Modelling the pre-anthropogenic distribution of wetlands in the Boreal Natural Region

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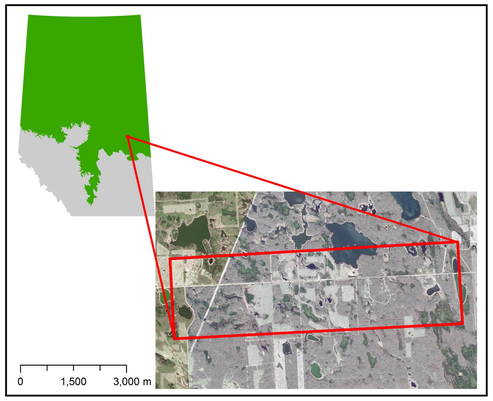
Objective

The ABMI wants to model the pre-anthropogenic distribution of wetlands in the Boreal Natural Region. This pre-anthropogenic "reference" condition is needed for land management frameworks such as the Biodiversity Management Framework (Government of Alberta). The modeled "current" state of wetlands can be compared to the "reference" condition to asses how human land-use is affecting wetland distribution in the Boreal.

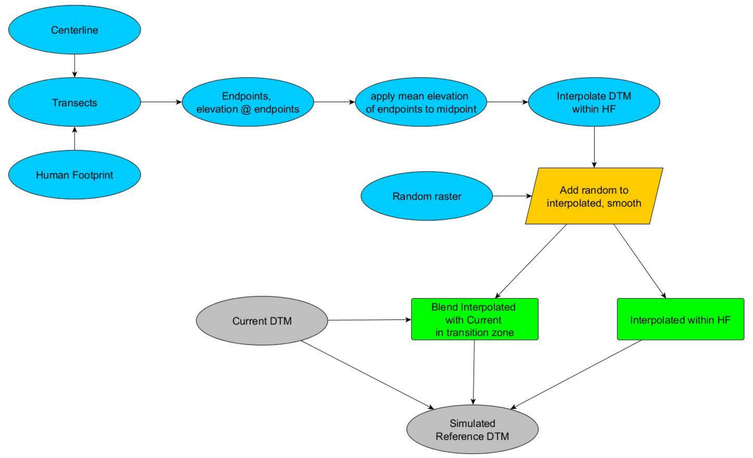
Test region

- Southern Lower Athabasca Region
- About 50% wetland and 50% upland
- Road cutting through middle of study area
- 1,820 ha

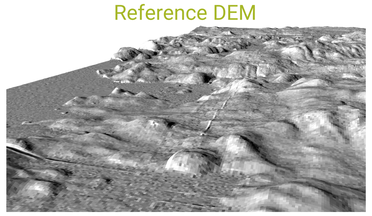


Methods

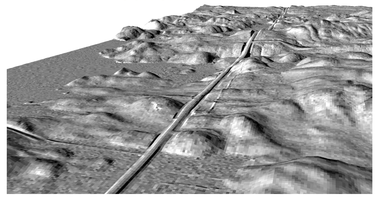
- Model wetland presence/absence using a boosted regression tree machine learning technique (Elith *et al.*, 2008, Hird *et al., 2018*).
  - Training data: ABMI 3x7 photo plots with no human disturbance
  - Input variables from LiDAR DEM:
    - Topographic Wetness Index (TWI), Topographic Position Index (TPI), Multiresolution Index of Valley Bottom Flatness (MRVBF), and Mid Slope Position (MSP).
- Generate reference DEM by erasing earthworks features (roads)
- Apply the model to reference DEM and current DEM
- Get change in wetland distribution between current and reference



Reference DEM



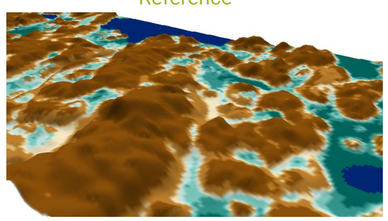
Current DEM



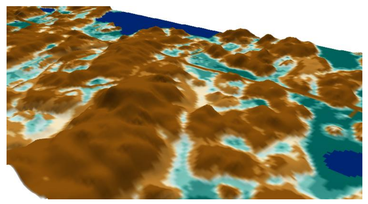
Results

Probability of wetland

Reference

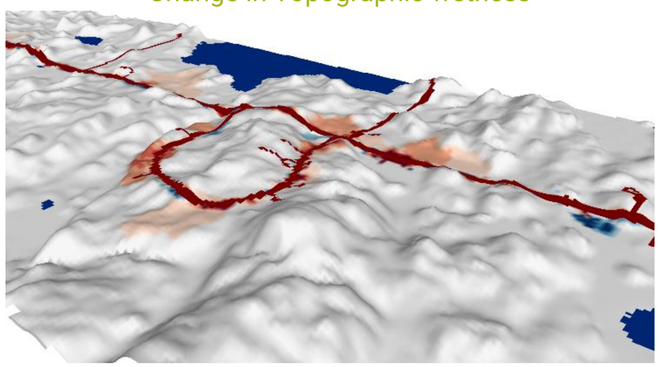


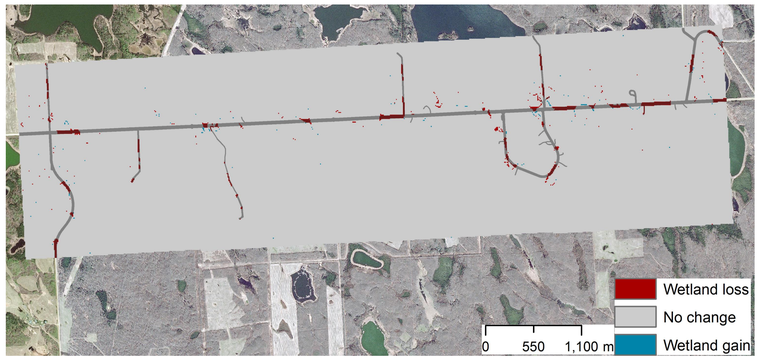
Current



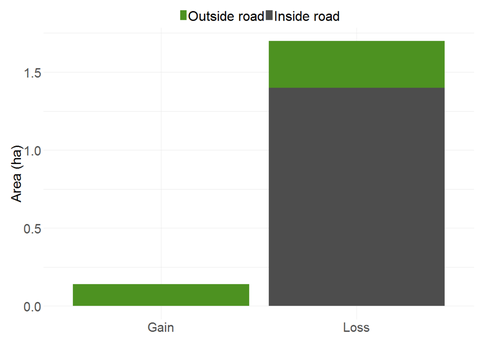
Low wetland probability — High wetland probability

Change in Topographic wetness



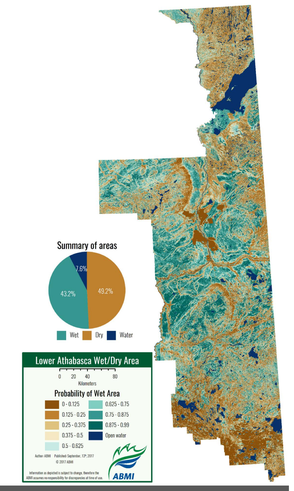


- Wetland loss – 1.7 ha:
  - 1.4 ha inside road features
  - 0.3 ha outside road features
- Wetland gain:
  - 0.14 ha



Next steps

- Model current and reference wetland area across the Lower Athabasca Region and Boreal
  - Erase human features from LiDAR DEM (roads, railways, buildings)
  - Use 1951 air photos for massive earth works features (Athabasca oil sands)



References

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