



AGGP-Agroforestry

SHELTERBELT REMOVAL IN THE DARK BROWN SOIL ZONE OF SASKATCHEWAN (2008–2016)

No. SASK-35

by BEYHAN Y. AMICHEV

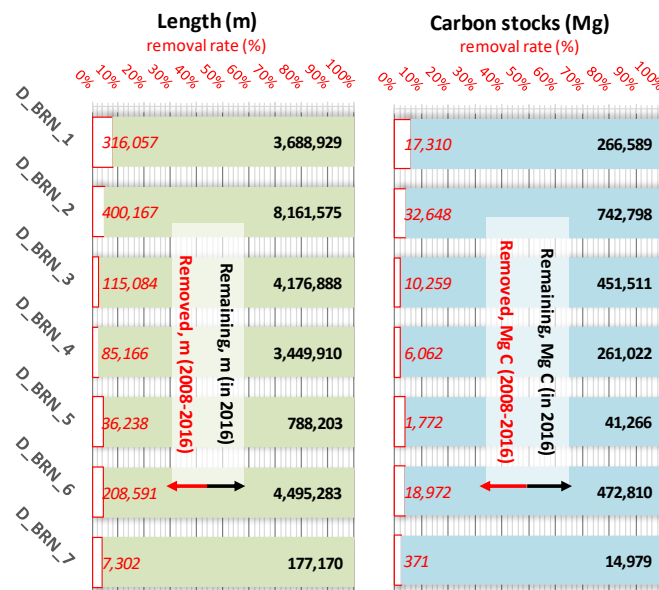
Shelterbelt agroforestry systems play a vital role in agricultural sustainability by providing a variety of benefits to producers. Shelterbelts also sequester atmospheric CO₂ at rates ranging from 1.78 – 6.54 Mg C km⁻¹ yr⁻¹, which emphasizes their high importance for balancing carbon emissions in the agricultural sectors. The ability to create up-to-date shelterbelt inventory maps is important to detect changes in these systems, including the retention or removal of existing shelterbelts, or planting of new ones. A new method was developed to map removal of planted shelterbelts using satellite imagery. This method was effective in mapping shelterbelts, cropland, and mixed cover types across the Dark Brown soil zone of Saskatchewan. C stocks removed from planted shelterbelts in the period 2008–2016 in farm yards or crop production fields were estimated using the map-derived removed shelterbelt lengths, approximate shelterbelt age, and estimated C sequestration rates (Fig. 1).

CARBON STOCKS OF REMOVED SHELTERBELTS

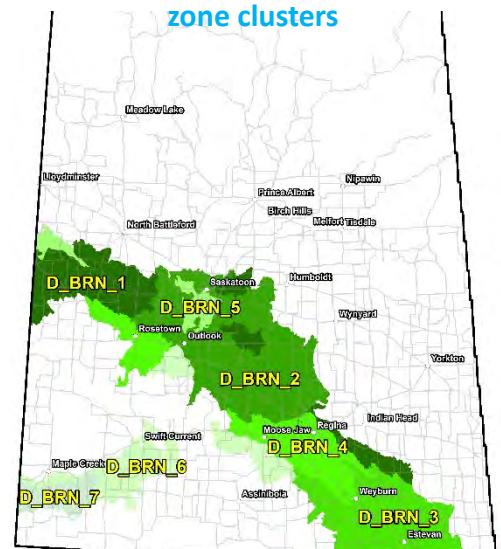
The total carbon stocks in removed shelterbelts in the Dark Brown soil zone for the period 2008–2016 were 87 Gg C (1,169 km total removed shelterbelt length). The removed carbon stocks ranged from 0.4 to 33 Gg C across seven clusters of homogenous ecodistricts in the Dark Brown soil zone, equivalent to an average of 4% (ranging 2–6%) rate of removal, relative to all existing shelterbelts per cluster. These clusters were used for shelterbelt inventory and analysis in the AGGP project (Fig. 1). The removal carbon stocks ranged by cluster as follows: (in descending order) D_BRN_2 (33 Gg C in 400 km total removed length) > D_BRN_6 (19 Gg C in 208 km) > D_BRN_1 (17 Gg C in 316 km) > D_BRN_3 (10 Gg C in 115 km) > D_BRN_4 (6 Gg C in 85 km) > D_BRN_5 (2 Gg C in 36 km) > D_BRN_7 (0.4 Gg C in 7 km) (Figs. 1, 2).

The shelterbelt analysis results reported here can be used to develop a new leading-edge shelterbelt management support toolbox for researchers and farmers, directing emphasis to the use of different shelterbelt species, designs, and types. This toolbox can also facilitate a more focused understanding of the rates and extent of the shelterbelt removal phenomenon in the Canadian Prairies, which can lead to new socioeconomic policies aimed at addressing future shelterbelt removal, and the planting of new shelterbelts. Separate fact sheets were created for each of the five soil zones of Saskatchewan.

Figure 1. Cumulative carbon stocks (Mg C) and length (m) of shelterbelts removed in the 2008–2016 period across seven clusters in the Dark Brown soil zone of Saskatchewan. Removal rates (%) and remaining shelterbelts (in 2016) are also shown.



Dark Brown soil zone clusters



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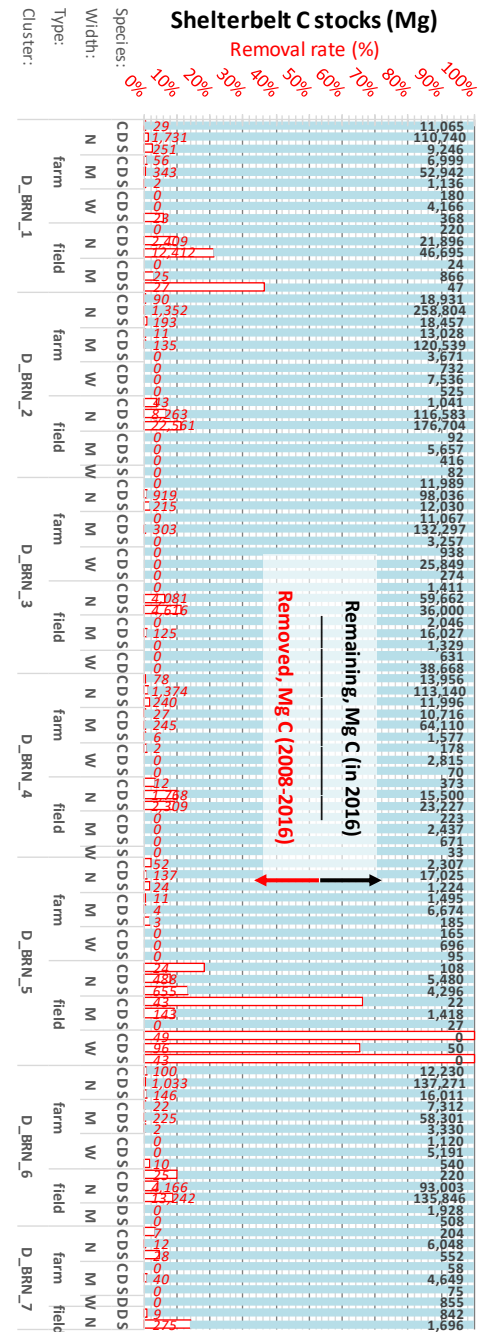


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REMOVALS BY SHELTERBELT SPECIES, DESIGN, AND TYPE

- Species:** Shelterbelt removal was highest for shrub shelterbelts (57 Gg C total) in the majority of clusters ranging from 0.3 to 23 Gg C (in descending order) for the D_BRN_2 > D_BRN_6 > D_BRN_1 > D_BRN_3 > D_BRN_4 > D_BRN_5 > D_BRN_7, and ranged from <0.1 to 10 Gg C per cluster for deciduous shelterbelts (29 Gg C total), and was <0.18 Gg C per cluster for coniferous shelterbelts (0.7 Gg C total)
- Design:** Shelterbelt removal was highest for narrow, 1-row shelterbelt designs (85 Gg C total) ranging 0.3 – 32 Gg C per cluster, followed by medium width, 2–3-row designs (2 Gg C total) ranging <0.1 – 0.4 Gg C per cluster, and was lowest for wide shelterbelts, planted in >3-row designs (0.2 Gg C total) at <0.18 Gg C per cluster (Fig. 2)
- Type:** Shelterbelt removal was higher in crop production fields (78 Gg C total) ranging 0.3 – 31 Gg C per cluster, compared to farmyard shelterbelts (9 Gg C total) ranging <0.1 – 2 Gg C per cluster
- The top three highest total C stocks of removed shelterbelts by design category in the Dark Brown soil zone were narrow field shrub shelterbelts (56 Gg C), followed by narrow field (21 Gg C) and narrow farm (6 Gg C) deciduous shelterbelts
- Removal carbon stocks and removal rates by design category varied largely between clusters, and were highest in the D_BRN_2 cluster where 22 Gg C in narrow field shrub shelterbelts were removed at 12% rate (Fig. 2)

→ Figure 2. Carbon stocks (Mg C) of shelterbelts removed in the 2008–2016 period in seven clusters in the Dark Brown soil zone shown by shelterbelt species group (C=coniferous; D=deciduous; S=shrub), planting design (N=narrow, 1-row; M=medium, 2–3 rows; W=wide, >3 rows), and type (farm= located in farm yards; field=planted in crop production fields). Removal rates (%) and remaining shelterbelts (in 2016) are also shown for each scenario. →



FURTHER READING: Fact sheets SASK-33, -34 and SASK-36 through SASK-39

CONTACT FOR MORE INFORMATION: SASKAGROFORESTRY.CA/

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