

Upland forest development in a reconstructed watershed after oil sands mining in northern Alberta, Canada¹

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Abstract: The goal of land reclamation after oil sands mining in northern Alberta is to re-establish functioning forest ecosystems. At the Sandhill Fen watershed reclamation research site, we studied initial upland forest development, i.e. tree growth and associated understory plant community composition, in response to different reclamation soil types (coarse vs fine textured) and to different tree planting densities (0, 5,000 and 10,000 stems per ha) over the course of five years. Height growth of trees (trembling aspen, jack pine, and white spruce) was greater on fine textured soils and this difference is increasing over time. There was no immediate impact of planting density on tree growth but by year 5 crown closure has almost been achieved in the highest planting densities so we expect more significant ecosystem changes after this time to be related to tree density. Understory species richness and total understory leaf area was greater on fine textured reclamation soils but by year 5 there was no difference in total plant cover (average 65%) between soil types. However, there were differences in plant community composition with coarse textured soils having greater bryophyte cover and lower forb cover than fine textured soils. There was also a tendency for understory plant cover to increase with tree density. In this water limited environment, of particular importance is the partitioning of water between upland forests and lowland bogs and fens with leaf area (i.e. tree species and density) and soil type being major drivers of this relationship. This work on upland forest development will contribute to the development of sustainable and integrated reclamation landscapes.

Additional Key Words: Reclamation, understory plant community, trembling aspen, jack pine

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