

**GRASS-TREE INTERACTIONS  
IN WESTERN CANADA**

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by

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UNIVERSITY OF REGINA

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## Abstract

Forest expansion into prairie is generally thought to result from reduced bison browsing on trees and elimination of tree-destroying fires. In addition, forest expansion may be accelerated by deposition of mineral nitrogen (N) from the atmosphere, because additional N should allow trees to overtop grasses faster.

I measured N deposition with ion-exchange resin for 2 yr in 6 national parks in western Canada. Parks in densely populated regions with intense industrialization or farming received significantly more N than parks in sparsely populated regions. Rates of N deposition were significantly and positively correlated with forest expansion. Forest expansion increased the total amount of N in the ecosystem.  $^{15}\text{N}$  analysis suggested that increased N deposition was anthropogenic.

Forest expansion likely occurs through interactions between individual plants. I tested the effect of water availability on standing crop of invading shrubs and of grasses in invaded prairie in a removal experiment. Total standing crop decreased only when water availability was as low as in drought years. Low water availability appeared to affect shrubs more strongly than grasses. Above-average water supply had no effect on standing crop.

I tested two herbicides for selective removal of grasses (sethoxymidim) and the selective removal of shrubs (metsulfuron) in rangeland. Both herbicides reduced target plant standing crop without damaging the other growth form. Higher concentrations of metsulfuron were necessary

to remove parts of a clonal shrub than to remove a complete clone.

I examined with a reciprocal removal experiment whether the competitive effect of invading woody species on invaded grasses and on resources (light, N, water) is related to plant mass or to growth form. Shrubs had generally similar or larger absolute effects on grasses and resources than grasses had on shrubs or on resources. The larger effects were attributable to shrub mass because grasses consistently had larger per-gram effects (effect size/standing crop). The experiment supported the hypothesis that higher N supply to woody plants would enable them to outcompete grasses in the absence of grazing and fire.

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## TABLE OF CONTENTS

ABSTRACT	I
ACKNOWLEDGEMENTS	III
TABLE OF CONTENTS	IV
LIST OF TABLES	VIII
LIST OF FIGURES	X
<b>1. INTRODUCTION</b>	
1.1 THE FOREST-GRASSLAND ECOTONE	1
1.2 CONTINENTAL-SCALE CONTROL OF THE FOREST-GRASSLAND ECOTONE	2
1.3 INDIVIDUAL-SCALE CONTROL OF TREE-GRASS INTERACTION	6
<b>2. NITROGEN DEPOSITION AND FOREST EXPANSION IN WESTERN CANADA</b>	
2.1 ABSTRACT	10
2.2 INTRODUCTION	11
2.3 METHODS	
2.3.1 Study sites	15
2.3.2 Atmospheric deposition and available soil nitrogen	18
2.3.3 <sup>15</sup> N and N in vegetation and soil at Elk Island and Jasper	23
2.3.4 Forest expansion	27

2.4	RESULTS	
2.4.1	Atmospheric deposition and available soil N – among-park comparisons	27
2.4.2	Atmospheric deposition and available soil nitrogen – Elk Island	31
2.4.3	<sup>15</sup> N and N in vegetation and soil at Elk Island and Jasper	40
2.4.4	Forest expansion	43
2.5	DISCUSSION	
2.5.1	Atmospheric deposition – among-park comparisons	47
2.5.2	Available soil nitrogen – among-park comparisons	50
2.5.3	N deposition and availability – Elk Island	51
2.5.4	<sup>15</sup> N and N in vegetation and soil at Elk Island and Jasper	52
2.5.5	Forest expansion	54
2.5.6	Conclusions	59
<b>3. WATER AVAILABILITY AND COMPETITION IN THE NORTHERN GREAT PLAINS</b>		
3.1	ABSTRACT	60
3.2	INTRODUCTION	60
3.3	METHODS	62
3.4	RESULTS	66
3.5	DISCUSSION	69

<b>4. THE SELECTIVE EFFECT OF METSULFURON AND SETHOXYDIM ON</b>		
<b>SHRUBS, GRASSES AND SEDGES</b>		
4.1	ABSTRACT	72
4.2	INTRODUCTION	72
4.3	METHODS	74
4.4	RESULTS	76
4.5	DISCUSSION	77
<b>5. COMPETITIVE EFFECTS OF INVADING SHRUBS AND INVADED</b>		
<b>GRASSES IN THE NORTHERN GREAT PLAINS</b>		
5.1	ABSTRACT	79
5.2	INTRODUCTION	80
5.3	METHODS	
5.3.1	Location, design and site preparation	83
5.3.2	Effects of shrubs and grasses on each other	85
5.3.3	Effects of grasses and shrubs on resources	87
5.3.4	Statistics	90
5.4	RESULTS	
5.4.1	Treatment effects on standing crop	94
5.4.2	Effects of shrubs and grasses on each other	96
5.4.3	Effects of shrubs and grasses on resources	99
5.4.4	Per-gram effects on resources	101

5.5	DISCUSSION	
5.5.1	Effects of grasses and shrubs on each other	104
5.5.2	Effects of shrubs and grasses on resources	105
5.5.3	Per-gram effects on resources	109
5.5.4	Grass-shrub competition	111
6.	CONCLUSIONS	114
7.	REFERENCES	120

## LIST OF TABLES

### NITROGEN DEPOSITION AND FOREST EXPANSION IN WESTERN CANADA

2.1	Description of sites: six national parks in western Canada.	16
2.2	Regression equations to calculate shrub mass (g) from diameter at ground ( $d$ [mm]) for species without previously published equations.	26
2.3	Details of air photographs used to calculate forest expansion.	28
2.4	N deposition in six national parks in western Canada during two years examined with univariate (ANOVA) and multivariate (MANOVA) analysis of variance.	34
2.5	Available soil N in six national parks in western Canada during two years examined with univariate (ANOVA) and multivariate (MANOVA) analysis of variance.	35
2.6	Rate of N deposition ( $\text{kg ha}^{-1} \text{ yr}^{-1}$ ) at Elk Island National Park.	39
2.7	Availability of soil N ( $\text{kg ha}^{-1} \text{ yr}^{-1}$ ) at Elk Island National Park.	39
2.8	Amount of N in biomass (above- and belowground) in two national parks in western Canada based on N concentration and mass measurements in 1996 and air photo interpretation.	48

**WATER AVAILABILITY AND COMPETITION IN THE NORTHERN GREAT  
PLAINS**

- 3.1 Monthly water supply rates ( $L/m^2$ ) in the three water supply treatments. 63

**COMPETITIVE EFFECTS OF INVADING SHRUBS AND INVADED GRASSES  
IN THE NORTHERN GREAT PLAINS**

- 5.1 A-priori comparisons using contrasts to answer specific questions when the effect of removal treatments or the habitat  $\times$  removal treatment interaction was significant. 92

## LIST OF FIGURES

### NITROGEN DEPOSITION AND FOREST EXPANSION IN WESTERN CANADA

- 2.1 Location of sites (national parks), N deposition rate ( $\text{kg ha}^{-1} \text{ yr}^{-1}$ ), population density, and regional land-use. 14
- 2.2 Deposition of atmospheric N and available soil N in six western Canadian national parks in the agro-industrial region (more densely populated) and the forested region (sparsely populated) region measured for two years in four seasons. 33
- 2.3 Relationship between available soil N and N deposition in six western Canadian national parks, four in the agro-industrial region (more densely populated) and two in the forested region (sparsely populated), measured for two years in four seasons. 36
- 2.4 Deposition of atmospheric N in Elk Island National Park, western Canada. 38
- 2.5  $^{15}\text{N}$  values of vegetation and soil compartments in a park with high (Elk Island) and low (Jasper) N deposition. 41
- 2.6 Concentration of N in vegetation and soil compartments in a park with high (Elk Island) and low (Jasper) N deposition. 42
- 2.7 Amount of N in vegetation in a park with high (Elk Island) and low (Jasper) N deposition. 44

2.8	Forest expansion in six western Canadian national parks determined by digital analysis (density-slicing) of aerial photographs.	45
2.9	Relationship between rate of forest expansion (percentage-points forest area per year) and atmospheric N deposition in five western Canadian national parks.	46
2.10	Relationship between rate of forest expansion (percentage-points forest area per year) and annual precipitation in six western Canadian national parks.	47

**WATER AVAILABILITY AND COMPETITION IN THE NORTHERN GREAT  
PLAINS**

3.1	Effect of habitat and growth form removal on standing crop of grasses and shrubs.	67
3.2	Effect of water supply on standing crop of grasses and shrubs in intact vegetation (no-removal treatment).	68

**THE SELECTIVE EFFECT OF METSULFURON AND SETHOXYDIM ON  
SHRUBS, GRASSES AND SEDGES**

4.1	Effect of metsulfuron and sethoxydim on standing crop of target and non-target growth forms.	76
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**COMPETITIVE EFFECTS OF INVADING SHRUBS AND INVADED GRASSES  
IN THE NORTHERN GREAT PLAINS**

5.1	Effect of four growth form removal treatments on standing crop in two habitats (prairie, brush) over two years.	95
5.2	Effect of removal and habitat treatments on aboveground net primary productivity (ANPP) of shrubs and grasses.	97
5.3	Aboveground net primary productivity (ANPP) of shrubs and grasses as a function of neighbour standing crop.	98
5.4	Effect of removal treatment and habitat on light penetration to the grass canopy, to the ground, available soil nitrogen, and soil water.	100
5.5	Differences among habitats and vegetation types in light consumption, soil N uptake, and water uptake per gram standing crop.	102

**CONCLUSIONS**

6.1	Mechanistical model of shrub-grass interactions in prairie at the scale of individuals when N is the most growth-limiting resource.	118
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