



AGGP-Agroforestry

# SHELTERBELT REMOVAL IN SASKATCHEWAN: AN OVERVIEW (2008–2016)

## No. SASK-33

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Shelterbelt inventory has grown in importance in light of a future carbon tax implementation across Canada. Two important outcomes of the shelterbelt research carried out in the previous AGGP project were quantification of the potential carbon (C) sequestration and mapping of planted shelterbelts in Saskatchewan. The results showed that six common shelterbelt species could sequester from 1.78 to 6.54 Mg C km<sup>-1</sup> yr<sup>-1</sup>. Soil C storage in shelterbelts was found to be 2 Mg C ha<sup>-1</sup> higher than surrounding crop production fields. These outcomes emphasized the high importance of shelterbelt retention or removal for balancing carbon emissions in the agricultural sectors.

A new method was developed to map removal of planted shelterbelts using object-based classification techniques and a combination of Sentinel MSI and SAR satellite imagery. This method was effective in mapping shelterbelts, cropland, and mixed cover types across a vast agricultural landscape. This method was useful in differentiating very narrow shelterbelts from the surrounding bare soil and crops, aiding in the production of province-wide land cover maps with an accuracy of 80%. A land-cover change detection analysis from two successive shelterbelt inventories (e.g., at time T and at time T+8 years) was used to produce a map of planted shelterbelt removal occurring in the period 2008–2016. Carbon stocks removed from planted shelterbelts in farm yards or crop fields, were estimated using the map-derived removed shelterbelt lengths, approximate shelterbelt age, and estimated C sequestration rates (Fig. 1).

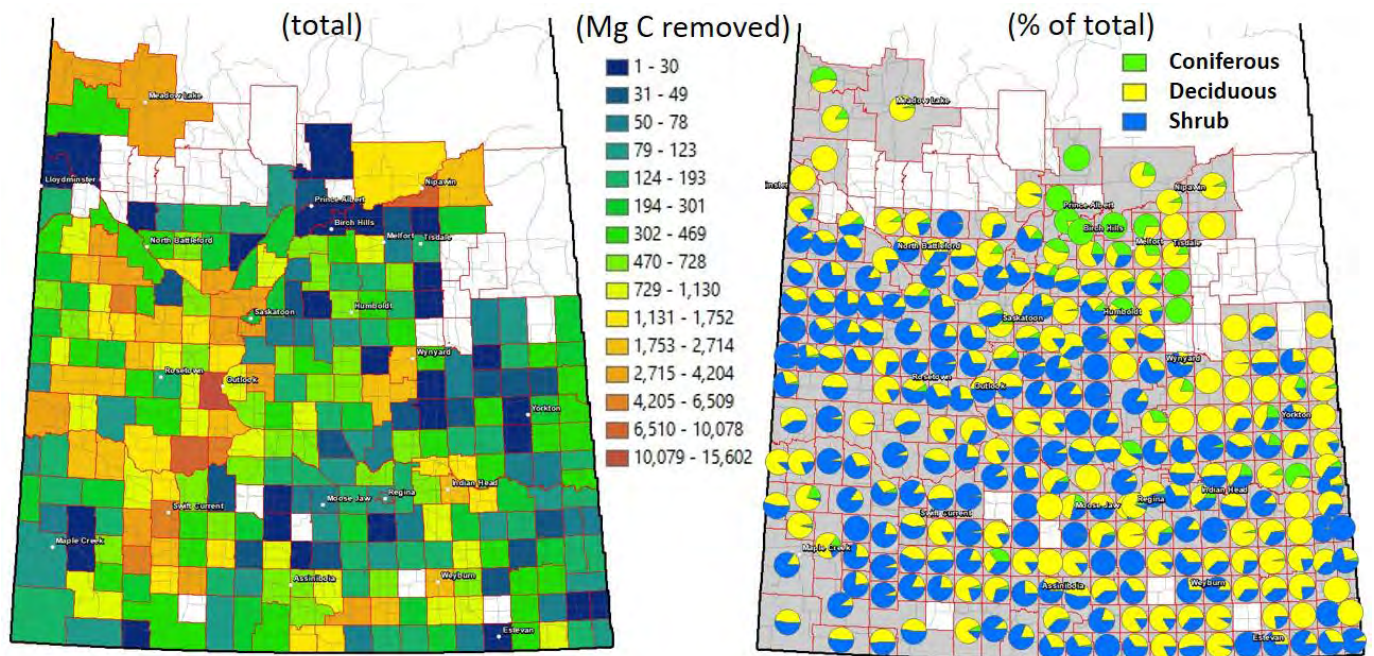


Figure 1. Extent and C stocks of removed shelterbelts in Saskatchewan during 2008–2016 period. Total removed C stocks and % of total values are for individual Canada Census Subdivision units (N=299, delineated by red polygons).



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## CARBON STOCKS OF REMOVED SHELTERBELTS

- A total of 2,491 km of planted shelterbelts were removed, sequestering 191 Gg C (1 Gg = 1,000 Mg = 1,000 tons) in five soil zones in the province, dominated by shrub shelterbelts removal in south-west, deciduous shelterbelts removal in south-east, and coniferous shelterbelts removal in central Saskatchewan (Figs. 1 and 2).
- Carbon stocks in removed shelterbelts ranged by soil zone as follows: (in descending order) Dark Brown (87 Gg C; = 46% of all removals) > Brown (47 Gg C; = 25%) > Black (36 Gg C; = 19%) > Dark Gray (13 Gg C; = 7%) > Gray (7 Gg C; = 4%).
- The majority of C stock removals were in shrub shelterbelts (107 Gg C in 1,677 km removed), followed by deciduous (78 Gg C in 719 km removed) and coniferous shelterbelts (5.4 Gg C in 95 km removed), ranging in age from 10 to 80-years-old for these species groups.
- Regarding designs, the highest amounts of removed carbon stocks were from narrow, 1-row shelterbelts (up to 85 Gg C) (Fig. 2).
- Majority of removals were from crop field shelterbelts ranging from 31–78 Gg C for (in descending order) the Dark Brown > Brown > Black soil zones; farmyard removals ranged from 6–9 Gg C in the same soil zone order (Fig. 2).



Figure 2. Carbon stocks (Mg; filled bars) and length (m; white bars) of removed shelterbelts in five soil zones shown by shelterbelt species group, design, and type.

This analysis can facilitate a more focused understanding of shelterbelt removals in Saskatchewan, which can lead to new socio-economic policies aimed at addressing future shelterbelt removal.

**FURTHER READING:** Fact sheets SASK-32, and SASK-34 through SASK-39

**CONTACT FOR MORE INFORMATION:** [SASKAGROFORESTRY.CA/](http://SASKAGROFORESTRY.CA/)

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