

Maria Tonellato

Methods and Models for Spatial Data Science

Project Proposal

Identifying Factors which cause Motion in Lichen Clustering in Boreal Alaska

- Potential sources of data
 - ABoVE: Lichen Forage Cover over Fortymile Caribou Range, Alaska and Yukon, 2000-2015
 - 2.5GB
 - Estimates of lichen groundcover at 30m resolution
 - Tiff files
 - Available at study range level and 'site' level
 - 30 m resolution percent cover tiles for 2000 and 2015 at study area level
 - This is the data I plan to use, as the site level data has only one temporal instance
 - Limitations: lichen cover is an estimate, limited range
 - CAVM
 - Circumpolar Arctic Vegetation Map
 - Yearly US wildfires
 - Wildfires have a major impact on lichen populations
 - USGS
 - Wildfire locations throughout Alaska by year (1878-2019) as presence rasters
 - 30m resolution
 - Tiff files
- Study area – where and why
 - Lichen plays an important role at high northern latitudes. During the winter it is the sole source of food for caribou, which provide an important source of food and income for people living there.
 - Literature
 - Biasi, C., Meyer, H., Rusalimova, O. et al. Initial effects of experimental warming on carbon exchange rates, plant growth and microbial dynamics of a lichen-rich dwarf shrub tundra in Siberia. *Plant Soil* 307, 191–205 (2008). <https://doi.org/10.1007/s11104-008-9596-2>
 - Jesse S. Dunford, Philip D. Mcloughlin, Fredrik Dalerum & Stan Boutin (2006) Lichen abundance in the peatlands of northern Alberta: Implications for boreal caribou, *Écoscience*, 13:4, 469-474, DOI: 10.2980/1195-6860(2006)13[469:LAITPO]2.0.CO;2
 - Collings, P. (1997). Subsistence Hunting and Wildlife Management in the Central Canadian Arctic. *Arctic Anthropology*, 34(1), 41–56. <http://www.jstor.org/stable/40316423>

- Kyle Joly, Randi R. Jandt & David R. Klein (2009) Decrease of lichens in Arctic ecosystems: the role of wildfire, caribou, reindeer, competition and climate in north-western Alaska, Polar Research, 28:3, 433-442, DOI: [10.1111/j.1751-8369.2009.00113.x](https://doi.org/10.1111/j.1751-8369.2009.00113.x)
 - Alaskan boreal areas
 - Areas that have had field work done to identify lichen on the ground to use as training data for the model, and have sufficient boreal forests at high northern latitudes
- Question or task
 - Where are lichen clusters in 2000? 2015?
 - Did the lichen clusters move significantly between 2000 and 2015?
 - Identify variables that had impact on the motion of the clustering and perform a regression
- Python tools
 - Sci-kit learn
 - rasterio
 - Scipy
 - GDAL
 - matplotlib
- Envisioned challenges
 - Adapting methods traditionally used in vector data to raster data
 - Combining raster and vector data in a meaningful way
- Exploratory plots
 - Presence cover in study area - 2000

