

Succession After Reclamation: Identifying and Assessing Ecological Indicators of Forest Recovery on Reclaimed Oil and Natural Gas Well Pads¹

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Abstract: To address a lack of understanding of long-term successional trajectories of reclaimed oil and natural gas sites, we sampled 30 reclaimed and adjacent reference sites in Alberta's boreal forest ranging from 7-48 years post-disturbance. The objectives of this study were to: i) measure above- and below-ground ecological properties to determine if certified reclaimed wellsites were on a positive successional trajectory for recovery, and ii) determine which properties were significantly influenced post wellsite reclamation and were thus good ecological indicators for recovery. Multi-response permutation procedures and non-metric multidimensional scaling illustrated separation between reclaimed and reference sites plant community compositions. When accounting for forest type, seral stage, and time since last disturbance, there was further separation of sites, with only two sites (7%) resembling community structure of reference sites, and 18 sites (60%) resembling treeless grasslands, two of which were >35 years post disturbance, indicating an arrested recovery trajectory. The remaining 30% of sites are likely on a positive trajectory towards recovery. We used a joint generalized estimating equation (JGEE) to determine reclamation had a significant effect on soil bulk density and pH, noxious plant cover, canopy cover, grass cover, woody debris, LFH, introduced plant richness, and live tree basal area. Our data indicate impacts can be long lasting and may remain for half a century or more post reclamation, potentially flat lining the recovery trajectory.

Additional Key Words: ecological recovery; boreal forest; multivariate statistics

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1. Poster presented at the 2019 National Meeting of the American Society of Mining and Reclamation, Big Sky, MT. Welcome Back to Montana: The Land of Reclamation Pioneers, June 3–7, 2019. Published by ASMR, 1305 Weathervane Dr., Champaign, IL 61821.
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 3. Work reported here was conducted in the Boreal Forest of Alberta, Canada.