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# Comparison of two site preparation treatments using the Meri Crusher

## Abstract

In 1999, the Forest Engineering Research Institute of Canada (FERIC) in cooperation with Mistik Management Ltd., Meadow Lake, Saskatchewan tested a Meri Crusher mounted on a skid-steer loader working alone and following a second skid-steer loader. The Meri Crusher created a mixed microsite to provide vegetation control and suitable planting sites. FERIC monitored the two treatments and compared the productivities and costs.

## Keywords

Site preparation, Scarifying equipment, Vegetation control, Crushers (Silv.), Mulching, Comparison, Meri Crusher, Saskatchewan.

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## Introduction

Mistik Management Ltd. has been using a Meri Crusher mounted on a small loader since 1998 to prepare sites for planting. The Meri Crusher mulches the organic material and mixes the mulched material with mineral soil to create a mixed microsite to favour planted white spruce and provide vegetation control from *Calamagrostis canadensis* (marsh reed grass) and aspen. However, harvesting in aspen and mixedwood forests creates moderate to high slash loading. When the Meri Crusher is used for site preparation, these slash loadings have led to low machine productivity.

In October 1999, Mistik Management Ltd., Meadow Lake, Saskatchewan evaluated a Meri Crusher MJ-1.0 mounted on a 65-kW Thomas T-245 HDS skid-steer loader. The company tested the Meri Crusher (mounted on the loader) working alone, and following a 34-kW Bobcat 7753 skid-steer loader with a front-mounted bucket that realigned the slash to clear a trail for the Meri Crusher. FERIC monitored the site preparation treatment to determine the difference in productivity of the Meri Crusher working alone, and following the second

loader. This report summarizes the results of the two-day study.

## Objectives

FERIC's objectives were to evaluate the equipment and operating practices for the two treatments and to determine the productivities and costs.

## Equipment description

The Meri Crusher<sup>1</sup> is a horizontal-drum mixing implement that can be front- or rear-mounted on a variety of carriers. It is available in drum widths of 0.8, 1.0, 1.4, 2.3, and 2.5 m. Hunt (1995) provides a full description of the Meri Crusher. The Thomas T-245 HDS skid-steer loader<sup>2</sup> is 1.8 m wide, weighs 3629 kg, has an engine power of 65 kW, and has a ground clearance of 0.23 m. The operator can control the depth of mixing by hydraulically raising and lowering

<sup>1</sup> The Meri Crusher MJ-1.0 costs \$25 000. It is manufactured by Suokone OY of Finland and is distributed in Canada by Hakmet Ltd. of Dorion, Que.

<sup>2</sup> The Thomas T-245 including tracks costs \$55 000. It is manufactured in New Brunswick and is distributed by TomCat Machinery (Edm) Inc. of Edmonton, Alta.

the Meri Crusher. The Bobcat 7753 skid-steer loader<sup>3</sup> is 1.7 m wide and weighs 2500 kg. It has a 34-kW engine with a hydraulic pump capacity of 57 L/min.

## Site description

The study site was located near Goodsoil, Saskatchewan, 100 km northwest of Meadow Lake. The mixed spruce and aspen stand had been full-tree harvested during the summer of 1999. Processing was completed at the roadside, and the coniferous slash was left to be piled and burned. The deciduous slash was returned to the stump by skidders and scattered over the harvested area with no designated pattern, to return nutrients to the site and to minimize the amount of burning required.<sup>4</sup>

**Table 1. Pre-treatment slash survey**

	Overall
Total length of transect sampled (m)	400.0 (20 transects @ 20 m)
Slash volume (m <sup>3</sup> /ha)	
>5.0 cm diameter	102.3
<5.0 cm diameter	9.2
Total	111.5
Avg slash pieces (no./quadrat) <sup>a</sup>	
<5.0 cm diameter [range]	4.1 [0–15]
>5.0 cm diameter [range]	1.3 [0–6]
Avg length of pieces (m)	
>5.0 cm diameter [range]	1.9 [0.1–9.0]
Avg slash depth (cm) [range]	5.0 [0.0–35.0]
Stumps	
number (no./ha)	1 640
avg height (cm) [range]	11.3 [0.0–100.0]
avg diameter (cm) [range]	24.6 [8.0–55.0]

<sup>a</sup> A quadrat is a 2.0-m segment of the 20-m sample transect.

The site was a D2 Lowbush Cranberry Aspen site with sandy loam soil (Beckingham et al. 1996).<sup>5</sup> The pre-treatment survey showed a moderate amount of slash (112 m<sup>3</sup>/ha) with an average depth of 5 cm, and 1640 stumps/ha with an average height of 11 cm (Table 1). Vegetation cover was minimal with 5% cover of aspen sprouts and some grass (<5%). Duff layer was approximately 10 cm. Overall, the site was flat with localized wet spots in the depressions and few rocks. There had been a light snowfall shortly before the study, and the ground and slash were wet and slippery.

## Results

### Productivities

The study area was divided into two treatment units. In the first unit the Meri Crusher, mounted on the front of the Thomas loader, created strips of mixed mineral and organic soil (Figure 1). The Meri Crusher spent 5.3 hours to treat the 1.0-ha unit (Table 2). It spent 69% of its time mulching and mixing, and 31% of the time maneuvering over and around the slash and stumps. The post-treatment survey showed that within each strip there were 44% mixed mineral/organic soil, 42% mixed organic soil, and 14% undisturbed soil. The distance between the mulched-strip centres was 2.4 m.

In the second unit, the Bobcat loader windrowed the slash and cleared a path for the Meri Crusher, which created two strips

<sup>3</sup> The Bobcat 7753 including tracks costs \$35 500. It is manufactured by the Bobcat Company in North Dakota and is distributed by TomCat Machinery (Edm) Inc. of Edmonton, Alta.

<sup>4</sup> K. Johnston, Mistik Management Ltd., personal communication, May 2000.

<sup>5</sup> T. Keddy, Mistik Management Ltd., personal communication, June 2000.

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**Table 2. Shift-level results**

	Meri Crusher on Thomas loader		
	Alone	Following Bobcat loader	Bobcat loader
Total time (h)	5.9	3.2	7.0
Productive time (h)	5.3	3.2	6.5
Non-productive time (h)	0.6	0.0	0.5
Total area treated (ha)	1.0	1.43	1.43
Productivity (ha/h)	0.19	0.45	0.22
Machine own. & oper. cost (\$/h)	73.37	73.37	82.40
Total treatment cost (\$/ha)	388.86	164.18	374.55

of mixed mineral/organic soil within each windrow (Figure 2). The Bobcat loader spent 6.5 hours to clear trails for the Meri Crusher, which then spent 3.2 hours to treat the 1.43-ha unit (Table 2). The Meri Crusher spent 88% of its time mulching and mixing and 12% maneuvering, mostly around stumps. The post-treatment survey showed that within each strip there were 96% mixed mineral/organic soil, 4% mixed organic soil, and no undisturbed soil. The mulched strips were in pairs 3.3 m apart.

### Costs

The treatment cost<sup>6</sup> for the Meri Crusher working alone was \$389/ha. When following the second loader, the treatment cost for the Meri Crusher was \$164/ha. The second loader cost \$375/ha for a total treatment cost of \$539/ha (Table 2). The Meri Crusher working alone had the less expensive cost, but left 14% of each strip untreated, while the two-pass treatment with the Meri Crusher following the second loader was more expensive, but treated 100% of the strip.

## Discussion and implementation

When working alone, the Meri Crusher spent over 30% of its time maneuvering over and around slash. The slash was too large and the loader was unable to push it out of the way or climb over it. The Thomas loader had a ground clearance of only 23 cm and the flexible tracks on the wheels were loose

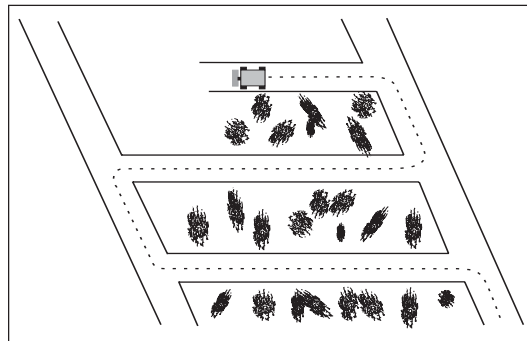


Figure 1. Treatment pattern for the Meri Crusher working alone.

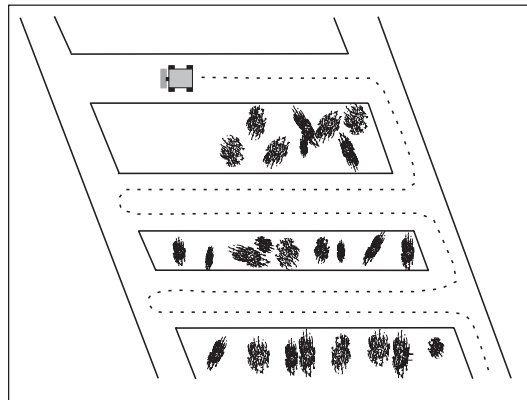


Figure 2. Treatment pattern for the Meri Crusher following a second loader.

fitting and slipped when the loader attempted to climb over the slash. The operation would be improved if the tracks were tightened (by increasing the wheel size or removing a link in the track) and teeth or grousers were added to the tracks to improve traction. The size of the slash and its orientation prevented

<sup>6</sup> Treatment costs were calculated using FERIC's standard costing method, which uses IWA wage rates (\$18/h in this study) for workers and current purchase prices for equipment. The calculated costs in the study were not those experienced by the contractor, and do not include supervision, overhead, profit, and risk allowances.

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the Meri Crusher from making long continuous mulched strips when working alone.

When working between the windrows created by the Bobcat loader, the Meri Crusher was able to create two mulched rows almost continuously with only 12% of the time spent maneuvering. The Bobcat loader had difficulty moving long pieces of slash because it lacked power. The bucket on the front of the loader was not suited to the work; a brush rake would be more effective.

If the Meri Crusher was mounted on the back of a larger prime mover, e.g., a bi-directional tractor or a skid-steer loader, with a brush rake mounted on the front, the treatment could be done more successfully in a one-pass operation. In Cormier and Paterson (1997), a Meri Crusher MJ-2.3 was mounted on the three-point hitch of a 63-kW John Deere 6400 tractor with a front-end loader. The Meri Crusher MJ-2.3 was found to have costs comparable to the traditional method (scalping with a crawler tractor), yet the treatment had the potential to create superior microsites.

If the aspen slash was left at the roadside, the Meri Crusher would not need a second machine to clear trails for it and a different prime mover may not be required. In this study, the slash had been returned to the harvested area before the Meri Crusher was chosen as the site preparation treatment, otherwise the slash would have been left at the roadside.<sup>7</sup> The Meri Crusher treatment was chosen over other methods such as mounding and disc trenching, because other forest users (e.g., trappers and outfitters) prefer the results.

The Meri Crusher creates an ideal microsite for planting, but the prime mover used in the study and the slash loading in the mixedwood forests led to low machine productivities. Further testing with a different prime mover with brush rake, or with the same prime mover when the aspen slash is left at roadside, would determine if this technique could improve the cost of treatment.

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<sup>7</sup> K. Johnston, Mistik Management Ltd., personal communication, May 2000.

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