PREDICTING THE FUTURE GROWTH OF WHITE SPRUCE ACROSS SOUTHERN SASKATCHEWAN

No. SASK-51

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We wanted to predict how shelterbelt trees will grow in the future under different climate scenarios. To do so, we sampled tree cores from four different shelterbelt species across 68 sites in the Brown, Dark Brown, and Black soil zones of Saskatchewan (Figure 1). The four shelterbelt species we sampled in this study were green ash, hybrid poplar, white spruce, and Scots pine.

All Tree Species
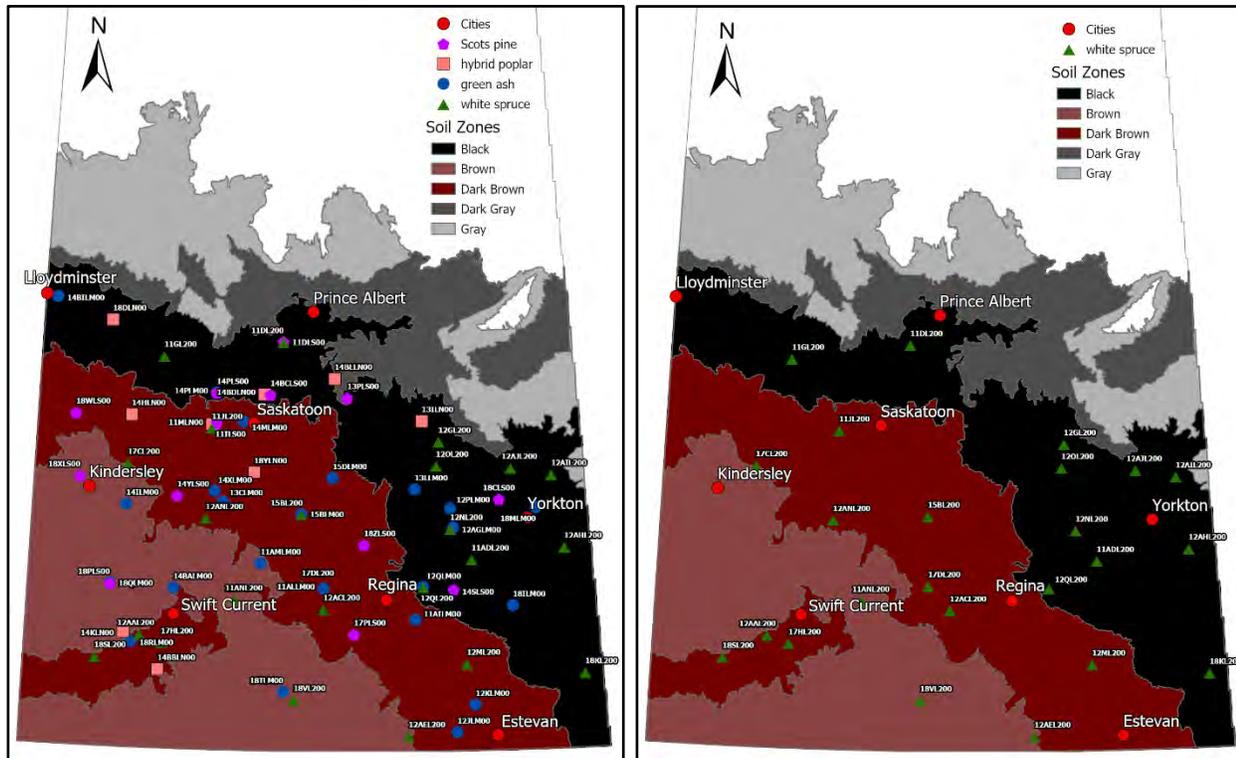
White Spruce Species

Figure 1. Locations where all four tree species were sampled, and the locations where all the white spruce species were sampled across southern Saskatchewan.

Predicted the Future Growth of White Spruce

White spruce radial growth is predicted to mainly decrease across the Brown, Dark Brown, and Black soil zones of Saskatchewan (Figure 2). Adequate soil moisture during the month of June was found to be critical for white spruce growth. Predicted rising June temperatures and only small increases in June precipitation will likely cause temperature-induced drought in white spruce, thus having a large negative effect on white spruce radial growth. Rising July temperatures also have a large negative impact on white spruce growth, indicating that summer temperatures will be too high for white spruce to grow successfully in the southern half of Saskatchewan. Many studies have come to the same conclusion that the southern boundary of white spruce growth is moving northward, and as a result, white spruce will not grow well in the three southernmost soil zones of Saskatchewan. In Figure 2, the predicted growth maps (c, f, i, l) show a widespread predicted decrease in white spruce radial growth across southern Saskatchewan.
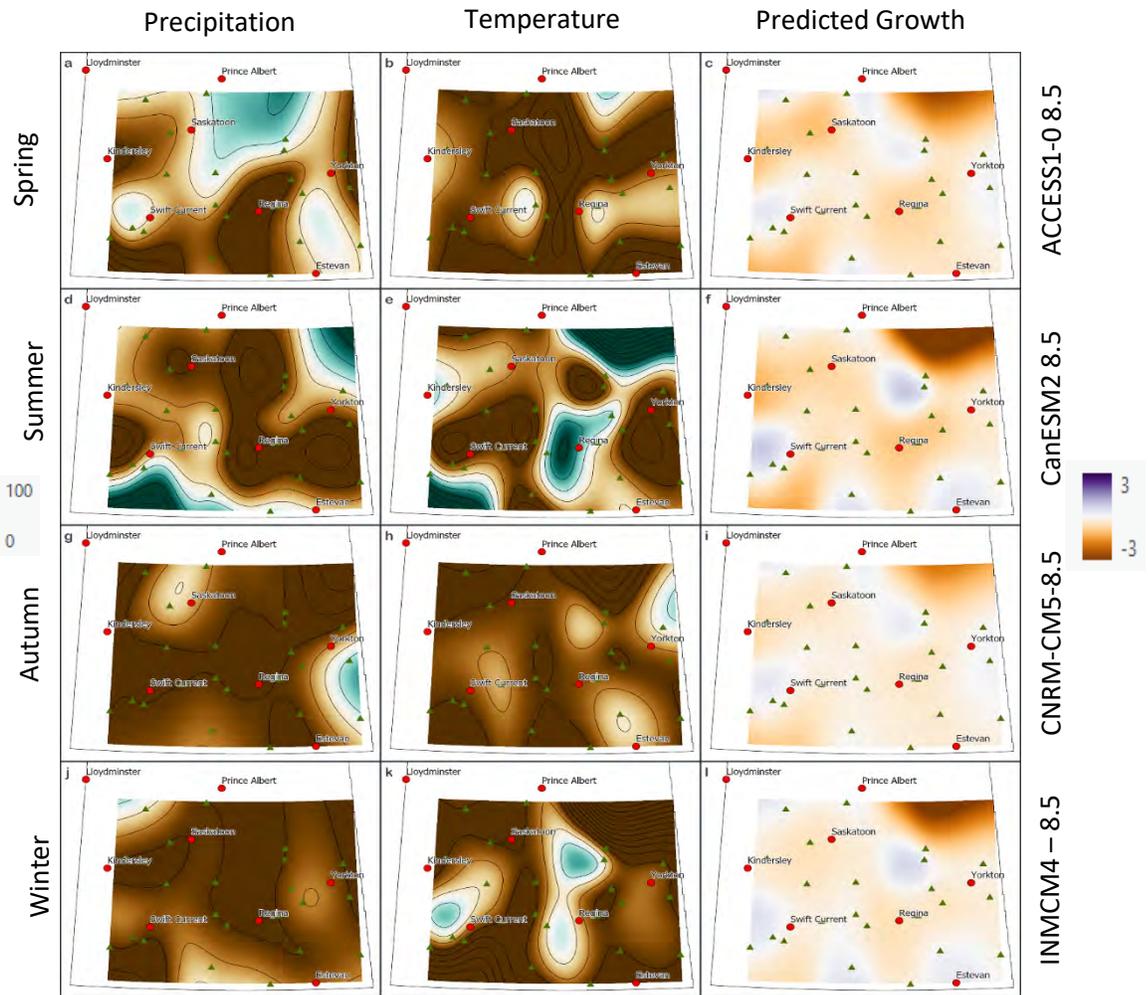
Figure 2. Relative weights maps (maps a, b, d, e, g, h, j, k) of spring, summer, autumn, and winter precipitation and temperature, identify areas where climate variables have the highest influence on white spruce growth in the southern half of Saskatchewan. In the maps a, b, d, e, g, h, j, k, the blue indicates that the specific climate variable has a large influence on white spruce radial growth. The maps to the right (maps c,f, i, l) predict changes in white spruce growth for four climate models under the higher emissions scenario (RCP 8.5) in the year 2100. In the maps c, f, i, l, the brown colour that covers most of the southern half of Saskatchewn indicates that white spruce radial growth is predicted to decrease.

FURTHER READING

https://harvest.usask.ca/handle/10388/13164

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ACKNOWLEDGEMENTS & COPYRIGHT

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