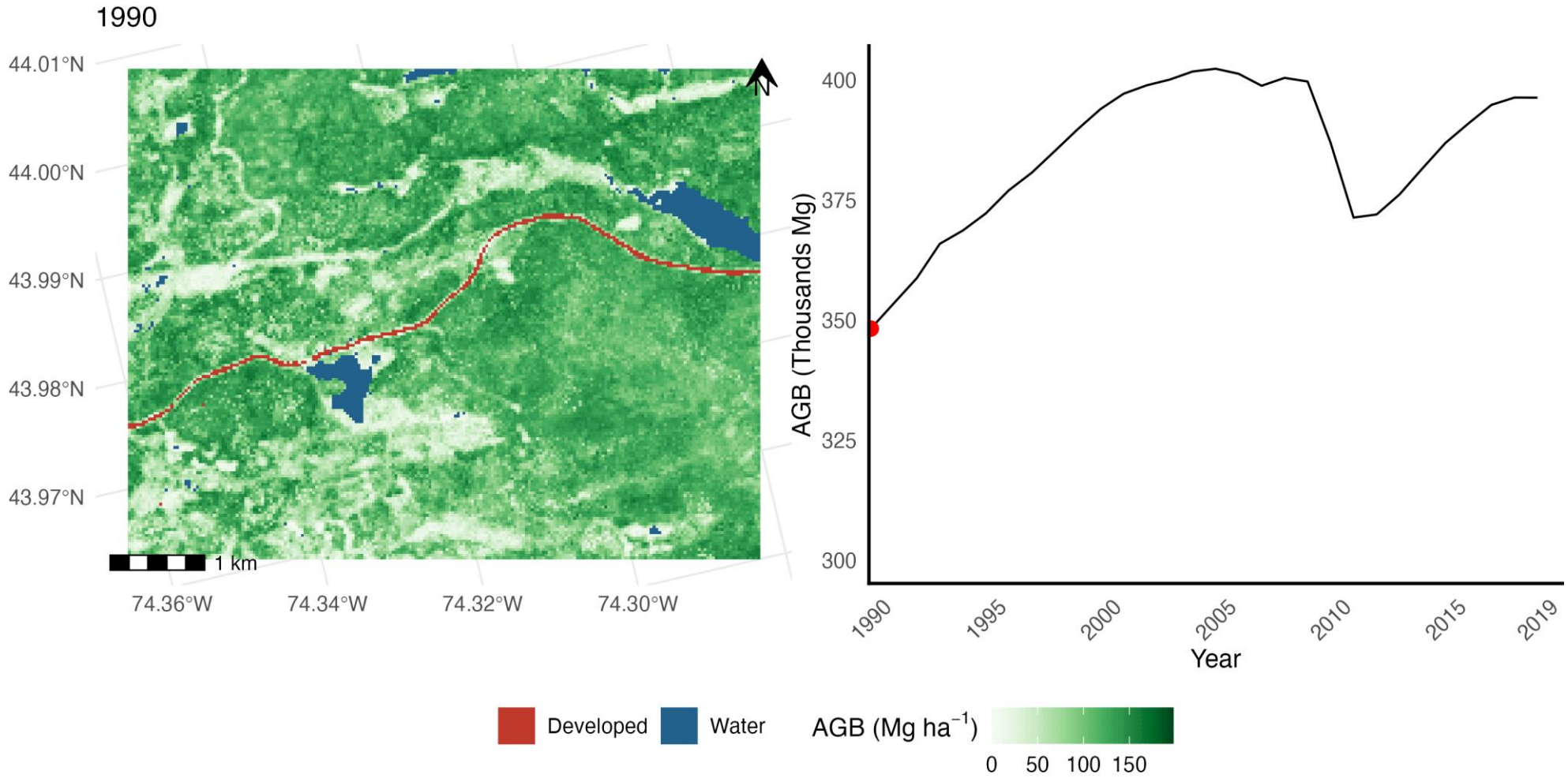


Huntington Wildlife Forest - AGB

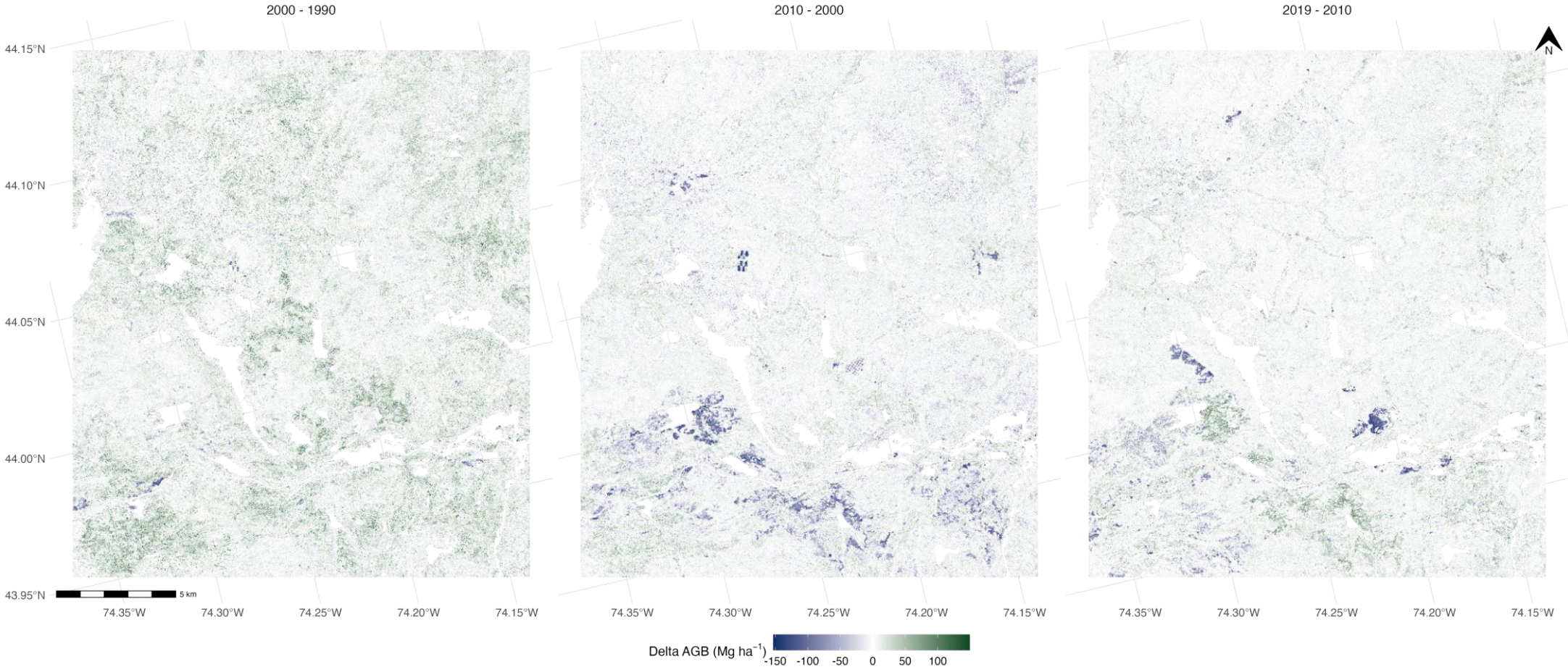


Huntington Wildlife Forest - AGB

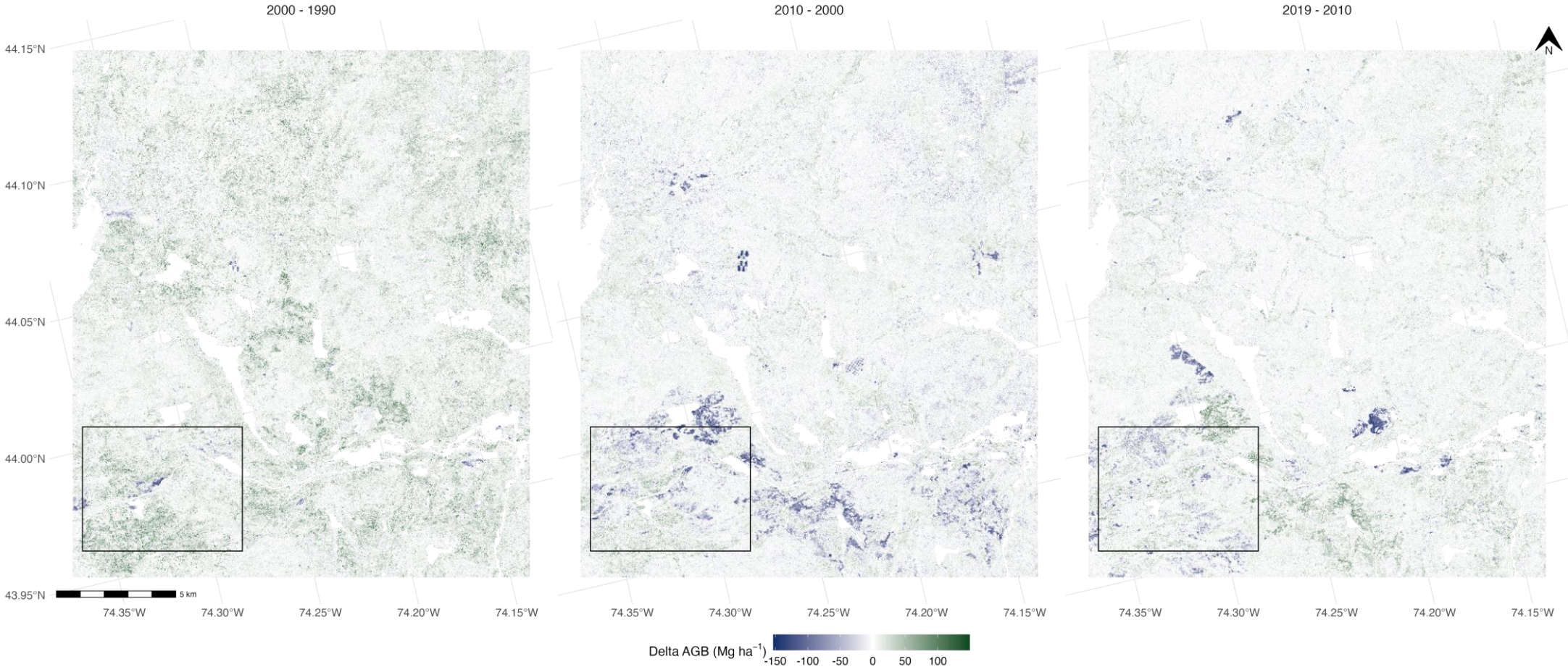


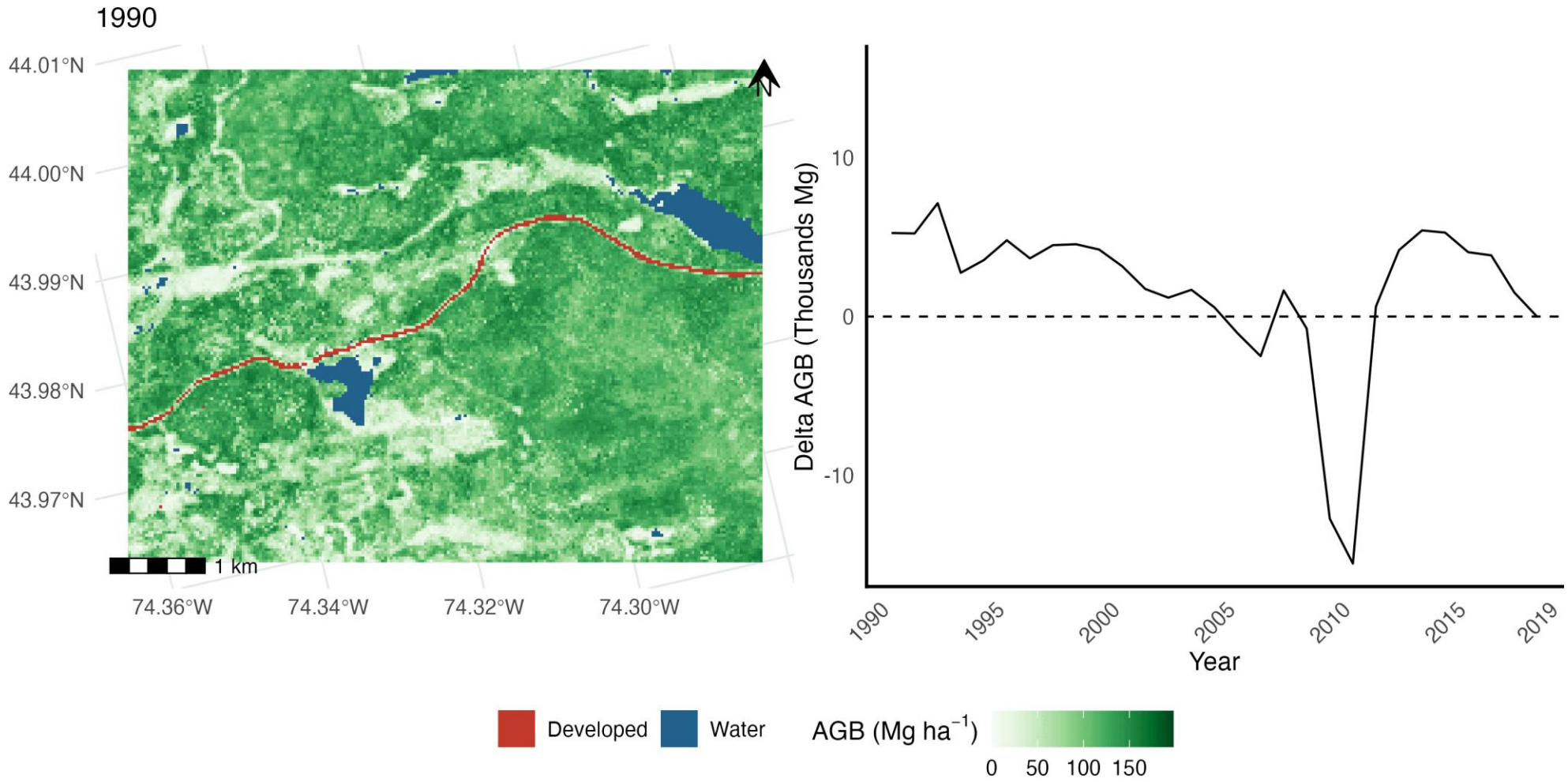

1990
44.01°N
44.00°N
43.99°N
43.98°N
43.97°N
N
1 km
74.36°W
74.34°W
74.32°W
74.30°W
AGB (Thousands Mg)
400
375
350
325
300
1990
1995
2000
2005
2010
2015
2019
Year
Developed
Water
AGB (Mg ha^{-1})
0
50
100
150

Huntington Wildlife Forest - Deltas



Huntington Wildlife Forest - Deltas




1990
44.01°N
44.00°N
43.99°N
43.98°N
43.97°N
N
1 km
74.36°W
74.34°W
74.32°W
74.30°W
Delta AGB (Thousands Mg)
10
0
-10
1990
1995
2000
2005
2010
2015
2019
Year
Developed
Water
AGB (Mg ha^{-1})
0
50
100
150

Limitations

- Saturation effect.
- Subtle changes – steady growth and decline.
- Limited applicability for soil & litter carbon pools.

Upshot

- Cheap and efficient.
- Represents landscape patterns and processes.
- Flexible capacity:
  - Micro -> macro scale.
  - Retrospective -> monitoring.

Thank you!

Access these slides at:

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lucaskjohnson.com

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ESF State University of New York College of Environmental Science and Forestry

CAFRI Climate & Applied Forest Research Institute