

A comparison of plant communities at the reclaimed Sandhill Wetland to natural Albertan peatlands and marshes

Author information – Jeremy A. Hartsock¹, Melissa K. House¹, Dale H. Vitt¹

Affiliation – Southern Illinois University Carbondale¹

Summary

Wetland reclamation efforts in the Athabasca Oil Sands Region seek to restore ecosystem services previously provided by wetlands that were lost consequent of oil sands mining development in northern Alberta, Canada. In this study, we characterize plant community composition, porewater chemistry patterns, and physical characteristics of soil across a gradient of water table position at the reclaimed Sandhill Wetland constructed on the Syncrude Canada Ltd. mineral surface lease. Further, we compare observations at the reclamation site to 12 mature reference wetlands (10 fens and 2 marshes) to evaluate the type of wetland to which the Sandhill Wetland is most analogous in the sixth year since initial wet-up.

Method

In late July, plant surveys were conducted across all wetland sites following methodology from Vitt et al., (2016). Circular 8.0 m² vegetation monitoring plots were established at each site (10 plots at reference sites and 20 plots at the Sandhill Wetland) and composition of the ground, field, shrub, and overstory layers was assessed by percent cover estimates (as canopy cover) to the nearest 5%. Porewater samples, volumetric soil cores (0-10 cm depths) and water table position measurements (distance from the ground layer) were also recorded at each plot.

Plant species abundances (% cover) were incorporated into a non-metric multi-dimensional scaling (NMDS) ordination (Bray-Curtis dissimilarity). For evaluating plant community composition differences among the wetland classes, comparisons were made using PERMANOVA.

Results, Observations, Conclusions

From this survey of 20 plots distributed across the reclaimed Sandhill Wetland, a total of 44 plant species were encountered (35 vascular plants and 9 bryophytes) and total plant cover was quite high, averaging 95%. Based on the NMDS ordination output (Figure 1), we show plant community structure across high and intermediate water table position areas of the Sandhill Wetland are most comparable to marshes, with *Typha latifolia* and *Carex aquatilis* exhibiting the highest cover. Across the periphery of the Sandhill Wetland, where water table position is several centimeters below the soil surface, plant communities are quite dissimilar from the reference sites and dominated by the grass *Calamagrostis canadensis*. At present, the Sandhill Wetland possesses a unique set of features, including aspects of water chemistry, physical soil characteristics, and plant communities. Overall, there is potential for the Sandhill Wetland to

transition into a marsh-like analogue in areas exhibiting water table position above the soil surface. The succession trajectory of low water table position areas, however, is uncertain.

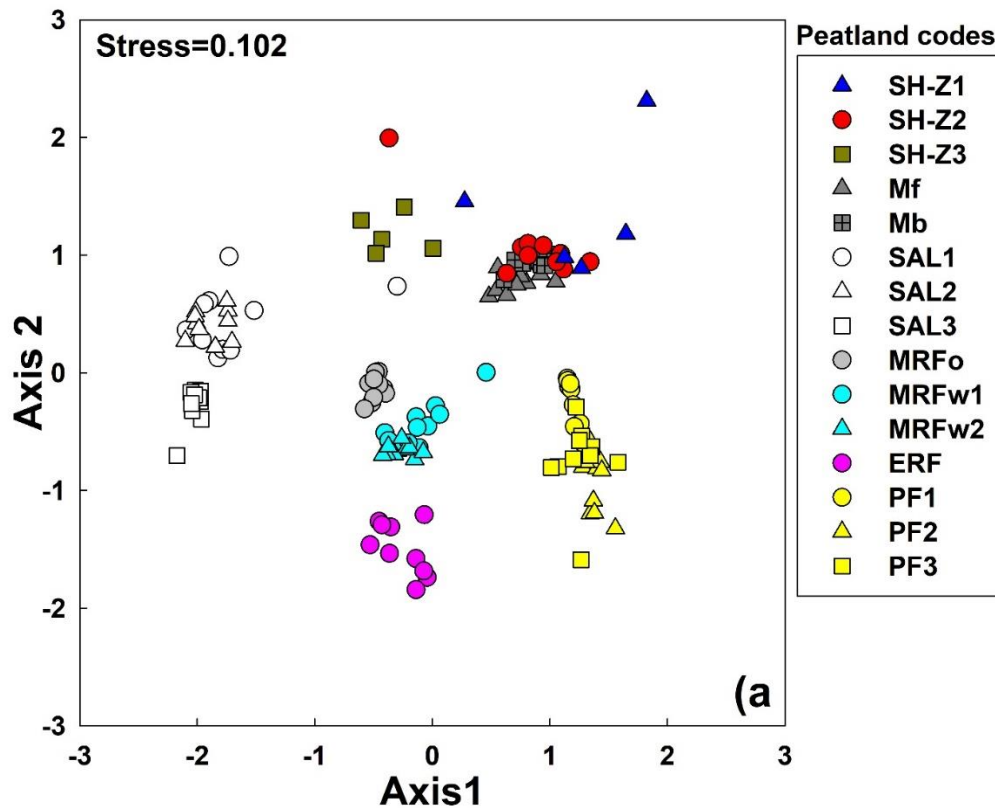


Figure 1 NMDS ordination of 140 sampling units. Abbreviations: SH-Z1 = Sandhill Wetland Zone 1, SH-Z2 = Sandhill Wetland Zone 2, SH-Z3 = Sandhill Wetland Zone 3, Mf = fresh marsh, Mb = brackish marsh, SAL = saline fen, MRFo = open moderate-rich fen, MRFw = wooded moderate-rich fen, ERF = extreme-rich fen, PF = poor fen.

Acknowledgements

We thank the Syncrude Reclamation and Closure team members (Carla Wytrykush, Jessica Piercey, Chris Beierling, Mohamed Salem, John Arnold, Wendy Kline, and Richard Kao) for logistical assistance and support. Special thanks to Phillip Piercey for assisting with off-site work near the Clearwater River.

References

Vitt, D.H., House, M., and Hartsock, J.A. 2016. Sandhill Fen, an initial trial for wetland species assembly on in-pit substrates: Lessons after three years. *Botany* **94**(11): 1015-1025. doi: 10.1139/cjb-2015-0262.