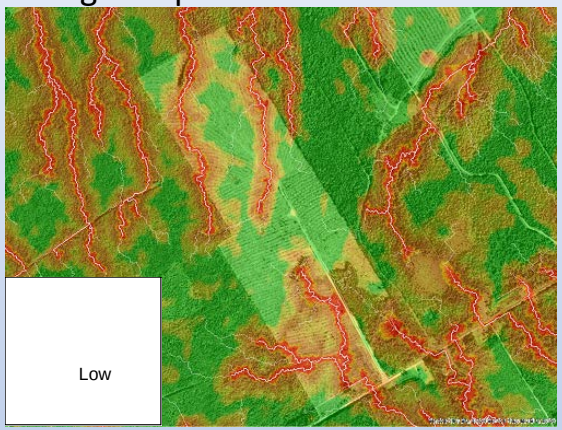
Mapping Forest Soil Trafficability

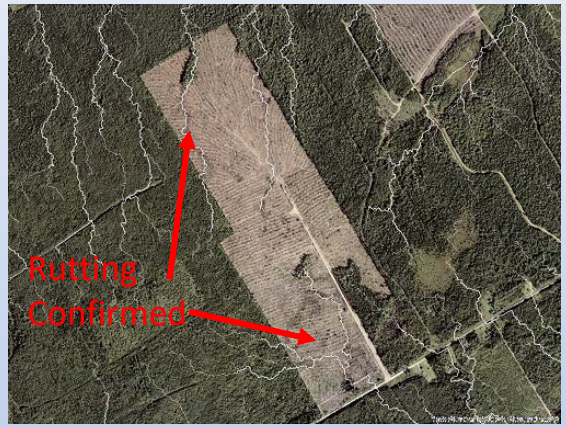
Daniel Snow
Oromocto, NB

Forest soil rutting has ecological consequences and hinders harvest productivity. Currently, soil trafficability advice is derived from a variety of sources, however, soil rutting still occurs during some harvests. Therefore, a need for an improved model to predict soil rutting potential exists.

- This project aims to map forest soil trafficability by modelling soil moisture content (SMC) to predict soil rutting potential. SMC is a function of many variables which are used as model parameters.
- Variables which impact SMC broadly grouped into classes:
  1) Topography: flow networks, depressions, slope, aspect
  2) Weather: precipitation, air temp., humidity, wind speed
  3) Soil: texture, organic matter content, density, depth
  4) Vegetation: type, distribution, age, transpiration rate
- Accurate spatial estimation of variable data is possible through:
  1) Digital elevation model (DEM) at 1m resolution derived from LIDAR
  2) Wet areas mapping (WAM) derived from DEM
  3) Publicly available Environment Canada weather data
  4) Digital soil mapping (DSM) from field samples, DEM, WAM, and more
  5) Forest attribute inventory from field samples and canopy height model (CHM) derived from LIDAR.
- Modelling SMC uses the variables above to estimate processes which cause changes in SMC: infiltration, drainage, retention, and evapotranspiration of soil water.

Model verification uses aerial images in recently harvested blocks where rutting was predicted to confirm rut occurrence:





Once available for industry use, high quality trafficability advice will have constructive implications for:

- Protection of forest landscape and habitat quality
- Harvest block delineation and harvest trail system layout
- Seasonal timing of harvest and harvest productivity
- Prevention of soil degradation and crop yield

Expected project completion: Spring 2021

Supervisor: Dr. Paul Arp

Supervisory Committee: To be determined

Research Partner: J.D. Irving, Limited