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# Contrasting Access Mats and Conventional Powerline Construction Impacts on Mixedgrass Vegetation

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## Introduction

Industrial activities such as powerline construction can alter vegetation and soils in the Mixedgrass Prairie of western Canada. Re-establishment of vegetation is critical to restore ecosystem function and meet regulatory compliance. Two different methods of high-voltage powerline tower construction are sod-stripping prior to construction followed by soil replacement and revegetation, or laying wooden access mats to minimize heavy equipment impacts to the underlying prairie (ASRD 2010). Access mats are thought to reduce direct damage to soil and vegetation by limiting physical disturbance, but subsequent recovery depends on regrowth of vegetation from surviving plant material or the seed bank (Dollhopf et al. 2007 Mitchem et al. 2009). While the use of access mats is widely recommended on public land in Alberta, little data exists on the effectiveness of mats in facilitating vegetation recovery, or on how this varies with soil texture. This study reports on the first-year recovery of high-voltage powerline towers constructed in Mixedgrass Prairie using two contrasting construction methods. Specific objective is to compare the recovery of vegetation following construction that used access mats to construction done with conventional sod-stripping.

**Figure 1.** Low disturbance site where access rig mats are in place for up to 4 months.

## Study Design and Field Measures

This study was conducted at 15 high voltage tower sites associated with the ATCO Eastern Alberta Transmission line crossing the University of Alberta's Mattheis Research Ranch, 40 km north of Brooks, Alberta, Canada. The powerline was constructed between September 2013 and September 2014. Sites range from Orthic Brown Chernozems that are dominated by *Hesperostipa comata* on loamy prairie to Rego Chernozems on sandy soils that are dominated by *Calamovilfa longifolia*. Towers were divided into those constructed with either low disturbance (LD; n=8) in which access mats were in place for up to 4 months during construction and vegetation was allowed to recover naturally (Fig. 1), or high disturbance (HD; n=7) in which soil was stripped, piled, and replaced 8 months later, and hydro-seeded in October 2014 (Fig. 2).

**Figure 2.** High disturbance site where soil is stripped, piled, and replaced up to 8 months later and reseeded.

At each site, we collected above ground plant biomass by growth form (litter, grasses, forbs, shrubs) from 4 quadrats and plant species cover was estimated in 8 quadrats (0.25 $m^2$). A nearby (< 50 m from tower) patch of undisturbed grassland on the same ecosite was sampled as a control. All data were collected during July and August 2015. Data were analyzed using mixed model ANOVA with ecosite and disturbance level as fixed effects and tower site as random.

**Results and Discussion**

High disturbance sites were colonized by forbs leading to an increase in biomass even though grasses almost disappeared from the site (Fig. 3).

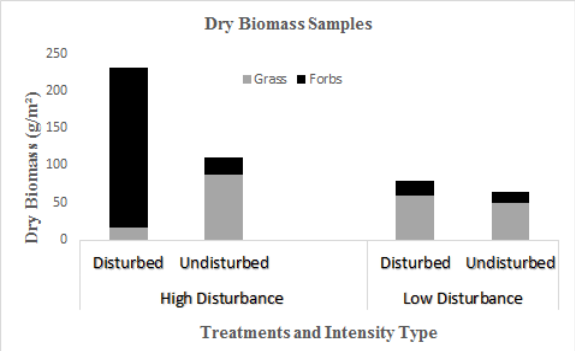


**Figure 3**. Biomass of grass and forbs in communities receiving different levels of industrial disturbance.

Grass biomass was higher in LD sites where a seed mix was added. It should be noted that control sites were markedly different from each other, possibly indicating a procedural bias in where tower installation methods were used (Fig. 3). Low and high disturbance sites also differed markedly in their cover of litter (HD 0%, LD 82%; P-value <0.001) and microphytic crusts (HD 0%, LD 12%, P-value 0.05) which were completely lost when the site was stripped, which could have consequences for the long term function and recovery of these sites.

**Conclusion**

Industrial activity in grasslands is extensive, but our results show that some types of activity on certain ecosites can limit the overall impact on the plant community. In this study, we found no impact of access mats on plant biomass one year after construction, while removal of topsoil altered the plant community.

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