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MANITOBA MAPLE GROWTH AND CARBON STOCKS IN SHELTERBELTS IN SASKATCHEWAN

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Tree growth (3PG model) and C dynamics (CBM-CFS3 model) modelling approaches were used to determine the total ecosystem C (TEC) stocks and C stocks additions in Manitoba maple shelterbelts in Saskatchewan. Our growth curves and biomass prediction values (Figure 1) were limited to age 60 years. All older-than-60 years shelterbelts were assigned a conservative, 60-year biomass estimate. Differences in climatic and soil conditions caused the wide ranges of Manitoba maple growth in shelterbelts: mean aboveground biomass (stems, branches, bark), at age 60 years, was 118–193 Mg Km⁻¹, diameter at breast height (DBH) was 34–44 cm, and height was 9–11 m (Figure 1). The growth curves were used in the CBM-CFS3 model to produce an inventory of the carbon stocks (Table 1) in all Manitoba maple shelterbelts planted from 1925 to 2009.

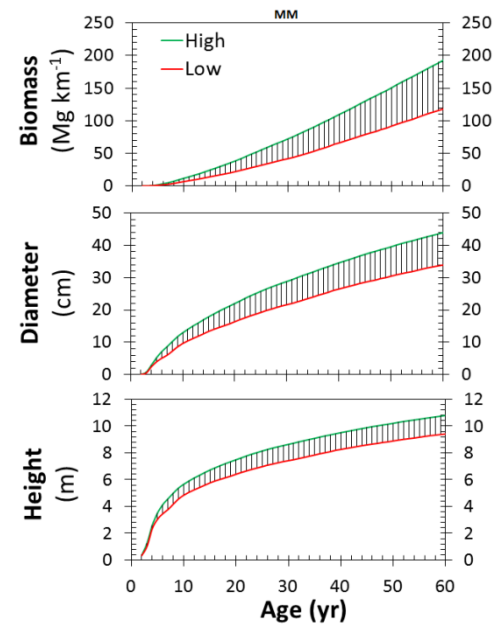


Figure 1. Manitoba maple growth in shelterbelts: biomass, DBH diameter, height.

CARBON STOCKS INVENTORY

- TEC stocks and C stocks additions in Manitoba maple shelterbelts were 0.36 and 0.21 Tg (1 Tg = 1 million Mg), respectively. About 67% of these C stocks additions (0.14 Tg) occurred since 1990, regardless of tree planting period, and have an estimated value of \$7.8 million, at \$15 per Mg CO₂-eq (Table 1).
- 14% (375 Km) of all Manitoba maple shelterbelts (2,646 Km) were planted in the last 25 years.
- For six common shelterbelt species in Saskatchewan, the total length of Manitoba maple shelterbelts is 5.2%, and the TEC stocks stored in them is 3.4%, of the cumulative length and TEC stocks, respectively.
- Although 86% are in the Dark Brown soil zone (Table 1), Manitoba maple shelterbelts represent about 5%, or greater, spatial occurrence in the Black, Dark Gray and Gray soil zones. In the Gray soil zone, they represent up to 16% of the cumulative TEC stocks in some clusters (Figure 2).

Table 1. Total ecosystem C and C additions stocks in Manitoba maple shelterbelts in Saskatchewan.

Soil zone	Manitoba maple shelterbelts planted 1925-2009					
	Total Ecosystem C		C Additions		Length	Km
	Since 1925	Since 1990	Since 1925	Since 1990		
Gray	2,209	1,144	1,286	1,025	20	20
Dark Gray	21,540	9,630	12,939	8,767	97	97
Black	36,216	16,452	20,502	14,274	71	71
Dark Brown	247,145	115,842	138,981	92,471	2,283	2,283
Brown	56,890	27,384	38,794	25,005	175	175
Totals (Mg C):	364,000	170,453	212,503	141,542	2,646	2,646
(Tg C =)	0.364	0.170	0.213	0.142		

North ← South



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RELATIVE OCCURRENCE AND C SEQUESTRATION RATE

- Manitoba maple growth and its C sequestration potential make it a valuable species for shelterbelt establishment (Figure 2).
- The average C sequestration rate was 2.39–2.60 Mg C Km⁻¹ yr⁻¹, the highest being in the Gray soil zone.
- Manitoba maple relative spatial occurrence and estimated rate of C sequestration (Figure 2) could be used as a guideline for identifying best locations for future planting.
- Best predicted areas for future planting are the Black and Gray soil zones, where on the majority of the clusters, the C sequestration rate is estimated >2.48 Mg C Km⁻¹ yr⁻¹, ranging 2.01–3.32 Mg C Km⁻¹ yr⁻¹.
- Planting Manitoba maple shelterbelt trees on agricultural landscapes is an important strategy for mitigating greenhouse gasses.

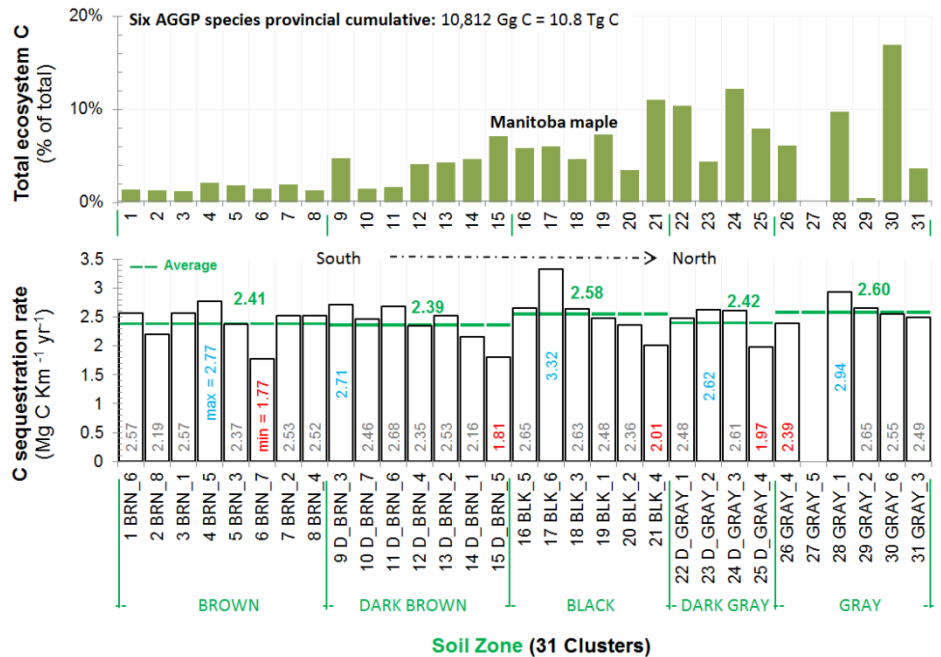


Figure 2. Relative spatial occurrence (top) and C sequestration rate of Manitoba maple shelterbelts across 31 clusters and 5 soil zones in Saskatchewan.

FURTHER READING

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-1, SASK-2, SASK-6, SASK-10

CONTACT FOR MORE INFORMATION: SASKAGROFORESTRY.CA/

ACKNOWLEDGEMENTS & COPYRIGHT

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