



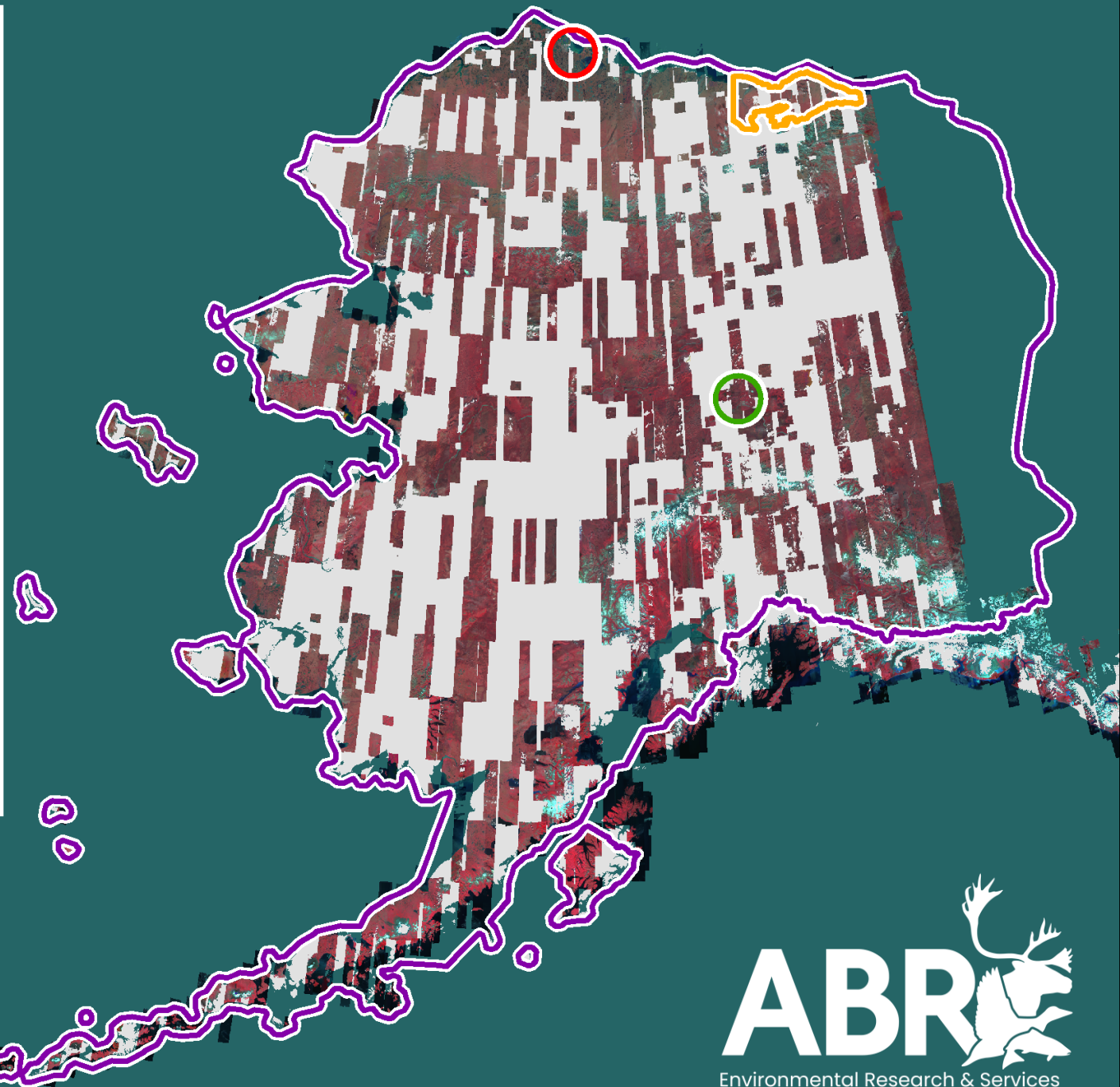


Vegetation and Wildlife Applications of High-Resolution Imagery

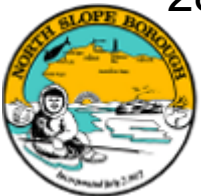
-  Ikpikpuk Delta Snow Goose Colony
(0.05 m, 147 km²)
-  Peat Pond Sedge Meadow
(0.03 m, 0.01 km²)
-  ANWR Arctic Coastal Plain Land Cover
(2 m, 14,000 km²)
-  Arctic and Boreal Alaska / NW Canada
(Multi-resolution, ~2 million km²)



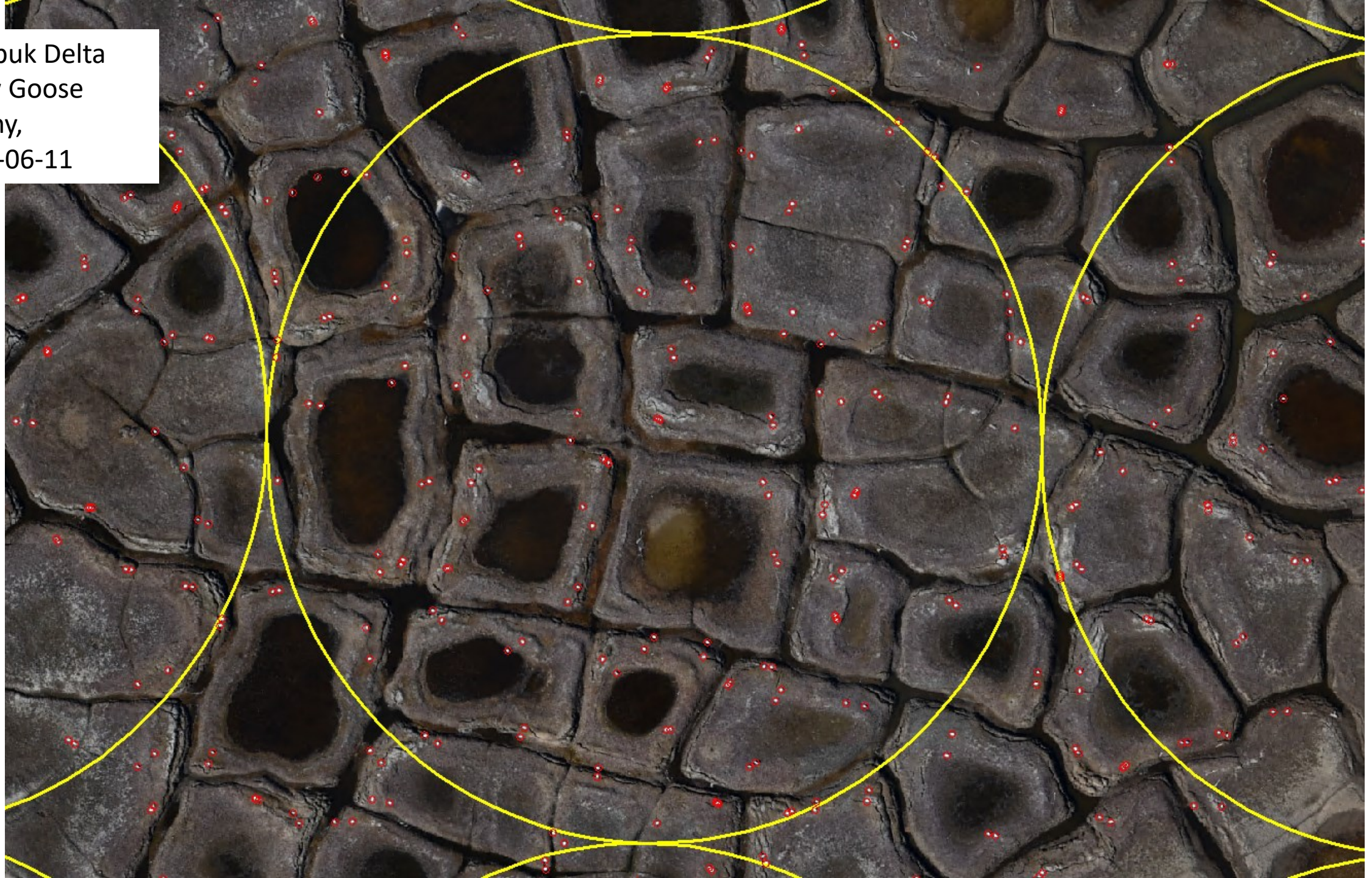
Ikpikpuk Delta Snow Geese Nesting Pair Photo Census 2023

North Slope Borough
Wildlife Management

- Flown 11 June 2023
- 5,600 geotagged 45 megapixel images
- Mosaic 5 cm resolution
- Ran YOLOv5 model trained on subset of 2022 data
- ~44,500 detections
- Provided nest density stratification data needed for field work, analysis complete 28 June



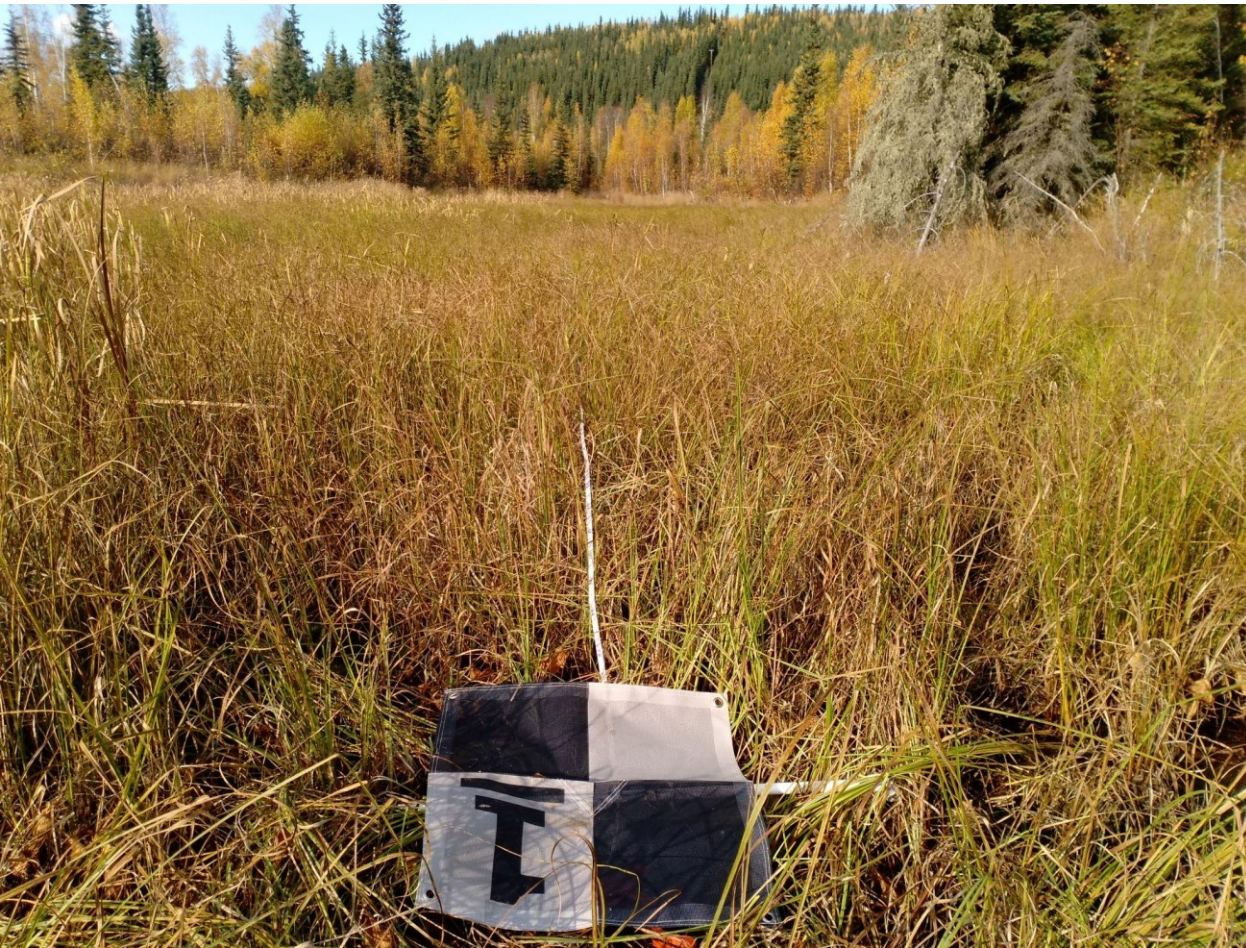
Ikpikuk Delta
Snow Goose
Colony,
2023-06-11



Vegetation Monitoring Metrics

Wet Sedge Meadow, Peat Ponds, Goldstream Valley, Alaska

17 September 2021



10
m

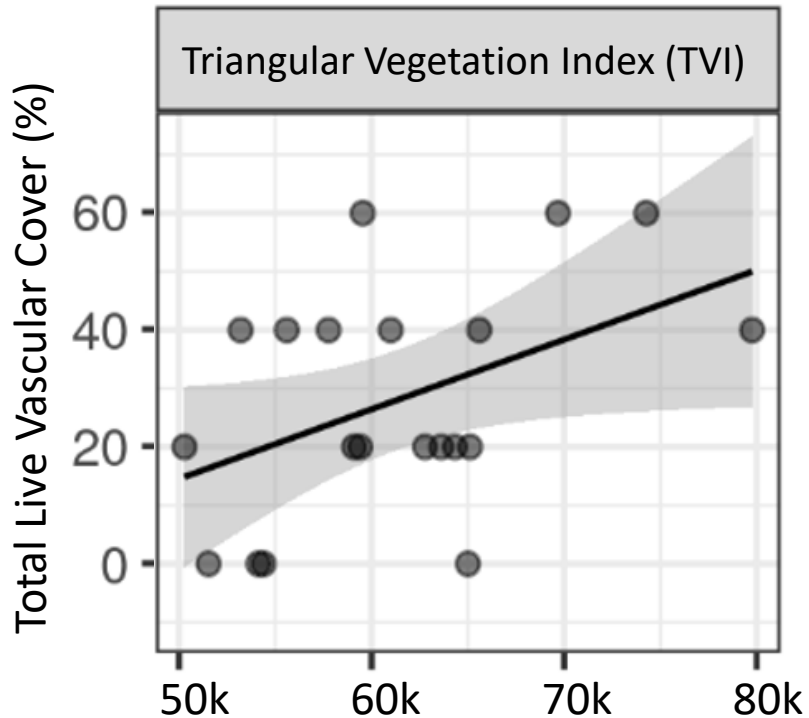
- Sample Lines
- Sample Points Top Hit
- Sedge
 - Cattail
 - Moss
 - Standing Dead or Litter
 - Water

Vegetation Monitoring Metrics

Wet Sedge Meadow, Peat Ponds, Goldstream Valley, Alaska

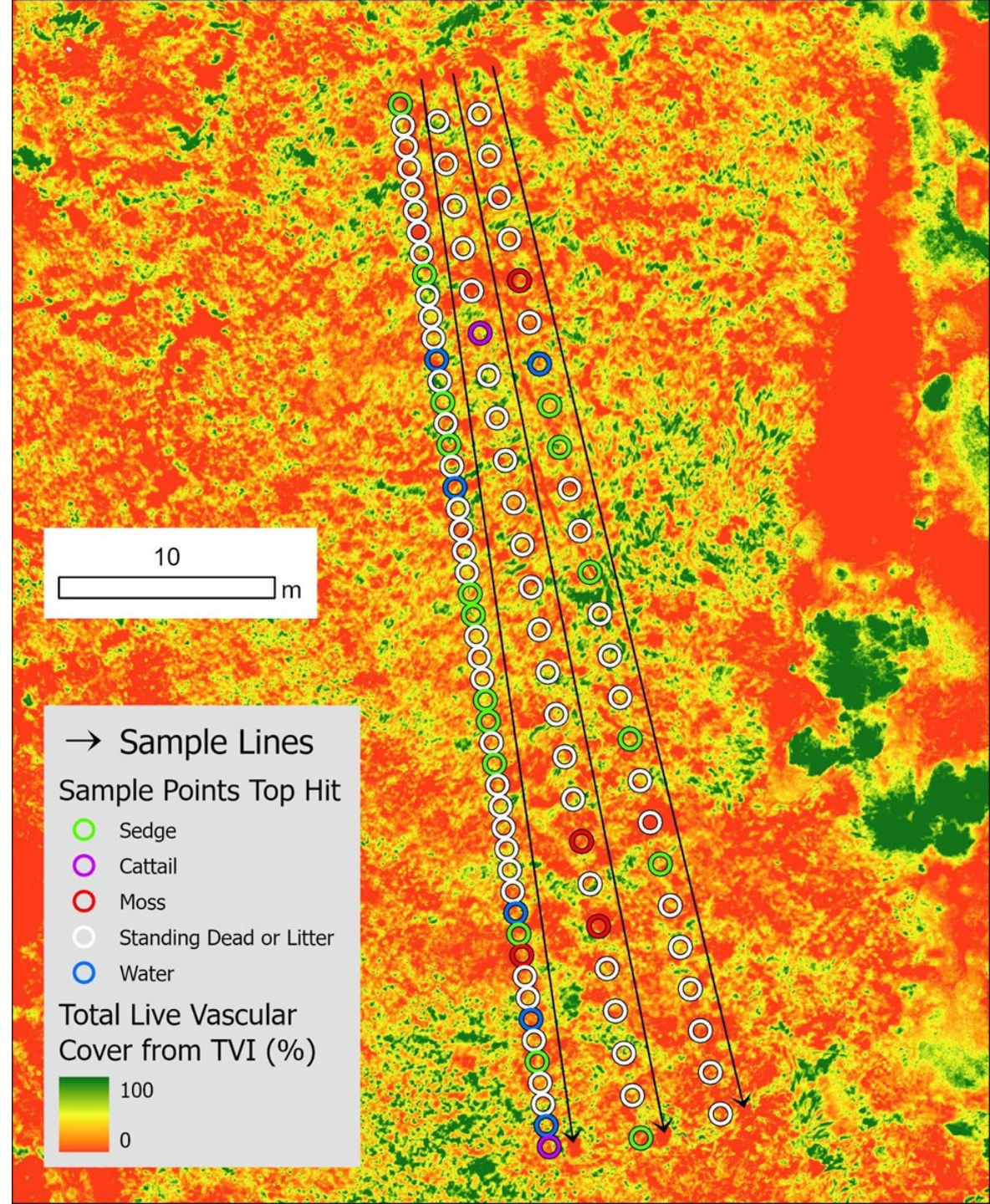
17 September 2021



$$TVI = \frac{120(\rho_{750} - \rho_{550}) - 200(\rho_{670} - \rho_{550})}{2}$$

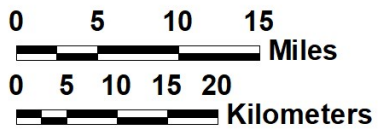


Total Live Vascular Cover (%) = $0.0012 * TVI - 45.07$

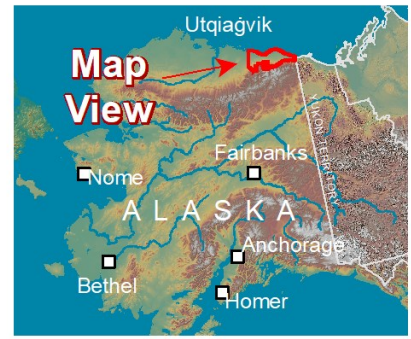
$R^2 = 0.20$
 $p = 0.046$



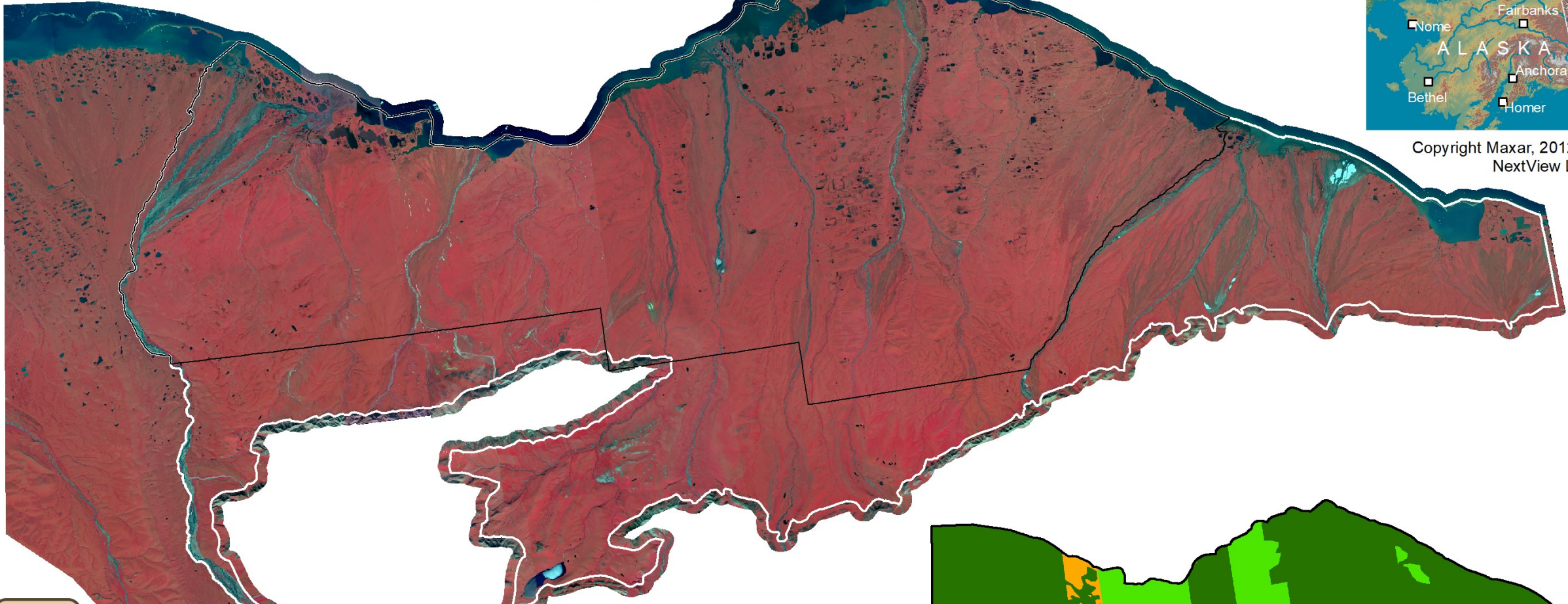
 Study Area
 ANWR 1002 Area



Kaktovik



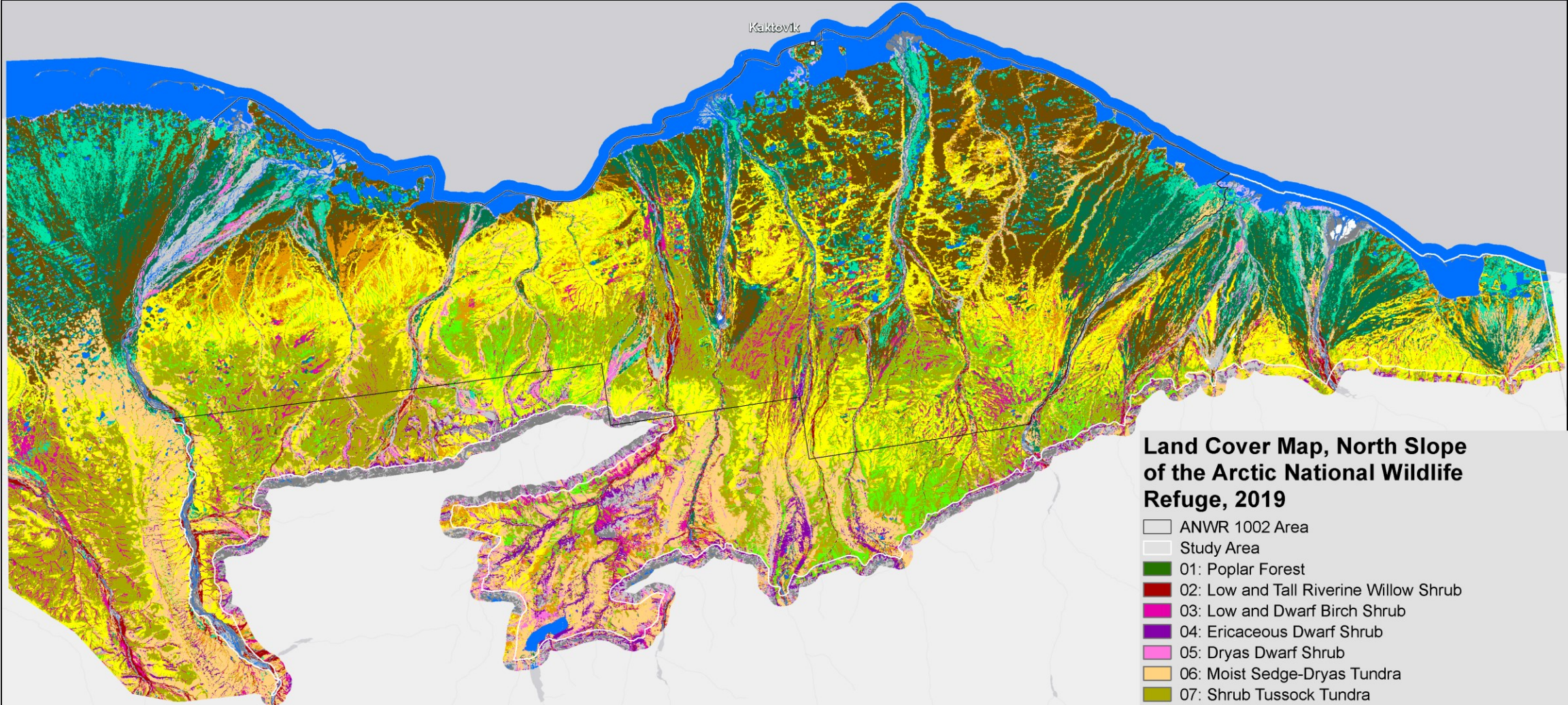
Copyright Maxar, 2012–2019
NextView License



**ANWR WorldView 2-m WorldView
Mosaic Normalized to Surface Reflectance
Source Imagery Month**

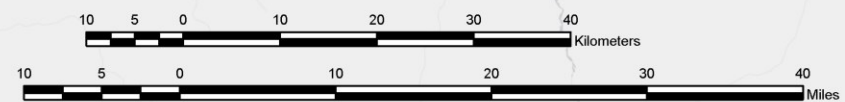


Kaktovik



Land Cover Map, North Slope of the Arctic National Wildlife Refuge, 2019

- ANWR 1002 Area
- Study Area
- 01: Poplar Forest
- 02: Low and Tall Riverine Willow Shrub
- 03: Low and Dwarf Birch Shrub
- 04: Ericaceous Dwarf Shrub
- 05: Dryas Dwarf Shrub
- 06: Moist Sedge-Dryas Tundra
- 07: Shrub Tussock Tundra
- 08: Tussock Tundra
- 09: Moist Sedge-Willow Tundra
- 10: Sedge-Willow Tundra in Drainage Tracks
- 11: Moist Sedge-Shrub Tundra with Wet Inclusions
- 12: Wet Sedge Meadow Tundra with Moist Inclusions
- 13: Wet Sedge Meadow Tundra
- 14: Freshwater Marsh
- 15: Salt Marsh
- 16: Water
- 17: Snowbed
- 18: Partially Vegetated
- 19: Barrens
- 20: Snow/Ice

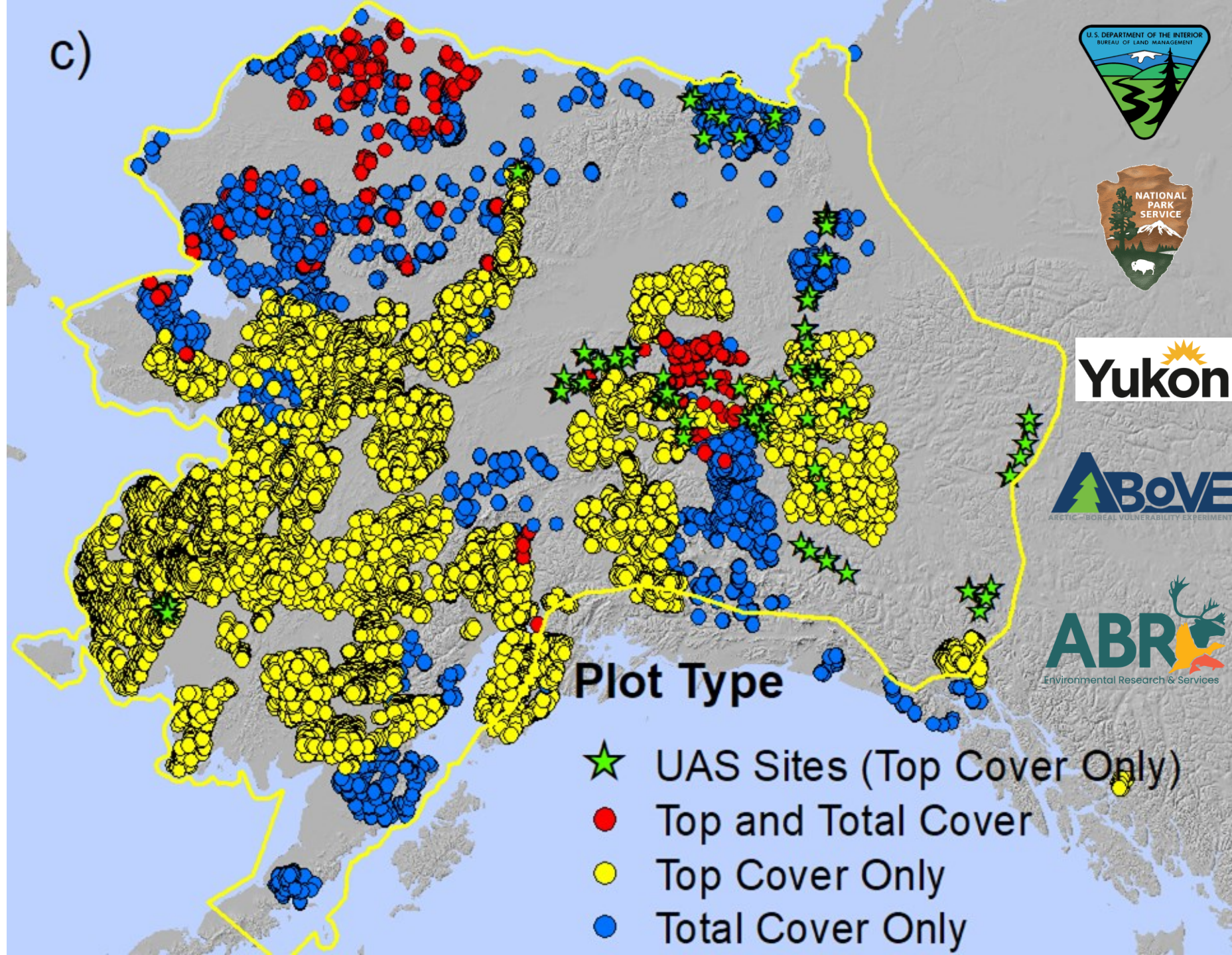


Macander, Wells, McNown
and Christopherson 2020

Vegetation
Cover
Reference
Data for Plant
Functional Type
Mapping

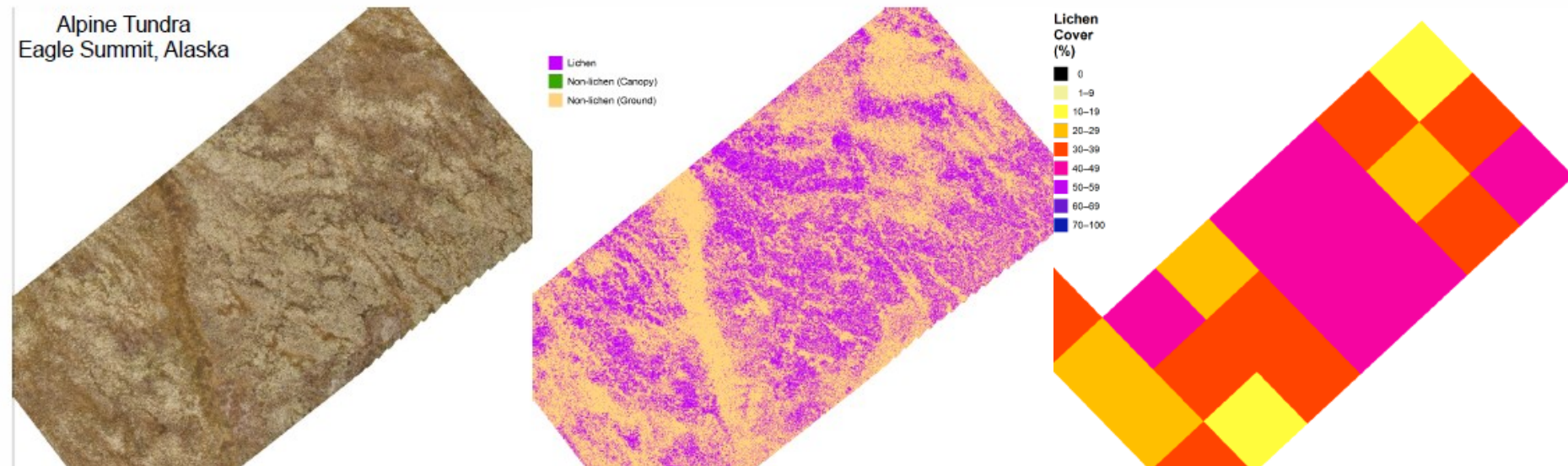
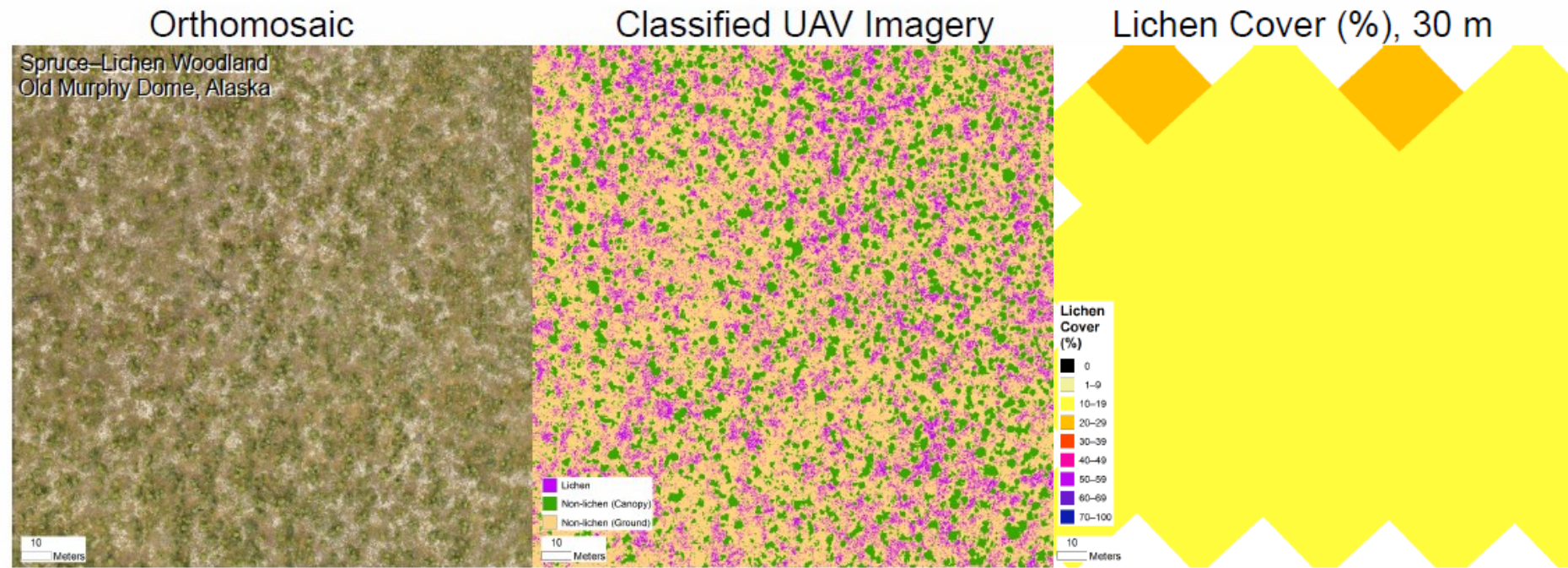
Mix of *in
situ*, aerial,
and UAS
data

[Macander
et al. 2022](#)



Fortymile Lichen Mapping

- Classified UAS imagery provided some of the training data for regional wall-to-wall models of lichen cover
- With Eric Palm, University of Montana
- [Macander et al. 2020](#)



Fortymile and Porcupine Herd Mapping

RGB UAS

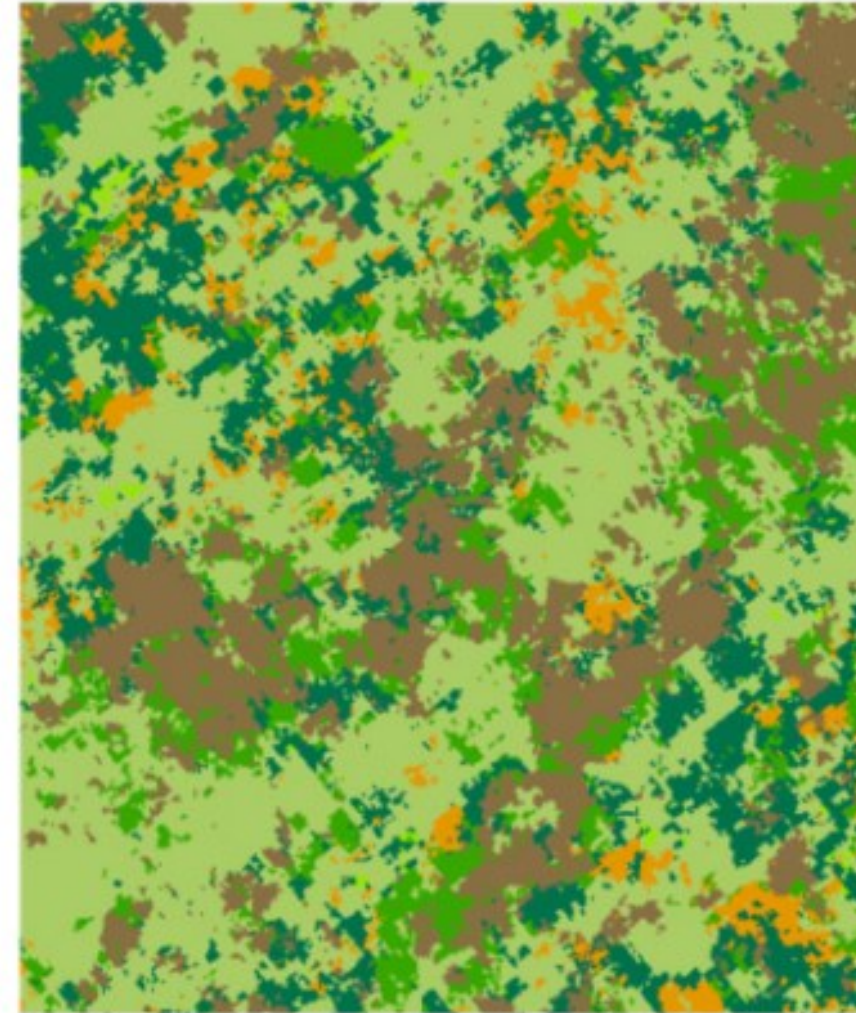
PFT Classification

-  Bryophytes
-  Deciduous shrubs
-  Evergreen shrubs
-  Forbs
-  Graminoids
-  Lichens
-  Non-vegetated

- With Katie Orndahl, Northern Arizona University

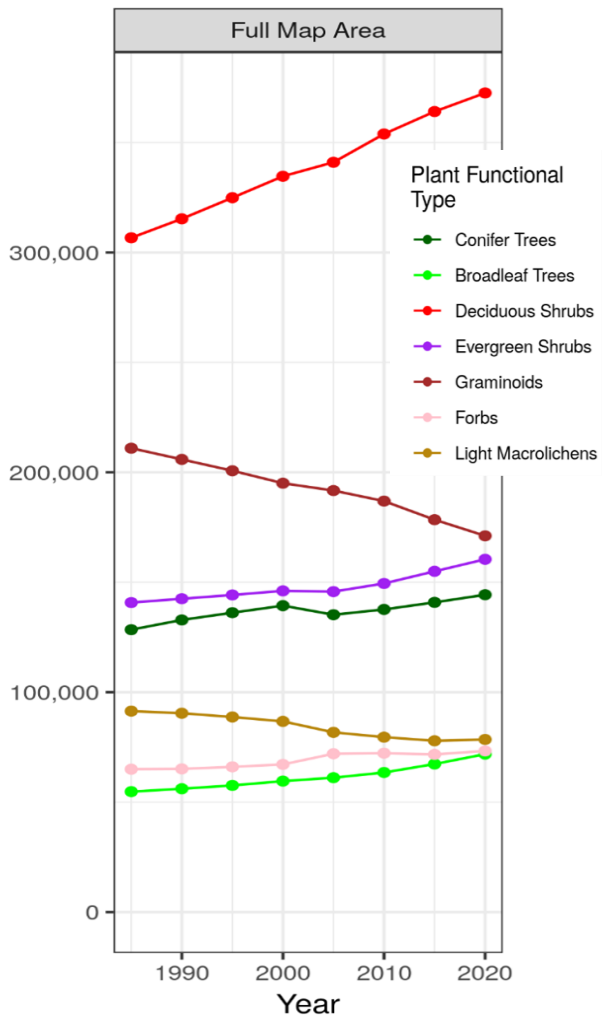
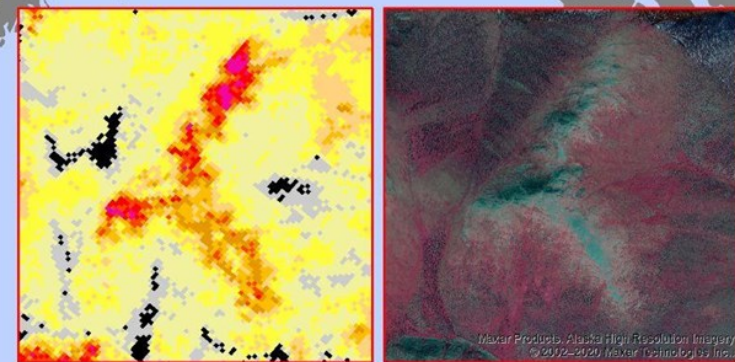
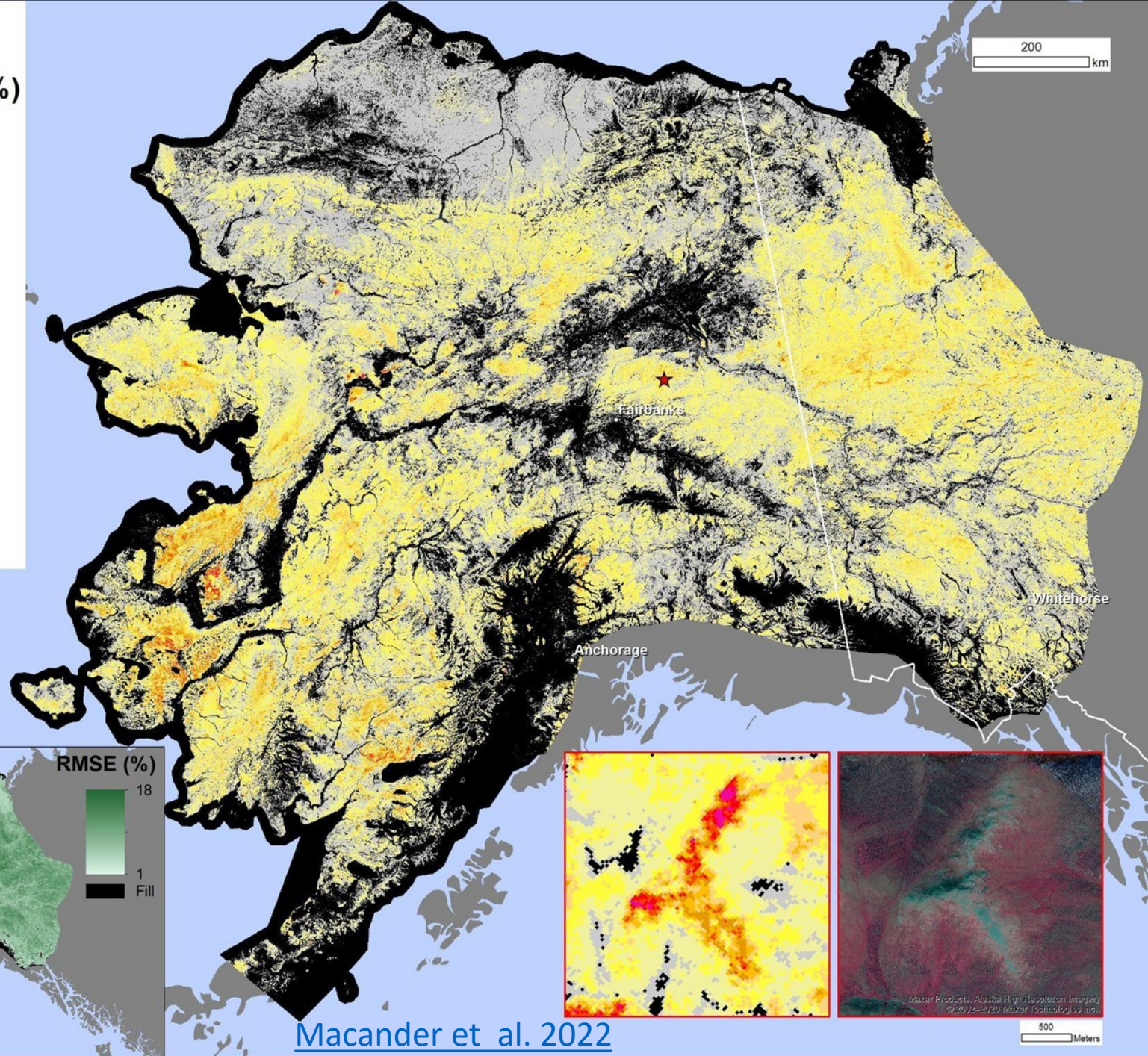
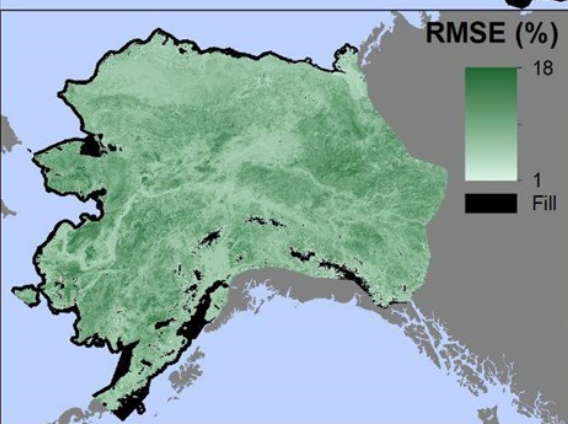
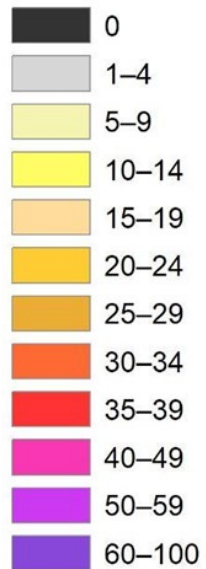


0 0.65 1.3 Meters



Plant Functional Type Cover Time-Series Maps (30 m)

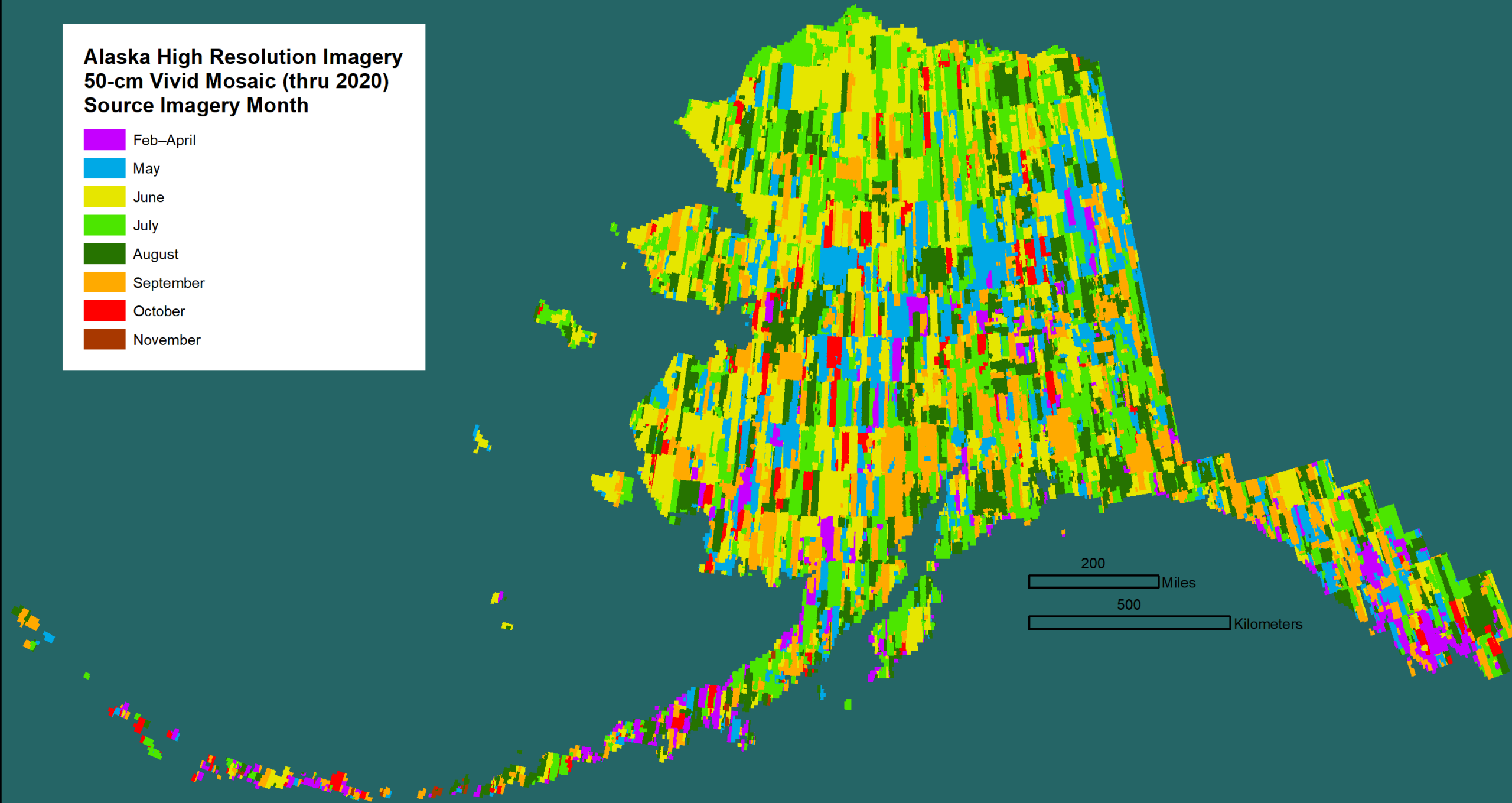
Light Terrestrial Macrolichen Top Cover, 2020 (%)



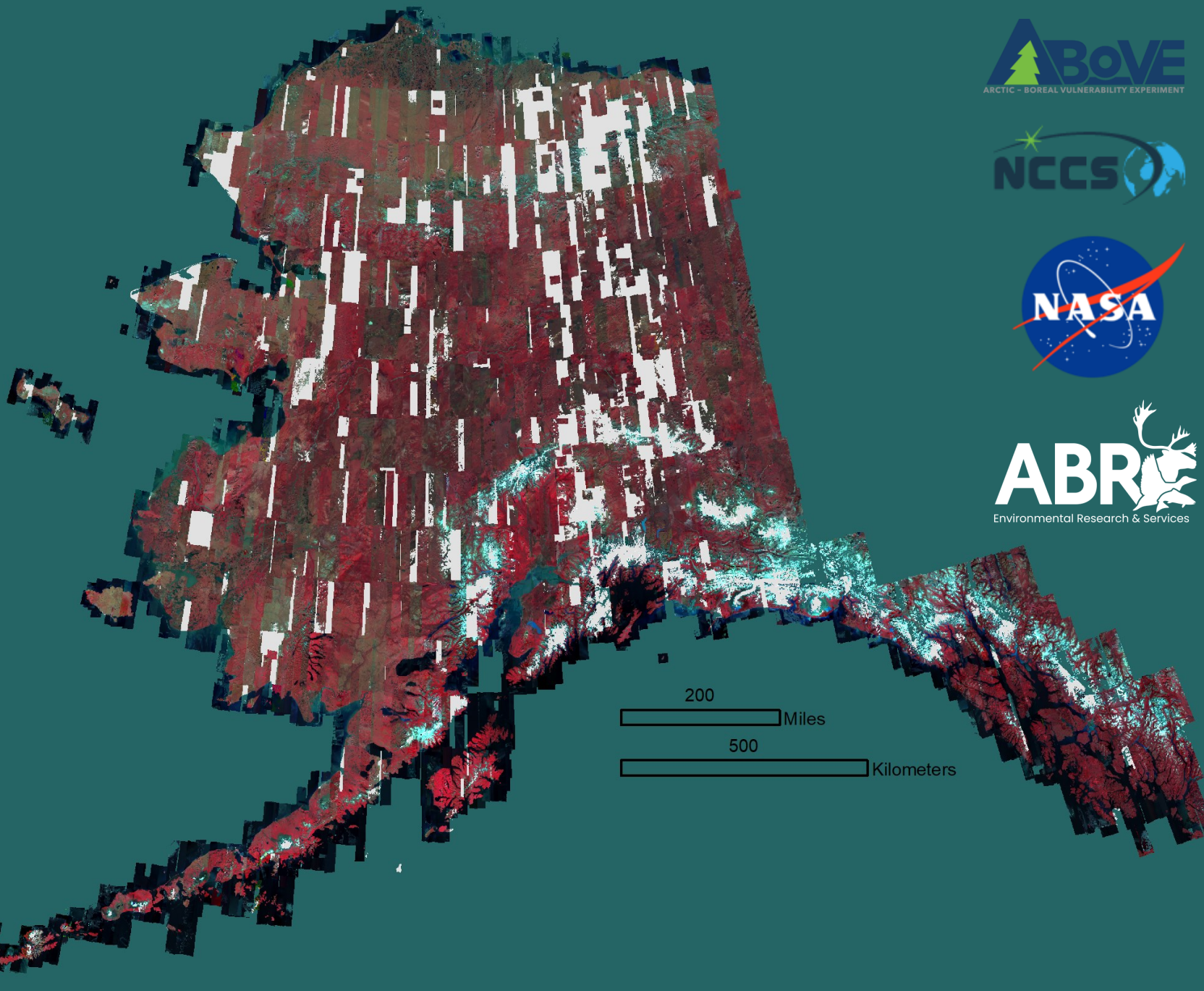
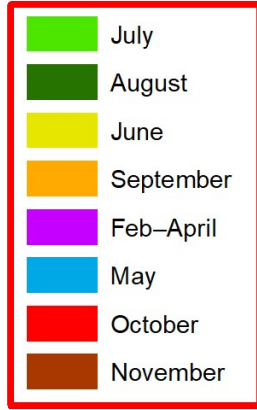
Macander et al. 2022

**Alaska High Resolution Imagery
50-cm Vivid Mosaic (thru 2020)
Source Imagery Month**

- Feb–April
- May
- June
- July
- August
- September
- October
- November

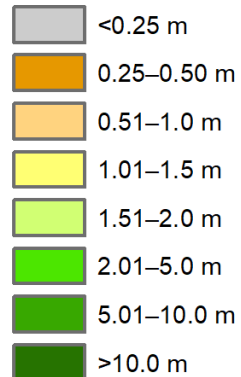


**Alaska Surface Reflectance Lite
2-m Strips
July and August over
June and September over
October to May
2010–2021**



**Canopy Height Model
2-m Strips
Trained on DGGs and GLiHT Lidar
and IFSAR CHM
2010–2021**

Canopy Height

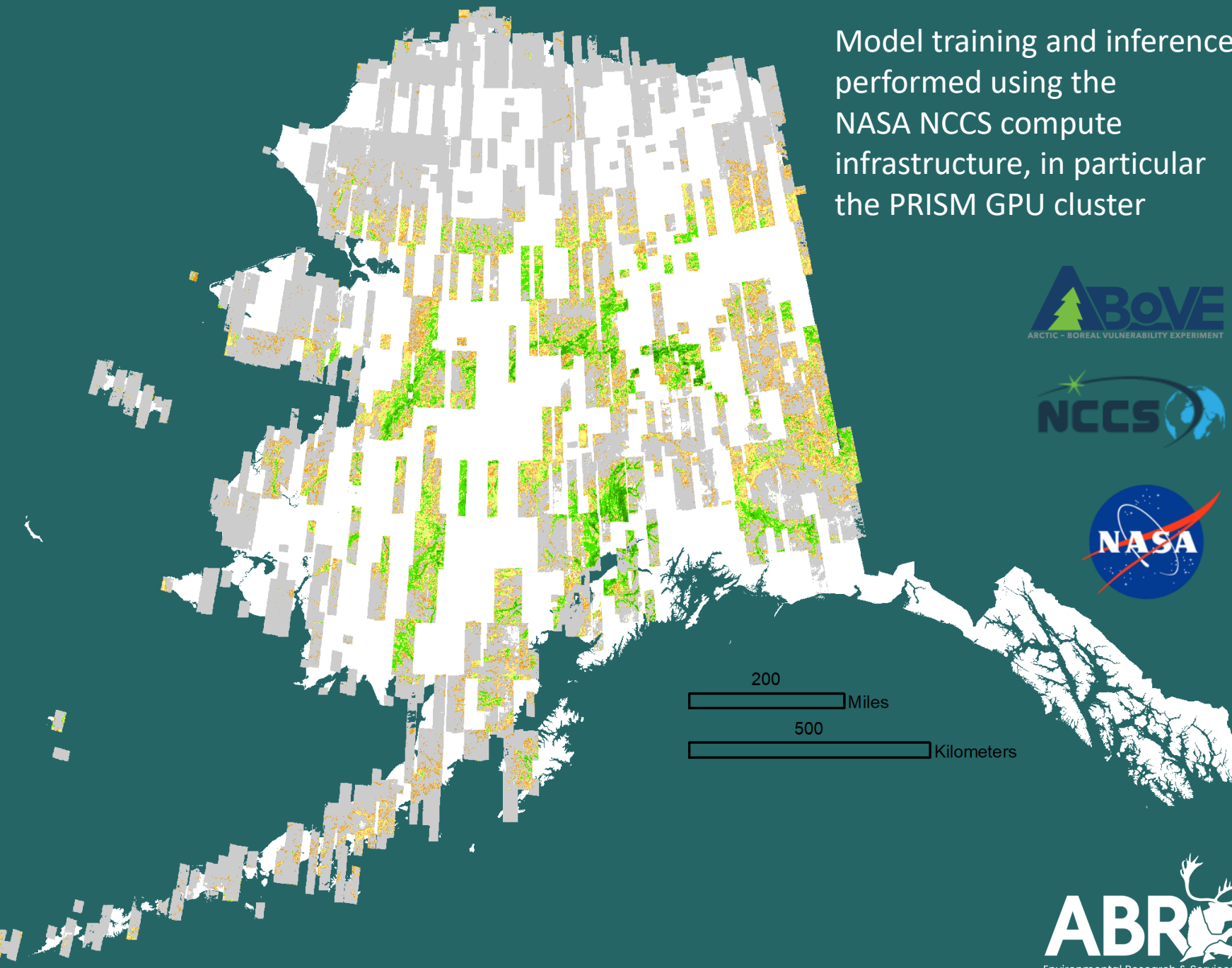
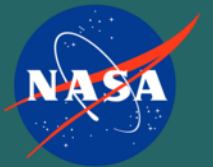


UNET Convolutional Neural Network
Predictors July and August
Blue/Green/Red/NIR
Normalized Reflectance
2 m resolution

Trained using 128 m chips
218k Lidar CHM
255k IFSAR CHM

Preliminary Validation
Mean Absolute Error = 1.02 m
R-squared = 0.714

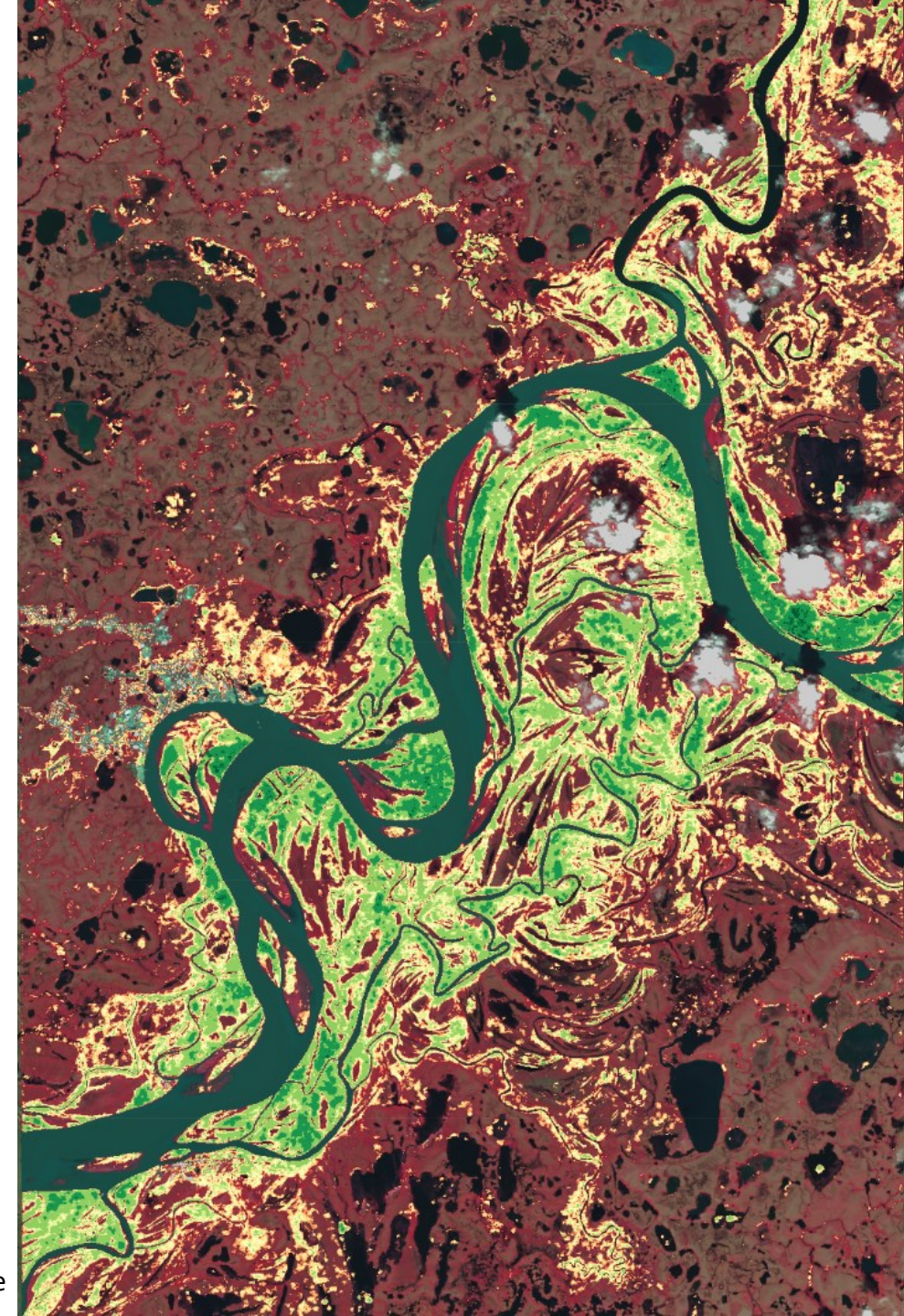
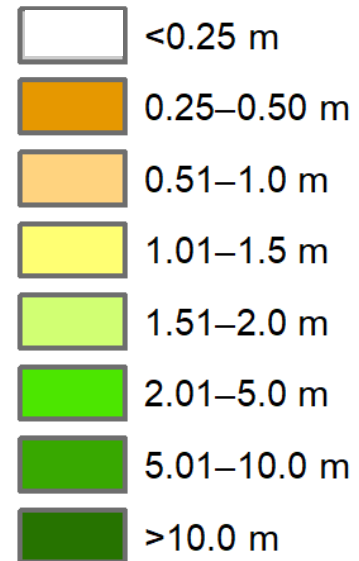
Model training and inference performed using the NASA NCCS compute infrastructure, in particular the PRISM GPU cluster



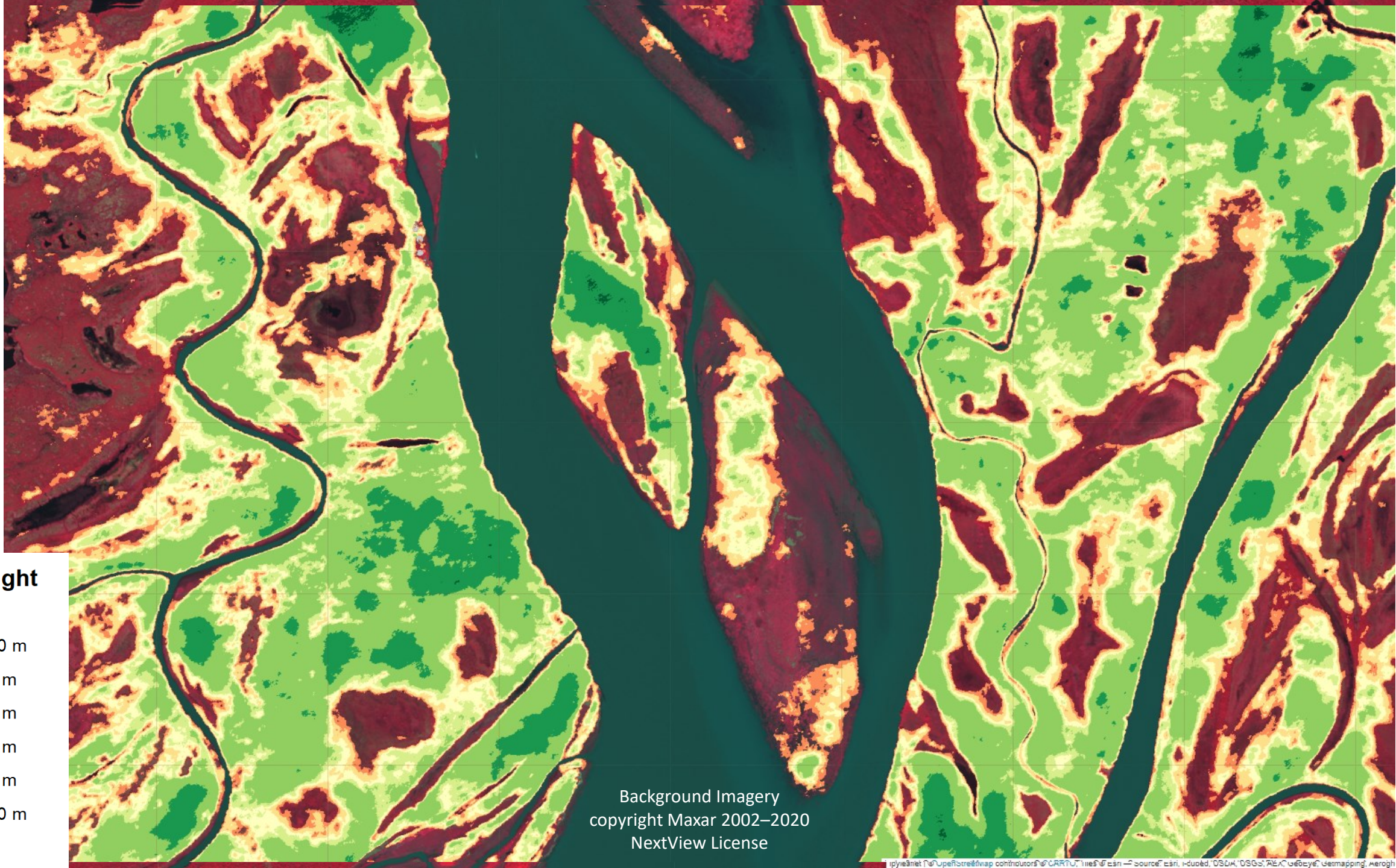
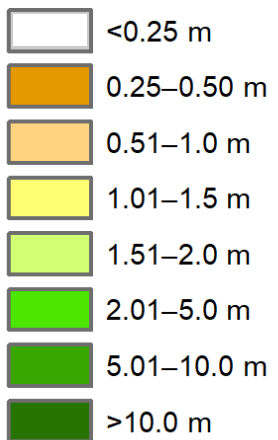
Bethel, Kuskokwim River

- UNET CNN trained with GLiHT and other lidar and IFSAR CHM

Canopy Height



Canopy Height



Background Imagery
copyright Maxar 2002–2020
NextView License

Statewide Vegetation Map Components

- Maintain current statewide/regional vegetation, fuels, and habitat maps (AKVEG Map)

