

# Response of forest birds to partial harvesting



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# Introduction

- Social pressure
  - Biodiversity conservation, moderate intensity harvesting procedures



Source: ARMVFR BSL







# Introduction

- Low-intensity harvest treatments may maintain habitat for some species (Gram et al. 2003, Holmes & Pitt 2007)
- Many songbirds and woodpecker species still sensitive to such treatments (Doyon et al. 2005; Guénette & Villard 2005; Holmes & Pitt 2007)



# Introduction

- How much habitat is enough ?
- How many species need to be conserved ?

# Focal species

- Brown Creeper and Ovenbird
  - Two of the most sensitive forest bird species to partial harvesting in North America (Vanderwel et al. 2007)
  - Strongly associated with mature and old growth stands





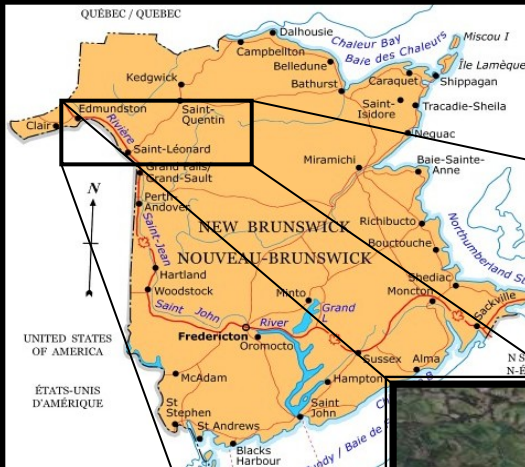


# Objectives

- Objective 1.
  - Identify key habitat variables in nest site selection and nesting success
- Objective 2.
  - Quantify the demographic response of two forest birds to experimental single-tree selection harvesting

# Study area

- Private lands :
  - J.D. Irving Ltd.
  - Acadian Timber Inc.



# Objective 1

Nest site selection  
and  
Nesting success





# Nest site selection

- Habitat selection of the Brown Creeper
  - Comparison between nesting and unused sites
    - Radius of 80 and 250 m
- Habitat characterisation at both scales
  - Forest inventory
  - GIS forest layer
- Discriminant function analysis and ROC curves

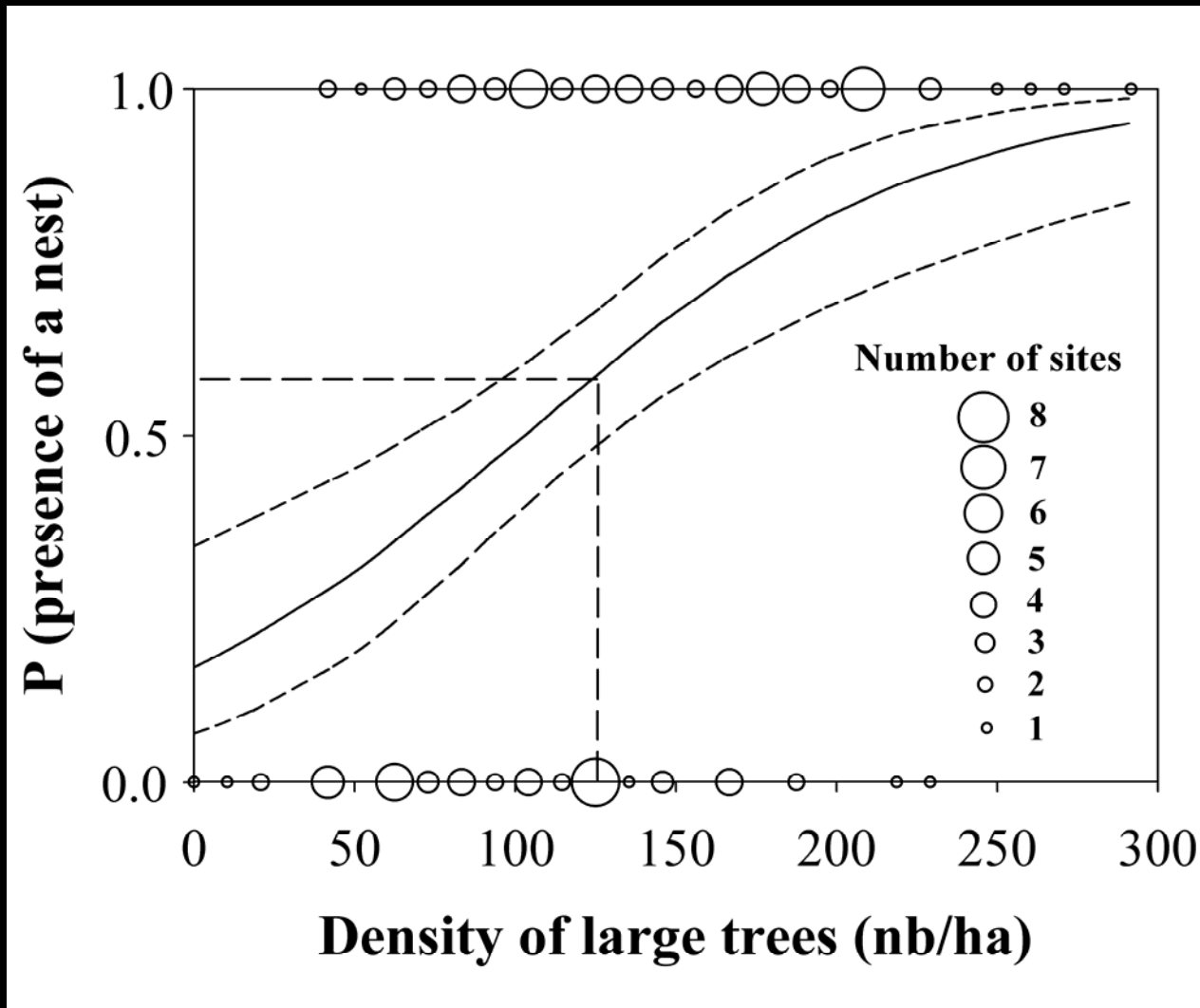


# Variables selected

<b>Model</b>	<b>Variables</b>	<b>% of variation explained</b>
Full	D_Large + D_Snags + Pot_nest + Mature	42.6
Territory	D_Large + D_Snags + Pot_nest	40.7
Meso	Mature	12.3

<b>Isolated component of variation</b>	<b>% of total variation explained</b>
Pure (Territory)	30.3
Pure (Meso)	1.9
Shared (Territory + Meso)	10.4

# Threshold: large trees

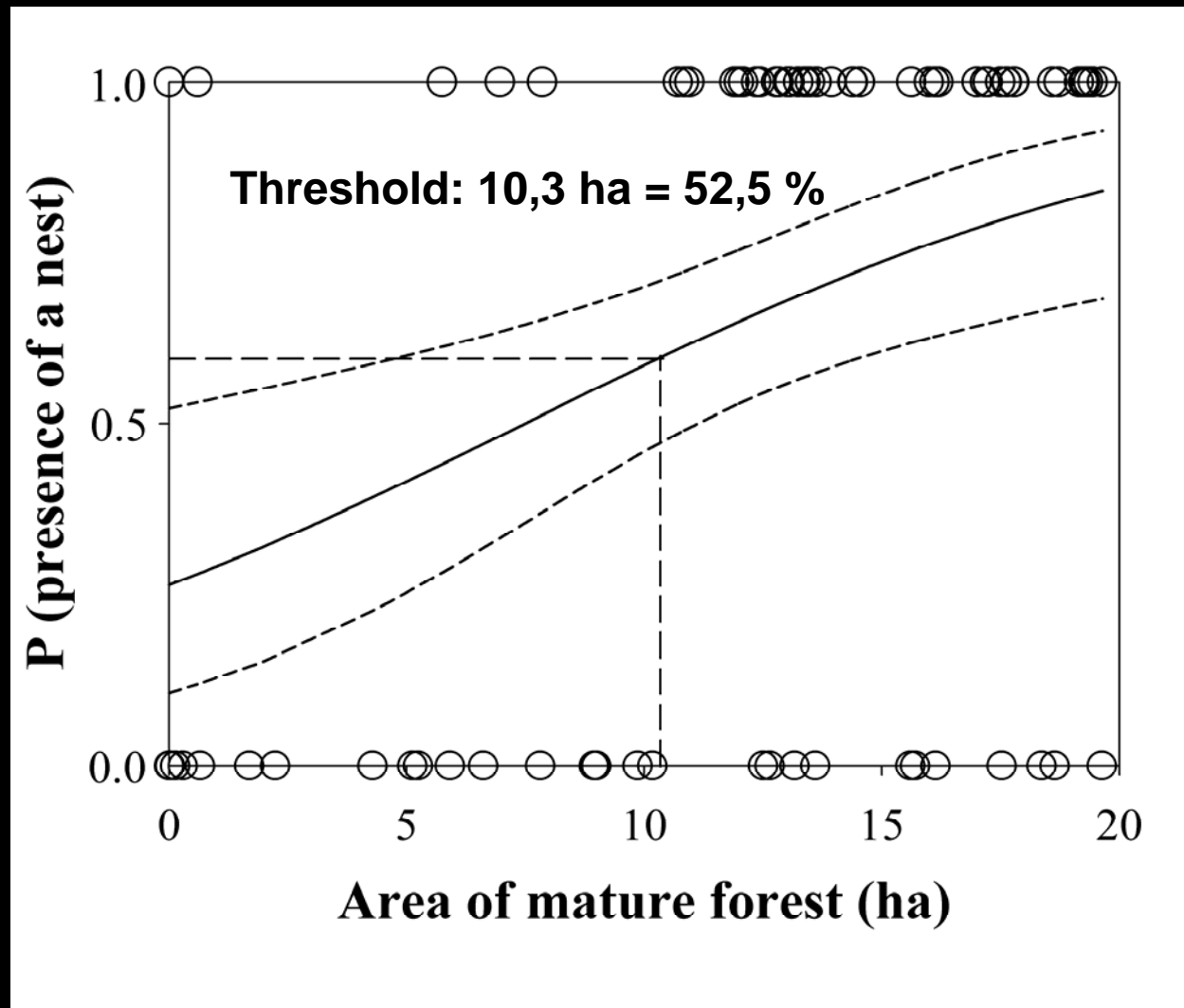


Threshold: 127 large trees/ha





# Threshold: area of mature forest



# Reminder

- Large trees
  - Abundance of invertebrates increase with diameter (Jackson 1979; Mariani & Manuwal 1990)



- Snags
  - Nesting substrate : important because 50 % of failure per nesting attempt
  - Re-nesting



# Reminder

- Patch of at least 11 ha of untreated mature forest
  - Link to the high requirements at the centre of the territory
  - Importance for other species ?







# Nesting success

- Comparison of habitat characteristic between successful and unsuccessful nesting attempts
  - Radius of 141, 500, 1 000 and 2 000 m
- Screening of variables using a discriminant function analysis
- Logistic regressions and AIC model selection with selected variables



# Variables selected

- Year (Y)
- Mean patch size in a radius of 141 m (M141)
- Area of non-forested land (ex.: roads) in a radius of 141 m (NF)
- Distance of the nest from the forest edge (E)
- Area of crop-producing spruce plantations in a radius of 2 km (PL)

# Variables selected

Variables	Mean (SD)	
	Successful nests (n=31)	Unsuccessful nests (n=23)
<b>Y</b>	n/a	n/a
<b>M141 (ha)</b>	4.15 (2.33)	3.61 (2.25)
<b>NF (ha)</b>	0.08 (0.13)	0.21 (0.38)
<b>E (m)</b>	147.84 (104.32)	109.91 (67.72)
<b>PL (ha)</b>	233.74 (191.93)	291.26 (175.94)





# Models retained

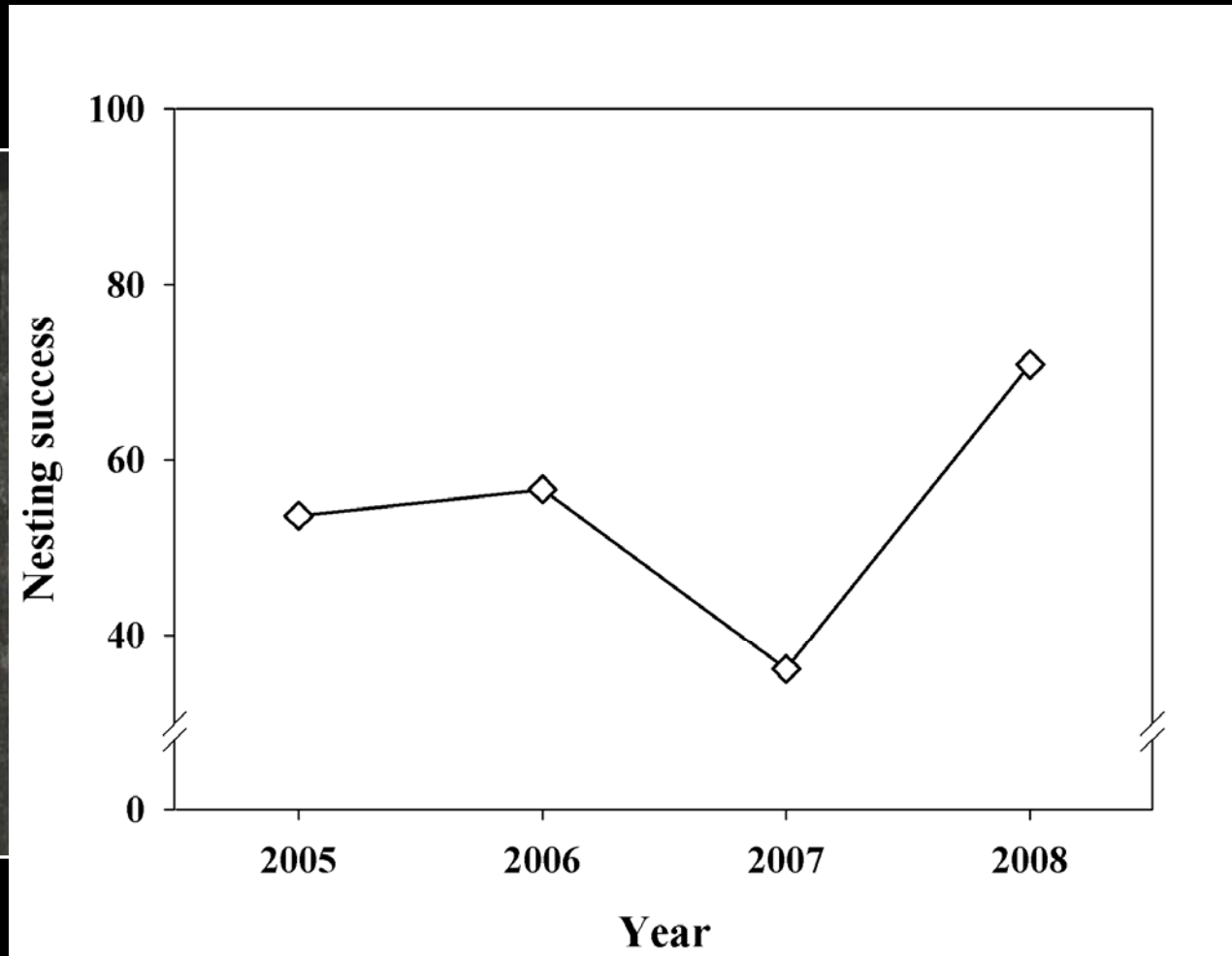
Model <sup>a</sup>	K <sup>b</sup>	Log-likelihood	AIC <sub>c</sub>	ΔAIC <sub>c</sub>	w <sub>i</sub>	R <sup>2</sup>
Y+PL+E	4	-31.94	72.69	0.00	0.19	0.223
Y+NF+PL	4	-32.37	73.56	0.86	0.13	0.205
Y+M141+PL	4	-32.39	73.60	0.91	0.12	0.204
E+PL	3	-33.64	73.75	1.06	0.11	0.150
E+NF+PL	4	-32.48	73.78	1.09	0.11	0.200
NF+PL	3	-33.85	74.18	1.49	0.09	0.141
NF	2	-35.02	74.28	1.58	0.09	0.087
Y+M141+NF+PL	5	-31.57	74.40	1.70	0.08	0.238
Y+NF	3	-34.11	74.69	2.00	0.07	0.129



# Keys to success...

- Large patch size
  - Lower nest visibility ?
- Higher distance to the edge
  - Edge effect, predator movements ?
- Lesser plantation in the landscape
  - Effect on predator population (red squirrel) ?

# Depending of the year...



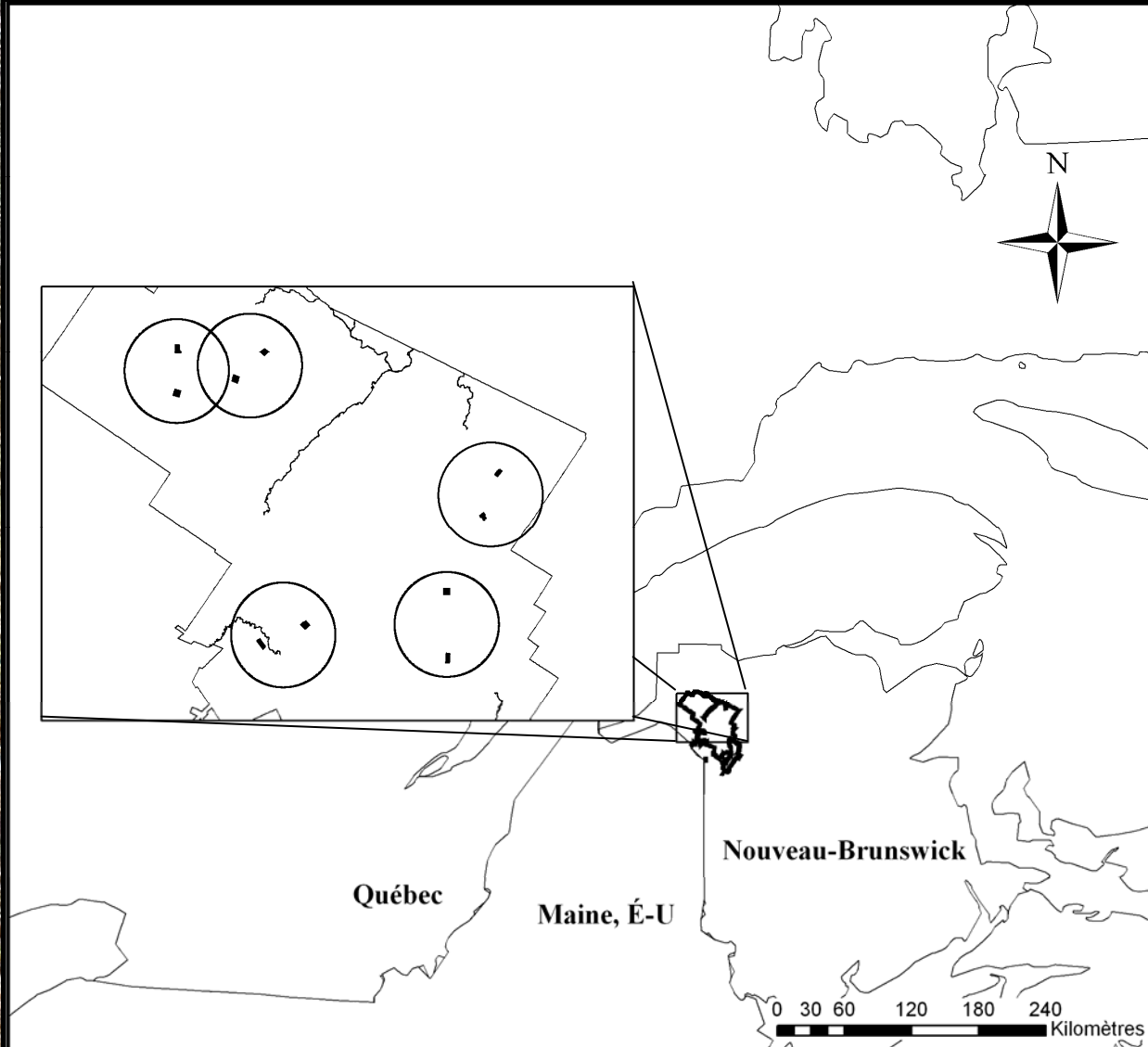


# **Objective 2**

Effect of single-tree selection  
harvesting

# Experimental design

-5 pairs of 25 ha sites each



# Experimental design

1 site treated per pair : single-tree selection harvesting





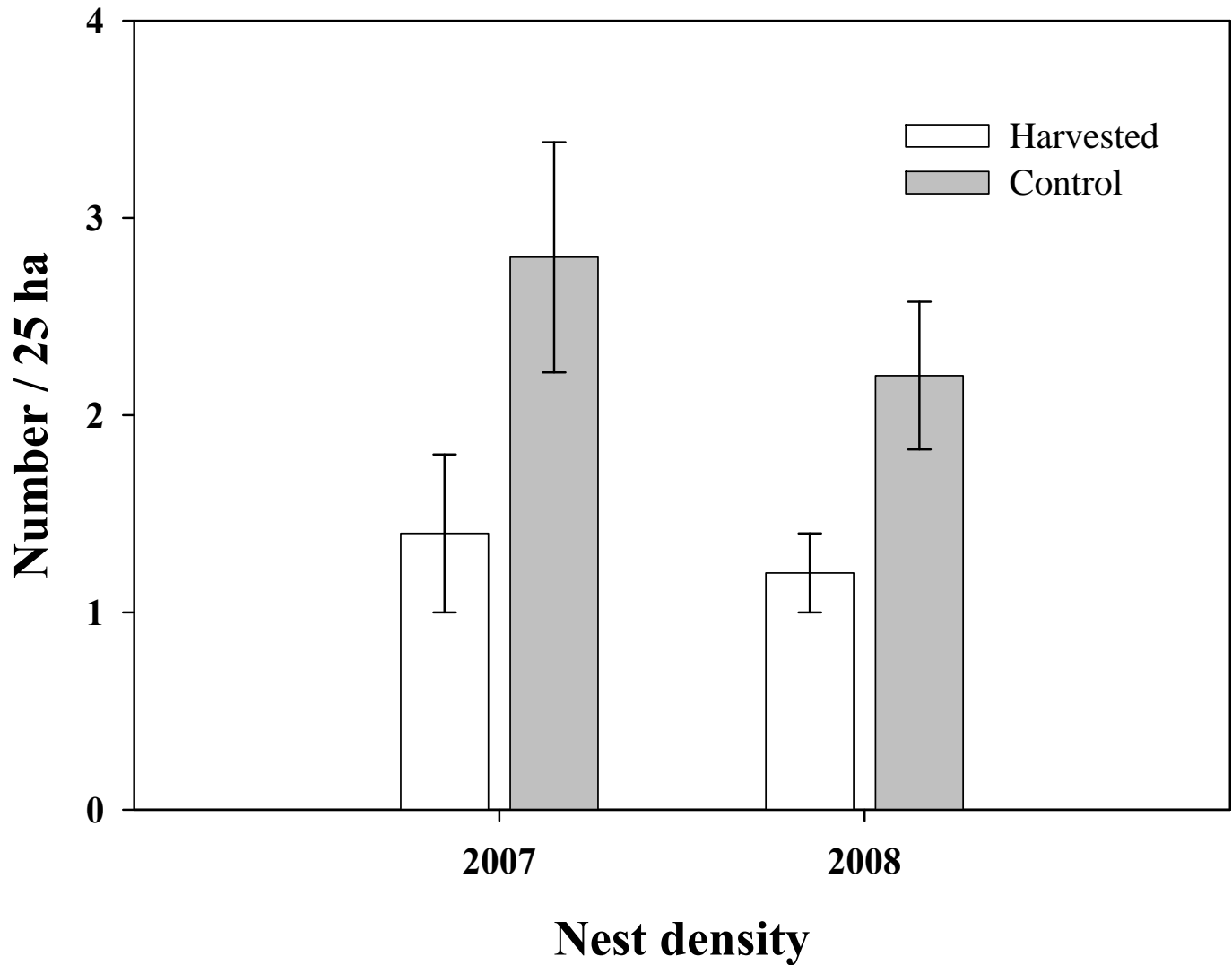


# Variables measured

- **Monitoring of all the territories inside each plot;**
- **Nest searching;**
- **Monitoring of the fate of each territory;**
- **% of ovenbird male return;**
- **% of recruits ovenbird in the population;**

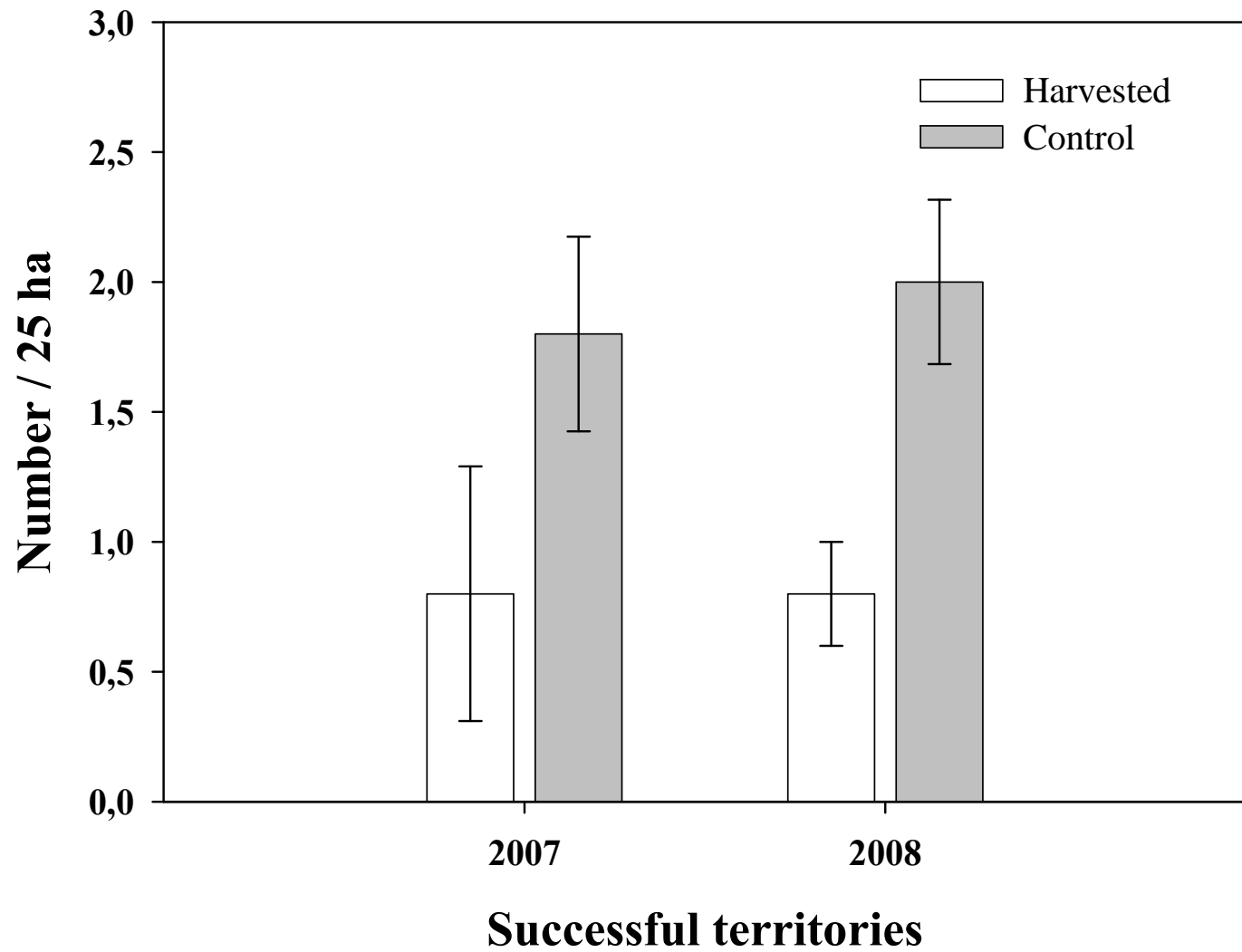
# Density

## Brown Creeper



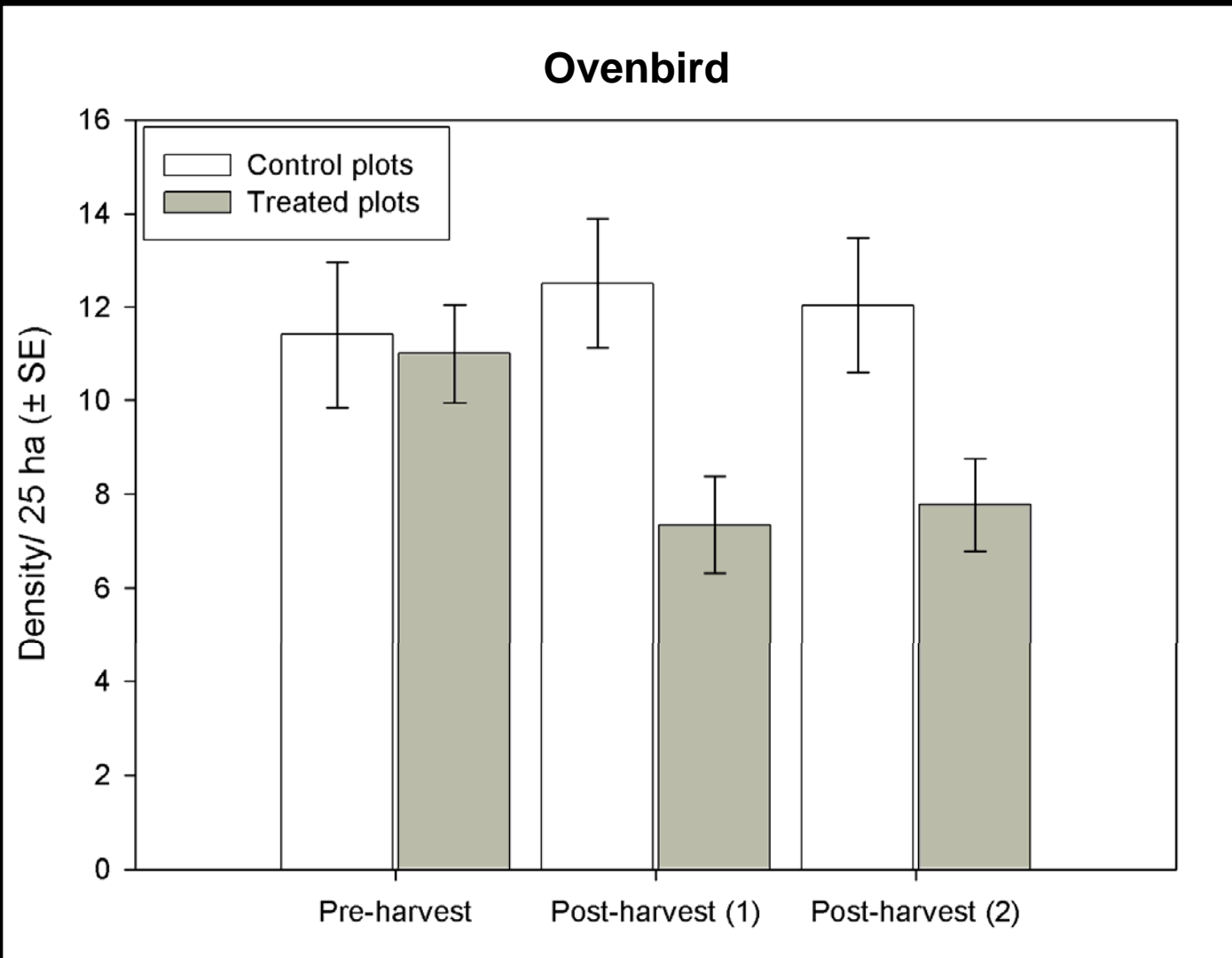
# Nesting success

## Brown Creeper

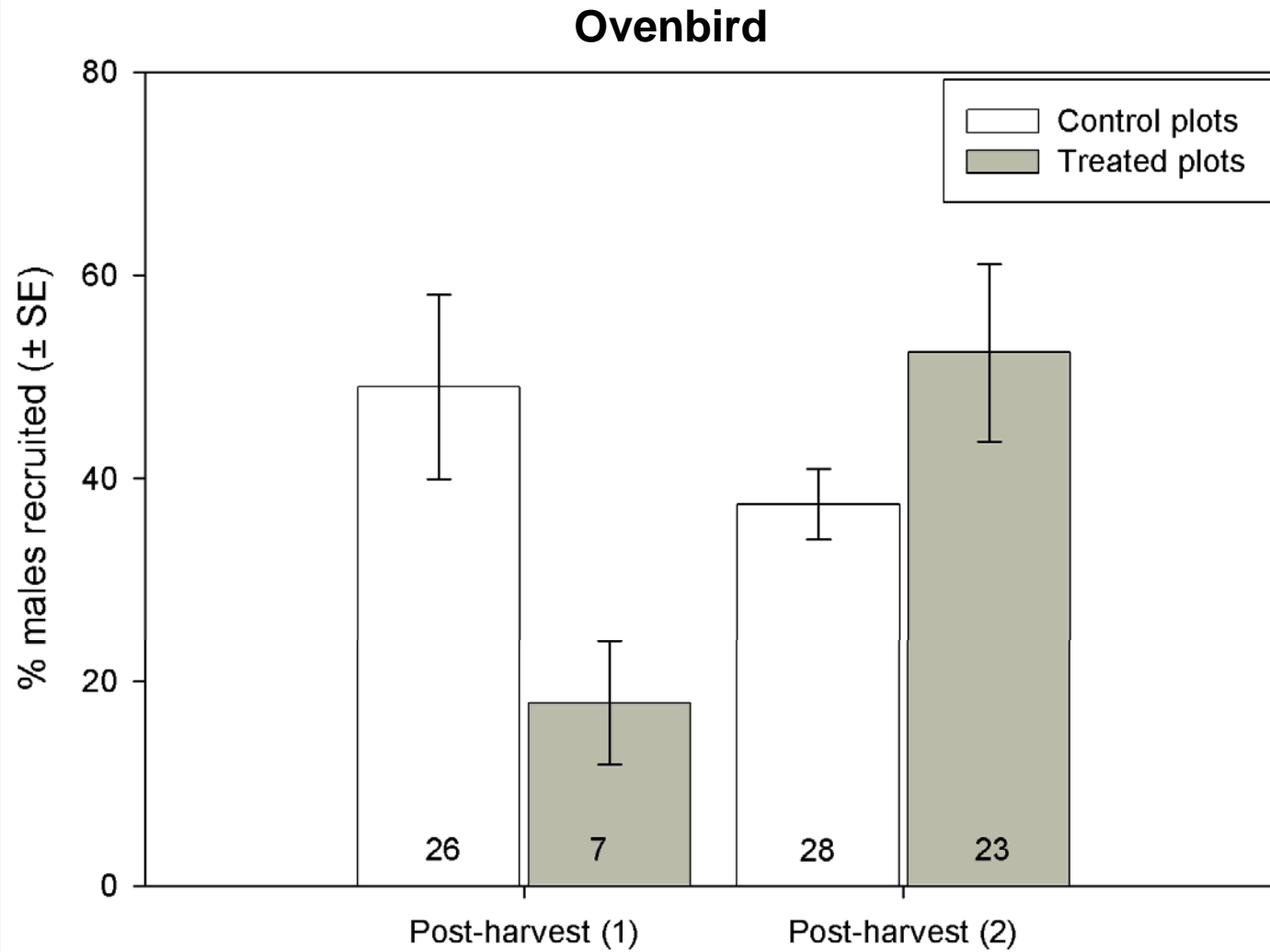




# Density



# Recruitment





# Creeper's response

- Negative impact on nest density
  - Less nesting substrate
  - Less foraging substrate
- Less success
  - Only in 2007 :
    - Higher abundance of predators
    - Higher visibility ?



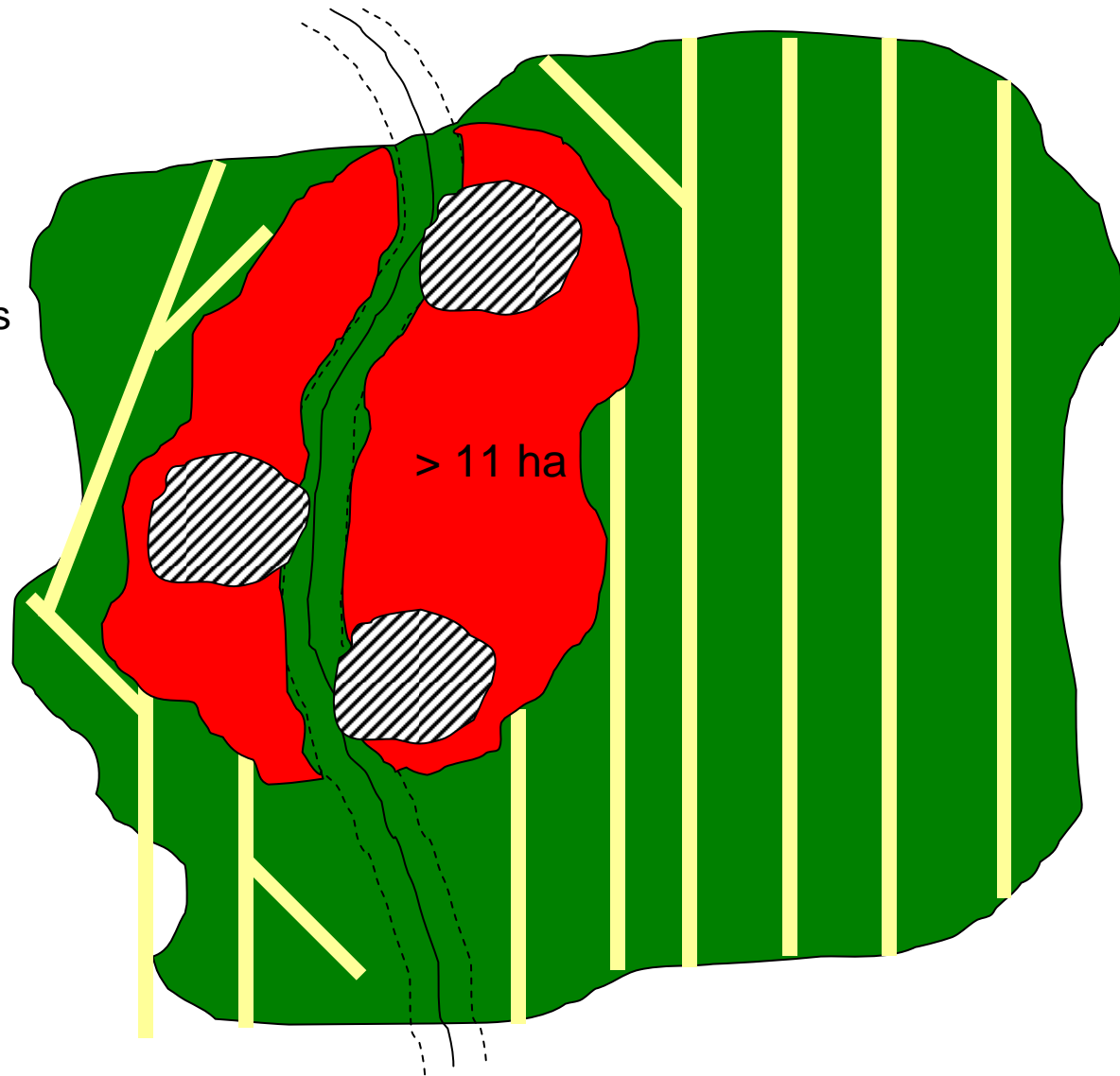


# Ovenbird demography

- Single-tree selection harvesting definitely alters Ovenbird demography
  - Most survivors tend to return, even to treated plots
  - Non-returning males are replaced, but recruitment lower (in absolute terms) in treated plots

# Large patch of mature forest + riparian buffer

- Water stream
- - - Riparian buffer
- Partial harvesting
- Conservation area
- ↑ density of large trees  
(2 ha)
- Skid trail
- Road





# Multi-scale concept

- Conserving micro-habitat feature within harvested stands
  - Retention patch
- Conserving macro-habitat feature in the landscape
  - Spatial arrangement of harvested stands
- Large core of mature forest (reserve)



# Financial partners



SUSTAINABLE **FOREST**  
MANAGEMENT NETWORK



RÉSEAU DE GESTION  
DURABLE DES **FORÊTS**



ACADIAN **TIMBER**



UNIVERSITÉ DE MONCTON  
CAMPUS DE MONCTON

# Questions ?

