I ac f echa ical i e e a ai f lia : ie f la ed hi e : ce eedli g i ed- d b eal f e i e i Albe :a

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Acce ed 13 Feb : a : 1998

Abstract

The i ac f diffe e e h d f echa ical i e e a ai (MSP) e f : a ce a d f lia : i i f la ed hi e : ce (Picea glauca (M e ch) V) eedli g e e e a i ed a i ed- d b eal f e i e (J d C eek, F C eek) i Albe :a, Ca ada. The ea e i cl ded h ee e f MSP: di c e ch, i e : l gh, a d bladed, he la e :i cl di g hi a d hick ic : i e (ba ed de h f e ai i g ga ic a e); a ell a a ha : e ed-c : l (MSP). Seedli g

Although a number of objective of MSP have been identified over the years, MSP has been associated with the ecological concept of the relationship between forest floor processes and forest productivity (Viereck and Mayo, 1985; Foster et al., 1986; Schoenau and Nambia, 1990; Viereck et al., 1992; Mead et al., 1993) and reduced availability of P (Kabzems and Rashal, 1987), N and Ca (Titus et al., 1985; Mead et al., 1993). MSP is effective in the reduction of competing vegetation (Bergerud and Pichette, 1988; Mead et al., 1993) but the empirical evidence of ecological effects of MSP on plant species composition (Bard and Jarvis, 1988; Bard, 1991) and growth (Weber et al., 1985) etc.

Observations, including climatic, and the ecological aspects, and the ecological concepts of the ecosystem will be described for the purpose of this study (Mead and Timney, 1995). The objectives of this study were to determine the effects of different methods of MSP on seedling growth in the mixed-wood boreal forest region of Alberta, and to investigate the ecological aspects of the forest floor decomposition and nutrient cycling. In this study (Schmidt et al., 1996), the designated harvest 15 years after MSP, each area had either received adequate amounts of all available N and available P in addition to adequate amounts of available Ca and Mg, or had been unfertilized. This study was the impact of different methods of MSP on the availability of N, P, K, Ca, Mg, S, Mn, Fe and Al in relation to white spruce (Picea glauca (Moench) Voss) seedling.

2. Materials and methods

2.1. Site description

The study site (Judy Creek: 54°24′N, 115°40′W, 1010 elevation, slope: 20%, aspect: 270° and Fox Creek: 54°15′N, 116°49′W, 975 , slope: 6%, aspect: 350°) were located in the White-

eedli g . The , 10 15 eedli g e ea e ed al g each f a ec e bl ck (e ea e , e i e). A he e d f A g 1993, heigh , e i al leade le g h, a d cali e (dia e e) f he e i al leade e ea ed f 10 eedli g al g each f h ee a ec e bl ck (e ea e e i e). F h e da a, he hi a d hick ic i e (i hi blade) e e di i g i hed.

F lia a le e c llec ed f la ed eedli g i e ea e : di c, i e ; blade- hi , blade- hick, a d ha e ed-c l (MSP). F each ea - e , i hi a bl ck, a le e c llec ed al g a ec c e di g al g hich he

ANOVA. Whe ea e a i e ac i i l i g
ea e a ig i ca f c ce a i c e ,

C eek (Table 2). F liage f eedli g a J d C eek had ig i ca l highe cf lia c ce a i f P, K a d Ca, c e f N, P, K, Ca, Mg a d S (h) a d l e cf lia c ce a i a d c e f M (Table 3) a d Al (h) ha eedli g a F C eek.

Diffe e ce i a be c f il che ical c e cie be ee he d i e al gge ha J d C eek i he e fe cile i e (Sch id e al., 1996). The f e ca J d C eek had ig i ca l highe c i e ali able N, H, e cha geable ba e , ba e a a- i a d al c ce a i f K, Ca, Mg, a d M ha a F C eek. The i e al il a 0 7 c , a J d C eek, had highe c i e ali able N, a ailable P, H, e cha geable ba e a d ba e a a i ha a F C eek.

Sig i ca i e× ea e i e ac i e e f d f cf lia c ce a i a d c e f Mg a d M (Table 1). A F C eek, he i e c ea e had li le effec Mg c ce a i c e , he ea hi ea e had ch la ge c effec a J d C eek (Fig. 1). I Oc be c1993, he e a a e de c f c f lia cMg c ce a i be l e cf cMSP ea- e a c a ed he c cl a J d C eek b be highe cf c MSP ea e a c a ed he c cl a F C eek (Fig. 1). F c M , he i e× ea e i e ac i i a ib able diffe e e ce i he effec i e e f he i e c a d blade ea e a he i e (Table 3, Fig. 2).

3.2. Seedling performance, foliar biomass and N, P, K, Ca, Mg and S

O e all eedli g c i al a >85% i all ea- e a d he e e e ig i ca effec f MSP eedli g c i al, hi g f he e c i al leade ; heigh i 1992 a d 1993, he dia e e ca d le g h f he e c i al leade ; c i eedle eigh (Table 1 a d 2). Rela i e f lia c bi a f eedli g i MSP a ea a ge e all highe c(e ce di c all a li gda e , i e ci J l 1992 a F C eek) ha f c c cl eedli g b he effec a all a d - ig i ca (p=0.07, Table 1 a d 2). The e i li le i f c a i ha li i ea t eedli g g c h i ed- d i e i he e e c b eal f e . S il e e a e, a e cl ggi g, ie a ailabili ,

Table 3
Re l f la ed c a i f ll i g ig ifica ea e : i e X ea e effec (Table 1). Da a f : he i e e led if he e e ig ifica i e ac i i l i g ie (ee Table 1). The a ge i gi e he la ed c a i e e ig ifica . Mea f lia : (a) c ce a i a d (b) c e f : la ed hi e : ce eedli g b ie, c llec i i e (J l 1992, J l 1993 a d Oc . 1993), a d MSP ea e (i alic e e e i di id al MSP ea e ig ifica l diffe e f : ha : e ed-c : l

(a) C ce a i (g g^{-1})

Si e	T ea e	P [a]		K	Fe		Al
		J l '93	Oc . '93	Oc . '93	J l '92	Oc . '93	J l '92
B h [1]	c : l	1.87	2.14 [b]	5.87 [b]	0.030 [b]	0.038	0.018 [b]
	di c	1.86	1.98	5.69	0.042	0.042	0.028
	i e :	1.78	1.97	5.38	0.047	0.070	0.037
	blade- hick	1.77	1.90	5.42	0.064	0.055	0.041
	blade- hi	1.68	1.74	5.27	0.150	0.093	0.106
		M		Mg			
		J l '93	Oc . '93	J l '92	J l '93	Oc . '93	
J d	c : l	0.20 0.34	0.76 [b]	0.92 1.07	0.77 0.81	0.86 1.07	
	di c		0.39				
	i e :		0.57				
	blade- hick		0.59				
	blade- hi		0.44				
F	c : l	0.53	1.03 [b]	0.83	0.73	0.92	
	di c	0.58	0.98	0.84	0.77	0.96	
	i e :	0.52	0.76	0.95	0.76	1.04	
	blade- hick	0.38	0.74	0.97	0.81	1.10	
	blade- hi	0.28	0.50	1.05	0.88	1.16	

(b) C e (g eedli g^{-1})

Si e	T ea e	Al					
		J l '92					
B h	c : l	0.07 [b]					
	di c	0.11					
	i e :	0.15					
	blade- hick	0.20					
	blade- hi	0.55					
		M			Fe		
		J l '92	J l '93	Oc . '93	J l '92	J l '93	Oc . '93
J d	c : l	0.95	2.10 2.64	5.80	0.16 [b]	0.19	0.40 1.22
	di c	0.75		3.81	0.14	0.45	
	i e :	1.80		6.70	0.23	0.45	
	blade- hick	1.16		5.45	0.31	0.24	
	blade- hi	1.31					

cli a ic effec , a d c e i i a e ge e all c -

c :l hile f lia :M c ce a i a d c e f
eedli g i di c a d blade- hi a ea e e ig i -

a ea a c a ed c l hile f lia bi a a d ie c e h ed ig i ca diffe e ce (Table 1, Fig . 3 a d 4). Thi gge ha l a f cie kee i h de a d. F M i J l a d Oc be 1993 he MSP- ea ed eedli g had l e f lia c ce a i a d c e ha eedli g i he c l a ea b i ila f lia bi a (Fig. 2). Thi a e i he e e e f ha all i e ed a l c i (Ti e a d S e, 1978) a d gge ed ced a ailabili f M , b ha i a -li i i g. I J l a d Oc be 1993, c ce a i f Mg f eedli g i blade- hi a ea e e highe hile f lia bi a a cha ged, i dica i g ible l c i (Fig. 1).

O e all, i a ea ha he i ac f MSP f lia ie a he e i e a i i al. The l c i e i i e effec f MSP eedli g i i a i c ea ed f lia Mg i blade- hi i e a F C eek (Fig. 1). I J l a d Oc be 1993, he e a ha e bee l c i f Mg. I dica i f ible ega i e i ac f MSP i cl de: ed ced P a d K c ce a i (Fig . 3 a d 4) a b h i e a d ed ced M c ce a i (Fig. 2) a d c e . H - e e ; he da a d i dica e a de cie cie f he e ele e h3.3(6)33.de.9((a d)-271-562.5(f)116l i9.5(i-2

3.3. Comparison with results of soil chemical property measurements

A c a i f il che ical e ie he e a e d i e (Sch id e al., 1996) i dica ed ha MSP ei he ed ced did cha ge al N a d C, C/N a i a d i e ali able N. L e C/N a i a - cia ed i h MSP e e c ide ed a i i e i e ce i e fe ili , i ce l e C/N a i a e f e a cia ed i h i c ea ed N a ailabili . H e e,

he i i ed ce eedli g (McLa ghli e al., 1991). I i likel ha , i J l 1992, eedli g i he blade- hi a ea e e e ie ci g ha f l c ce a- i f Al (0.106 g g^{-1}

f MSP ea e il h ical a d che ical
e ie , a d i he i e e e f he e a d,
e iall , diffe e ce i he a MSP ea e
e e a lied a each i e. The i e ea e had he
g ea e i i e (b ig i ca) effec ee
g h a d f lia ie a . Seedli g i he

i ha e ed (. ha e ed) a ea had highe
Fe a d Al c ce a i (Sch id e al., 1996),
e abl a a e l f c a i a i b i e al
il, al h gh e ha e da a Fe a d Al i i e al
il .

3.5. Comparison of MSP treatments

The a i MSP ea e diffe ed i hei i -
e ce f lia ie a be ee i e a d e
i e. Thi ca be a ib ed diffe e ce i he effec

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