AGGP-Agroforestry

No. SASK-1

OVERVIEW OF DATA ANALYSES USED TO ESTIMATE C STOCKS IN SHELTERBELTS IN SASKATCHEWAN

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SHELTERBELT DATA ANALYSES

Shelterbelts have been planted in Saskatchewan for more than a century, since 1901, under the provisions of the Government of Canada's Prairie Shelterbelt Program (PSP). In the past two decades, the carbon storage potential of planted shelterbelts was recognized, but there was a lack of shelterbelt distribution data and growth models. To estimate the carbon stocks in shelterbelts for the agricultural land in Saskatchewan, the following data analyses are performed (Figures 1 and 2):

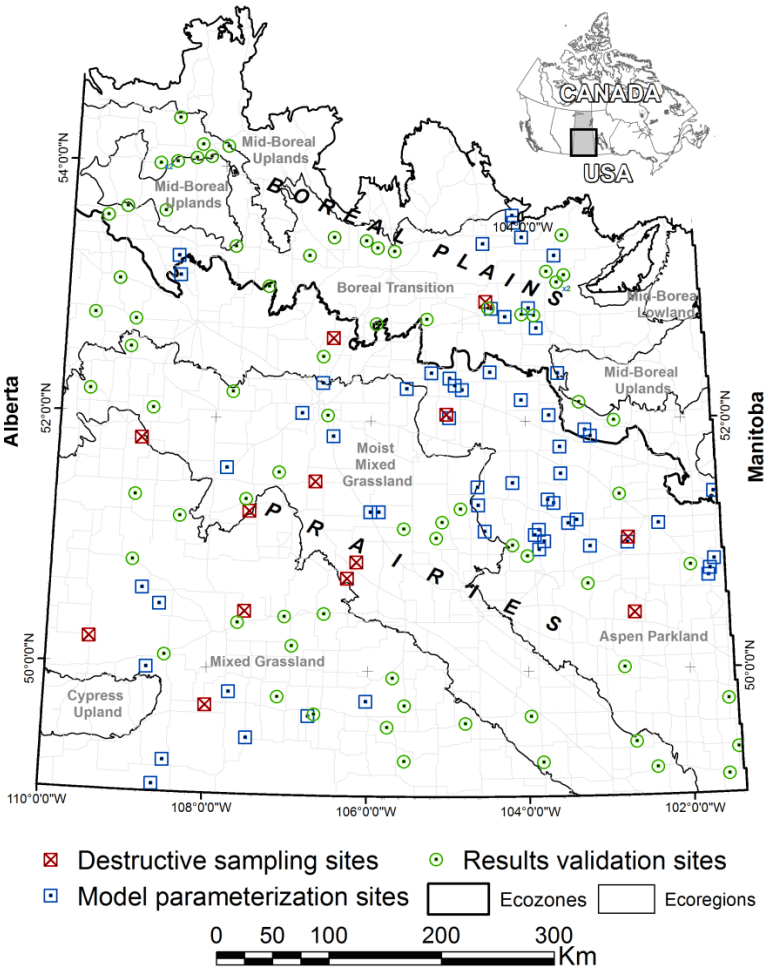

Figure 1. Locations of randomly selected shelterbelt sites for field data sampling in Saskatchewan.

- Cluster analysis is used to group and map 106 ecodistricts into 31 clusters based on similar tree-growth variables for simulation modeling purposes
- Shelterbelt planting and distribution during eight decades and their estimated length are mapped across 31 clusters for six common shelterbelt species
- Unbiased selection of field sampling sites is achieved by a modified randomized branch sampling (RBS) procedure to collect data from shelterbelts at randomly selected township locations within randomly selected soil polygons within randomly selected ecodistricts within the cluster with the highest number of trees ordered though the PSP (i.e. model parameterization cluster)
- Field data are collected from white spruce (WS), hybrid poplar (HP), Manitoba maple (MM), Scots pine (SP), green ash (GA), and caragana (CG) shelterbelts at a total of 143 sites: 13 for destructive sampling, 59 for model parameterization, and 71 for validation of results (Figure 1)
- Field data are used to parameterize the 3PG model and perform tree growth simulations for a 60-yr period, from 1954 to 2014, for three spacings (2.0, 3.5, and 5.0 m, all within a linear row of planted trees) and four mortality levels (0, 15, 30, and 50%) within the parameterization cluster; additionally, 3PG model simulations are conducted for the remaining 30 clusters encompassing the entire agricultural land base in Saskatchewan

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GENERATED SHELTERBELT PRODUCTS

- Yield tables quantifying shelterbelt volume increment are generated by the 3PG model and used as input data in the CBM-CFS3 model
- In CBM-CFS3, C stocks for six shelterbelt species are generated in 31 clusters and validated with field data
- Finally, maps of the carbon stocks inventory are created, including total ecosystem carbon (TEC) and carbon stocks additions (Figure 2)
- Carbon inventories are generated for four periods: a/ planted 1925-2009; b/ since 1990, regardless of planting period; c/ planted 1990-2009; and d/ planted 2015-2075, using the A2-scenario of future climate projections by the Canadian Centre for Climate Modelling and Analysis
- All generated products (Figure 2) are valuable tools for shelterbelt decision support systems for future tree planting on agricultural landscapes

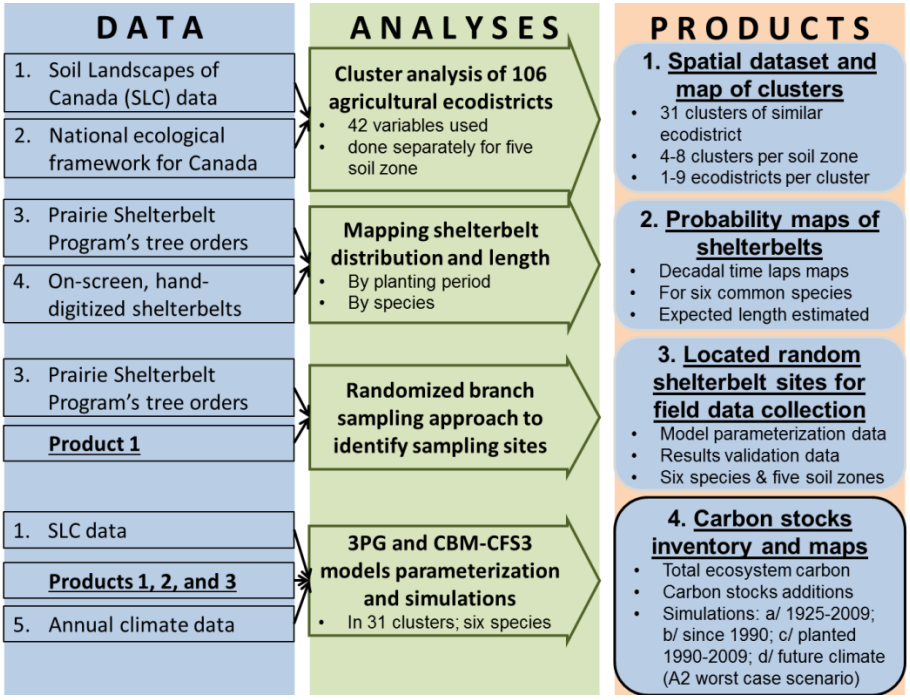

Figure 2. Overview of shelterbelt data analyses and products created for the agricultural land in Saskatchewan.

FURTHER READING

Amichev, B.Y., et al. 2015. **Mapping and quantification of planted tree and shrub shelterbelts in Saskatchewan, Canada.** *Agroforestry Systems* 89(1):49-65

Amichev, B.Y., et al. 2016. **Carbon sequestration by planted shelterbelts in Saskatchewan: 3PG and CBM-CFS3 model simulations.** *Ecological Modelling* 325:35-46

AGGP Fact Sheet(s): **SASK-2, SASK-3, SASK-10**

CONTACT FOR MORE INFORMATION: SASKAGROFORESTRY.CA/

ACKNOWLEDGEMENTS & COPYRIGHT

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