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Effectiveness of five soil reclamation and reforestation techniques on oil and gas well sites in northeastern British Columbia

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McConkey, T., Bulmer, C. and Sanborn, P. 2012. **Effectiveness of five soil reclamation and reforestation techniques on oil and gas well sites in northeastern British Columbia**. Can. J. Soil Sci. **92**: 165–177. Techniques developed for forestry landing reclamation were applied to five oil and gas well sites in northeastern British Columbia to ameliorate soil and facilitate reforestation. Treatments implemented in fall 2003 and spring 2004 were tillage, wood chip mulch, tillage+wood chip mulch, tillage+incorporated wood chips, brush mats and a control. Lodgepole pine (*Pinus contorta* var. *latifolia*) and white spruce (*Picea glauca*) seedlings were planted. Soil and vegetation were assessed (bulk density, soil mechanical resistance, water content, air filled porosity, water retention, least limiting water range, nutrient availability, seedling survival and growth) throughout 2004 and 2005 growing seasons. Tillage improved soil physical condition, reducing soil mechanical resistance and bulk density; treatments did not affect soil chemical properties. Treatments did not significantly affect species survival; after 6 yr, spruce height and root collar diameter improved with tillage but treatments did not affect pine. Brush mats led to increased spruce growth. Regression relationships between tree performance and soil condition were significant, but generally did not explain large variability. More elaborate soil physical condition measures were no better than bulk density for predicting seedling performance, but relative bulk density and least limiting water range may be useful for evaluating soil productivity.

Key words: Reclamation, least limiting water range, reforestation, bulk density, compaction

McConkey, T., Bulmer, C. et Sanborn, P. 2012. **Efficacité de cinq techniques de restauration du sol et de reboisement sur les sites d'extraction du pétrole et du gaz du nord-est de la Colombie-Britannique**. Can. J. Soil Sci. **92**: 165–177. Les techniques élaborées pour restaurer les sites d'exploitation forestière ont été appliquées à cinq puits de pétrole et de gaz du nord-est de la Colombie-Britannique en vue d'en améliorer le sol et d'en faciliter le reboisement. Les traitements, réalisés à l'automne 2003 et au printemps 2004, étaient les suivants : travail du sol, paillis de copeaux de bois, travail du sol+paillis de copeaux de bois, travail du sol+incorporation de copeaux de bois, tapis de broussaille et témoin. Des plantules de pin tordu latifolié (*Pinus contorta* var. *latifolia*) et d'épinette blanche (*Picea glauca*) ont ensuite été mises en terre. Au cours des saisons végétatives de 2004 et 2005, les auteurs ont évalué plusieurs paramètres (densité apparente, résistance mécanique du sol, teneur en eau, pores remplis d'air, rétention de l'eau, variation d'eau la moins limitative, disponibilité des éléments nutritifs, survie et croissance des plantules). Le travail du sol rehausse les propriétés physiques du sol, en réduit la résistance mécanique et la densité apparente; les traitements ne modifient toutefois pas ses propriétés chimiques. Les traitements n'ont pas d'incidence notable sur la survie des espèces; le travail du sol améliore la hauteur et le dimension au collet des épinettes après six ans, mais pas chez le pin. Les tapis de broussaille améliorent la croissance des épinettes. Il existe des liens de régression sensibles entre la performance de l'arbre et les conditions du sol, mais en général, ces liens n'expliquent pas les fortes variations. Les mesures plus élaborées des conditions du sol ne s'avèrent pas meilleures que la densité apparente lorsqu'il s'agit de prévoir la performance des plantules, mais il se pourrait que la densité apparente et la variation d'eau la moins limitative aient leur utilité pour évaluer la productivité du sol.

Mots clés: Restauration, variation d'eau la moins limitative, reboisement, densité apparente, compaction

Oil and gas development involves clearing land for construction of well sites, gas processing plants, pipeline rights-of-way, roads and seismic lines. Over 10000 oil and gas wells were drilled in northeast British Columbia between 2000 and 2010 (British Columbia Oil and Gas Commission 2010). Many were located on productive land under management for forest resources, and cumulative reductions in future timber supply may occur if well sites (~1.4 ha in size) are not reforested. Soil productivity on well sites may be negatively affected by a number of processes during construction and operation, and reduced survival and growth of conifers may result without soil reclamation.

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