



The Impact of Agroforestry Buffers on Biodiversity in Lowbush Blueberry Agro-Ecosystems

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Presentation Overview ...

Lowbush Blueberry Agro-Ecosystem

Shelterbelt/ Hedgerow Classification

Linking Shelterbelt Variables to Biodiversity

Birds

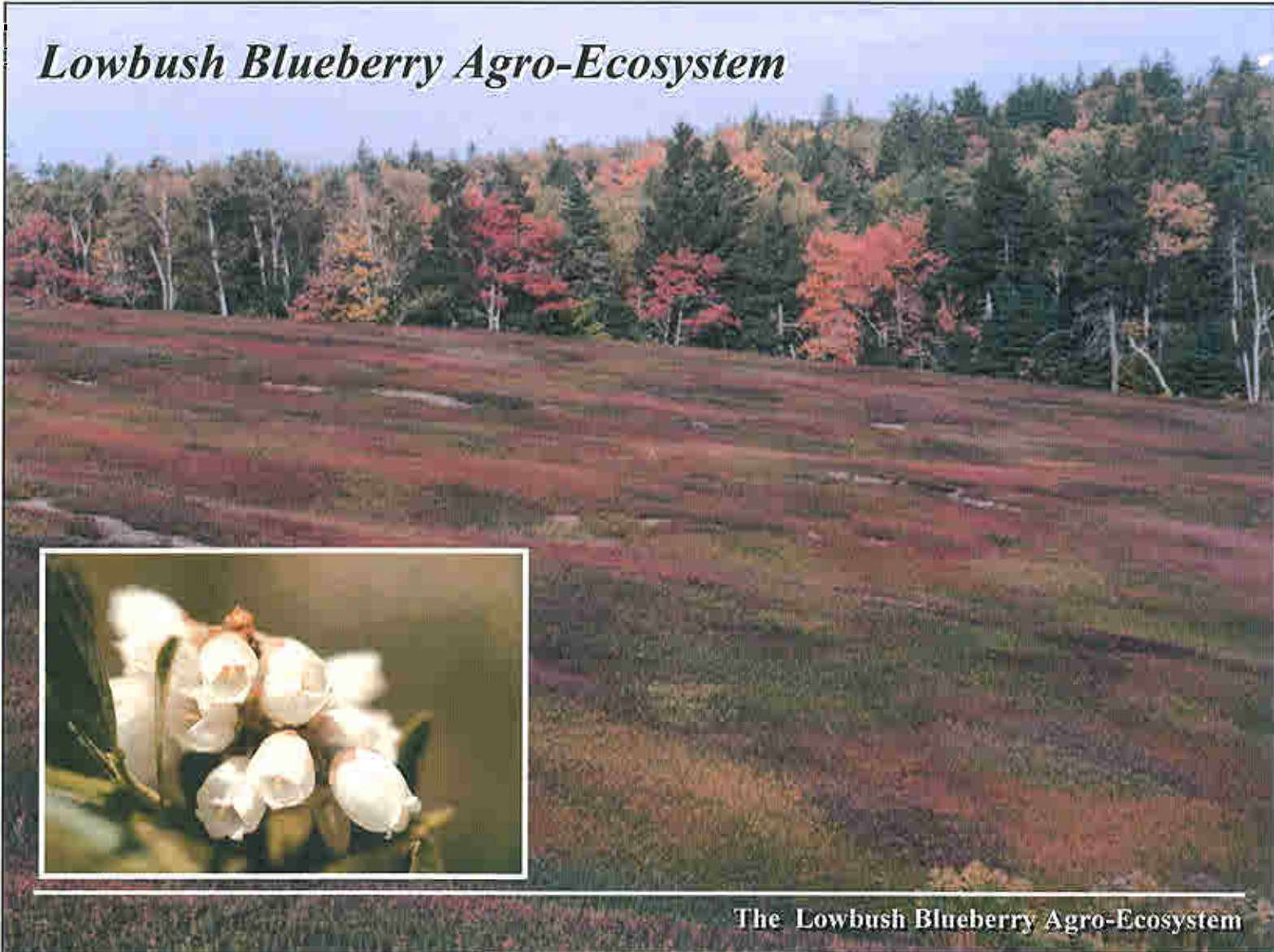
Butterflies

Bees

Ground Beetles

The Impact of Agroforestry Buffers on Biodiversity

Lowbush Blueberry Agro-Ecosystem



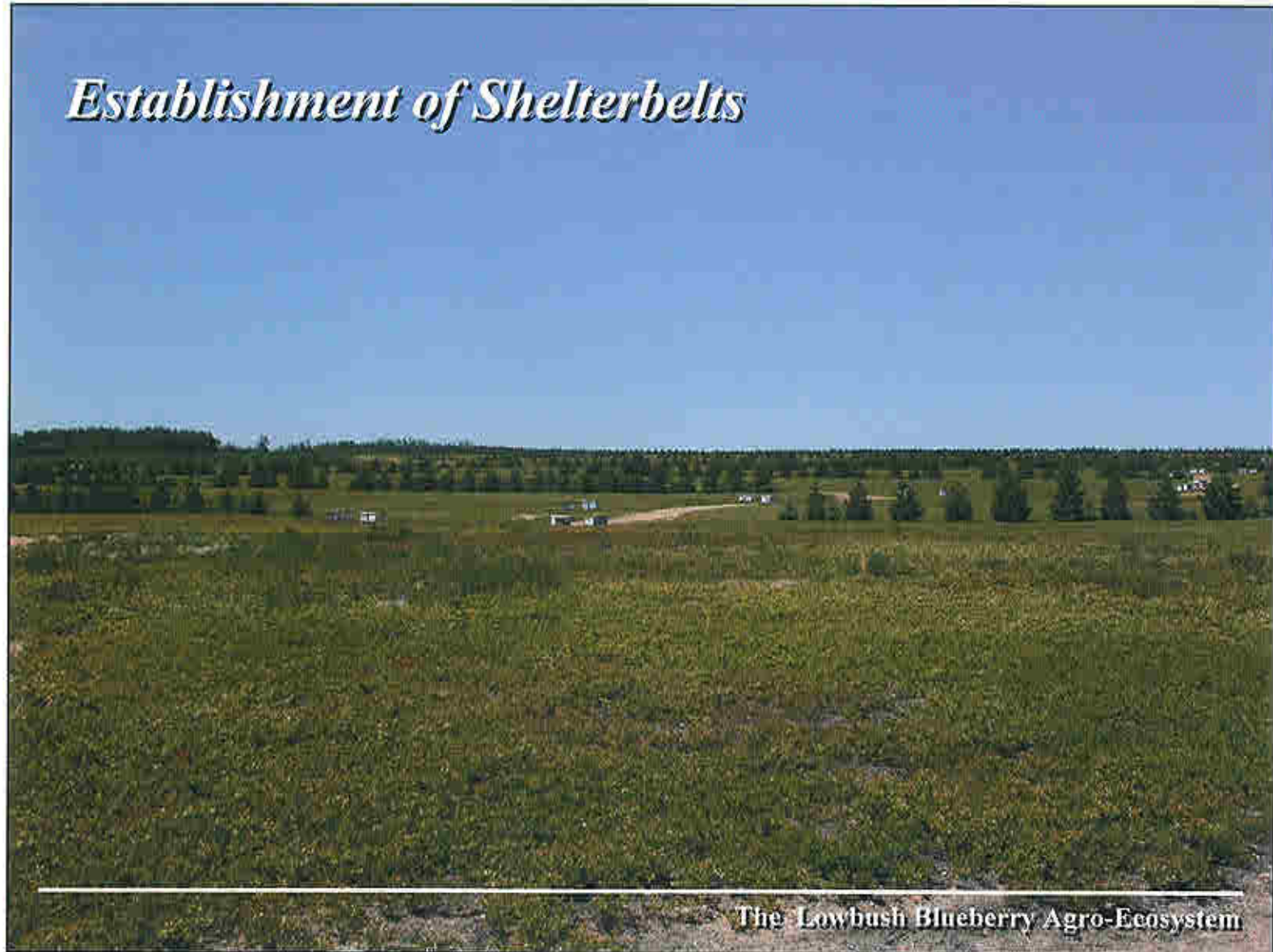
The Lowbush Blueberry Agro-Ecosystem

Trend ...



The Lowbush Blueberry Agro-Ecosystem

Establishment of Shelterbelts



The Lowbush Blueberry Agro-Ecosystem



**Shelterbelt Classification:
Structure and Composition**

Shelterbelt Classification

Data Collection: General Information

Kort 2005

1	1.Basic									
2										
3										
4	101 Comments:									
5										
6	102 Date		103 ID#		104 Sampler					
7	105 Landowner or contact name									
8	106 Landowner or contact phone									
9	107 Landowner or contact address									
10										
11										
12	Location									
13	108 GPS Coordinates									
14	109 Local coordinates (i.e legal land discription)									
15	109 Vegetation type*									
16	110 Agroforestry type**									
17				111 Orientation						
18				112 Age						
19	(use more than one if needed)									
20	Agroforestry Dimensions									
		Sample	116 Width (m)	117 Width over crops (m)	118 Snags (Down or CoDominant)	119 Fallen dead (downwood) (>4 cm)				
21	113 Length (m)	A								
22	114 Area (m ²)	B								
23		C								
24	115 Configuration***									
25										
26	* Veg type options	** Agroforestry type options			*** Configuration options					
27	AC - Alley crop	LBN-livestock -Barns	AA - Area agroforestry							
28	NW - Natural woody	CF - Crop (field)	LO-livestock -Outdoors			IR - In rows				
29	PW- Planted woody	FB - Field boundary	LW-Lane way			LB - Linear buffer				
30		FY - Farmyard	PF - Pasture (field)							
31		IC - Intercrop	RB - Riparian buffer							
32			RS - Roadside							
33										

Shelterbelt Classification

Data Collection: Trees

1	2. Trees Database																				
2	Sample the trees in their rows from North to South or West to East, row one being North or West.																				
3	For trees not in rows, like natural shelterbelts, count trees over 4 cm diameter for each species, including multi-stemmed trees in which the largest stem is greater than 4 cm																				
4	201 Sample	202 length (30m)				202 length (30m)				202 length (30m)				202 length (30m)							
5	203 Floor (if applicable)																				
6	204 Species																				
7	205 Crown width of row (m)																				
8	206 Trees per sample																				
9		207 Diameter (cm)	208 Height (m)	209 Age (yr) (if different from planting tag) in natural shelterbelts, core 2 dominant trees per species		210 % tree crown	207 Diameter (cm)	208 Height (m)	209 Age (yr) (if different from planting tag) in natural shelterbelts, core 2 dominant trees per species		210 % tree crown	207 Diameter (cm)	208 Height (m)	209 Age (yr) (if different from planting tag) in natural shelterbelts, core 2 dominant trees per species		210 % tree crown	207 Diameter (cm)	208 Height (m)	209 Age (yr) (if different from planting tag) in natural shelterbelts, core 2 dominant trees per species		210 % tree crown
10	1																				
11	2																				
12	3																				
13	4																				
14	5																				
15	6																				
16	7																				
17	8																				
18	9																				
19	10																				
20	211 parallel slope:																				
21	212 perpendicular slope:																				
22		213 Comments:				213 Comments:				213 Comments:				213 Comments:							
23																					
24																					

Shelterbelt Classification

Data Collection: Shrubs

	A	B	C	D	E	F	G	H	I	J	K
1	3. Shrubs/sapling Datasheet (Shrubs/saplings are woody plants greater than 1.3 m high but less than 4 cm in DBH)										
2	Sample the shrubs/saplings greater than 1.3 m in height in their rows from North to South or West to East, Row one being North or West.										
3											
4	201 Sample		202 length		202 length		202 length		202 length		202 length
5	203 Row (if applic.)		(30m)		(30m)		(30m)		(30m)		(30m)
6	204 Species										
7	205 Crown width of row (m)										
8	206 Shrubs per sample										
9		207 Crown diameter (m)	208 Shrub height (m)	207 Crown diameter (m)	208 Shrub height (m)	207 Crown diameter (m)	208 Shrub height (m)	207 Crown diameter (m)	208 Shrub height (m)	207 Crown diameter (m)	208 Shrub height (m)
10	1										
11	2										
12	3										
13	4										
14	5										
15	6										
16	7										
17	8										
18	9										
19	10										
20+		213 Comments:		213 Comments:		213 Comments:		213 Comments:		213 Comments:	

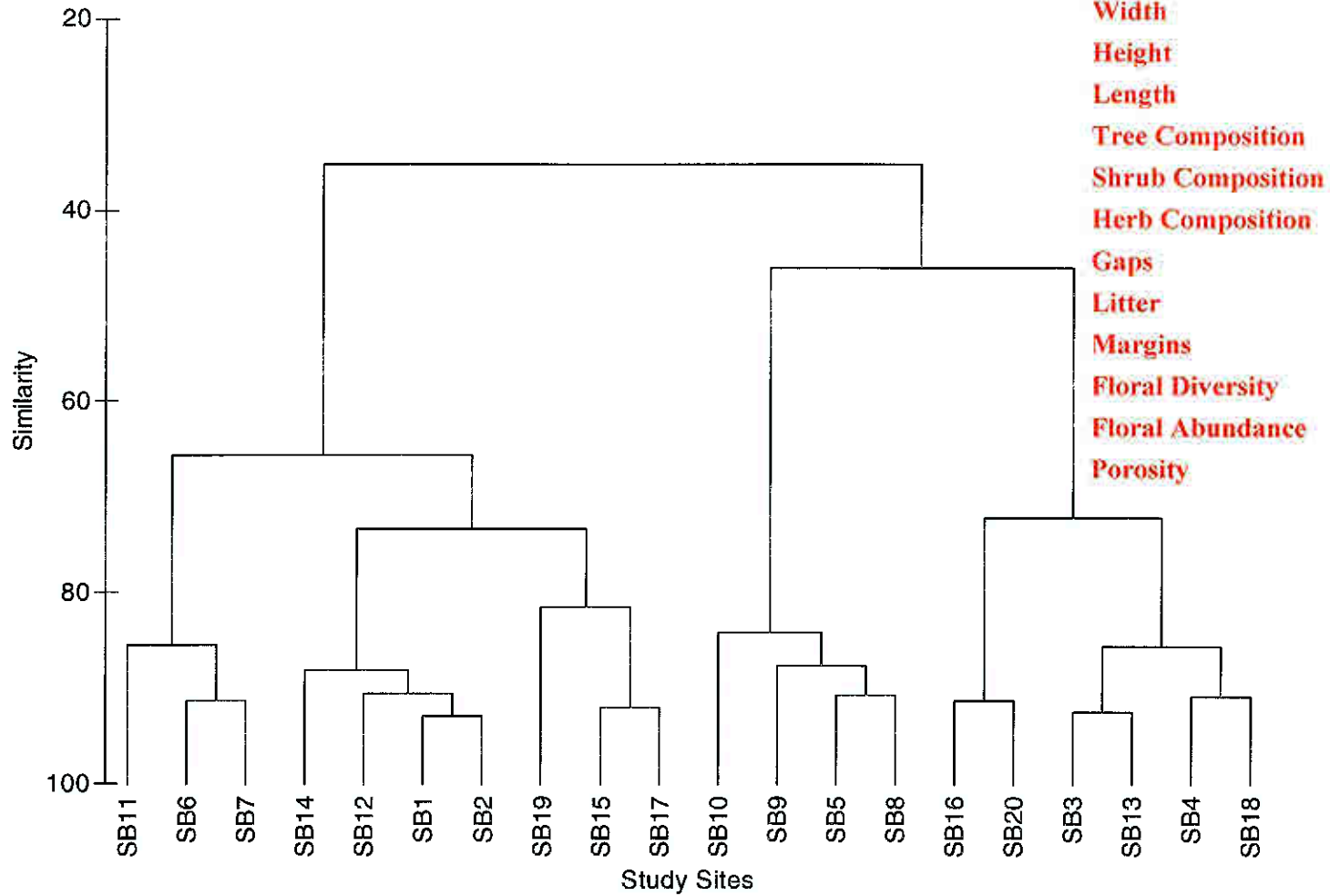
Shelterbelt Classification

Data Collection: Herbaceous

	A	B	C	D	E	F	G	H	I	J
1	X Herbaceous plants datasheet (because there can be multiple layers of foliage, the total can be greater than 100%)			Includes woody groundcover up to 1.0 m in height		Species names can be common names on datasheet but need to be converted to Latin names				
2	Quadrat									
3	301_Sample	1	2	3	4	5	6	7	8	9
4	302_Location(N,S,E,W or N)									
5	303_Cover Category	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
6	304_Bare Ground									
7	305_Litter									
8	306_Species									
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24	Other species from sample walk-through									
25										
26										
27										
28										
29										
30										
31										
32										

Shelterbelt Classification

Shelterbelt Classification – Study Sites



Shelterbelt Classification



Shelterbelt Classification



Shelterbelt Classification

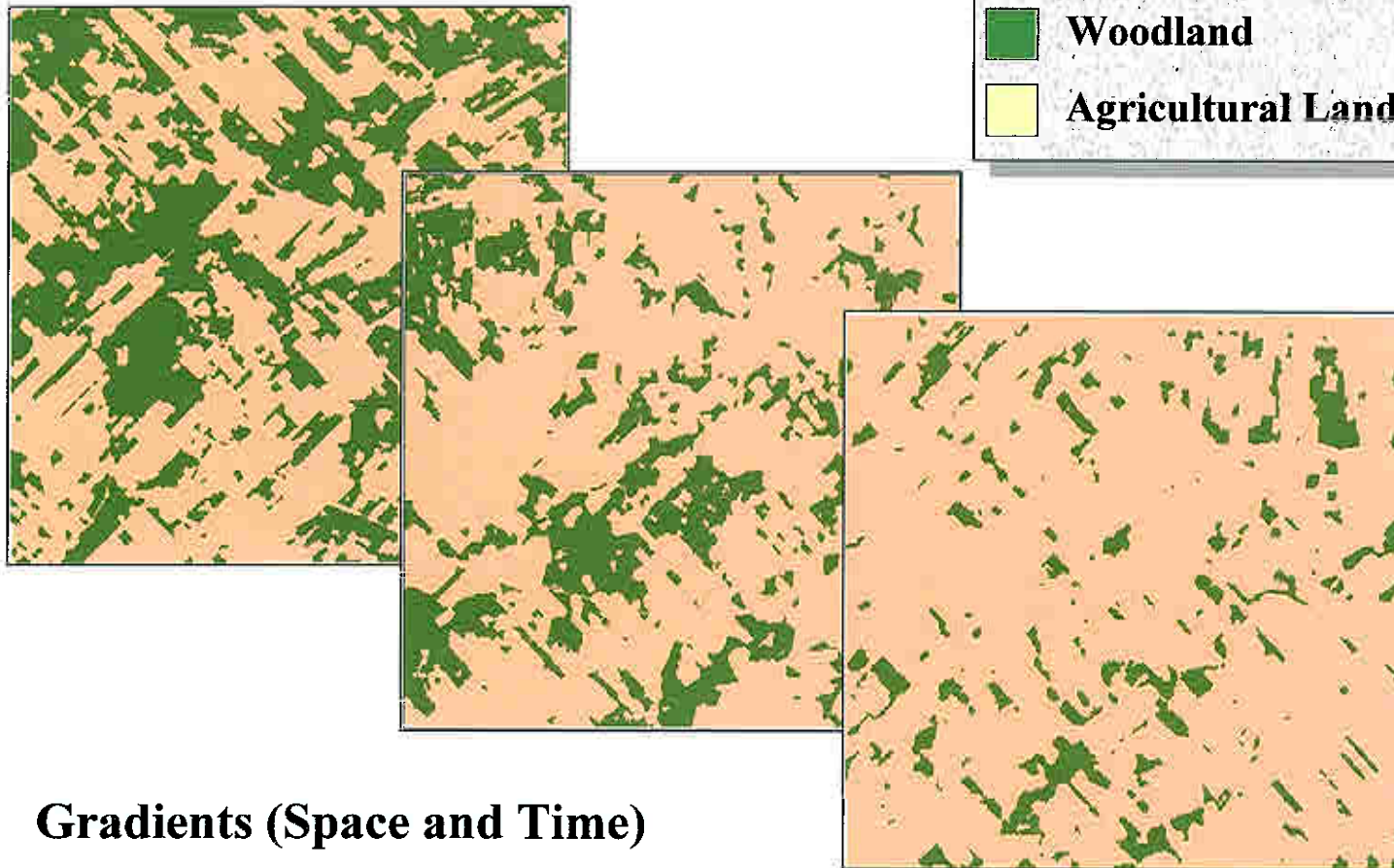


Shelterbelt Classification





Landscape Context: Agricultural Footprint

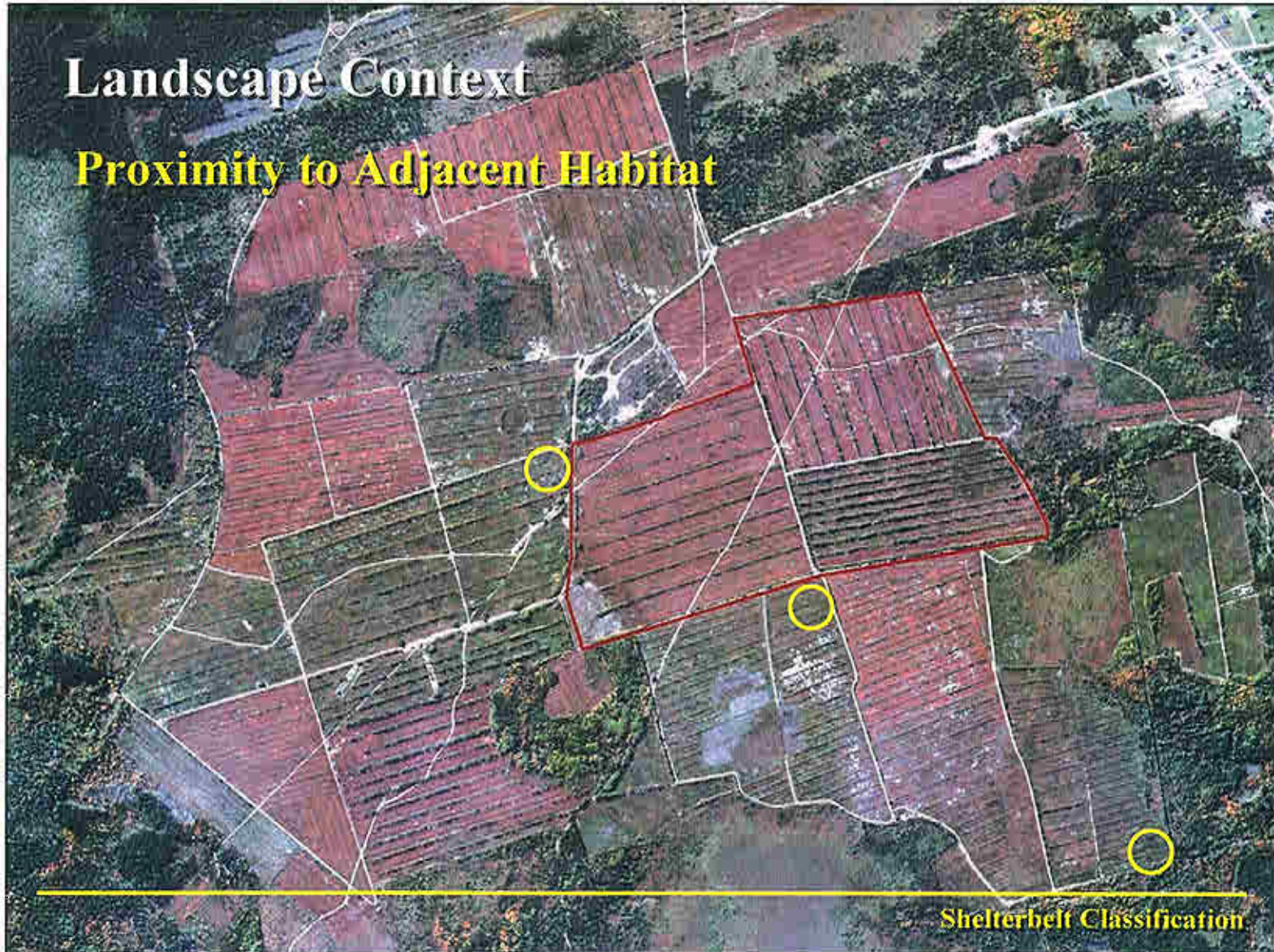


Gradients (Space and Time)

Shelterbelt Classification

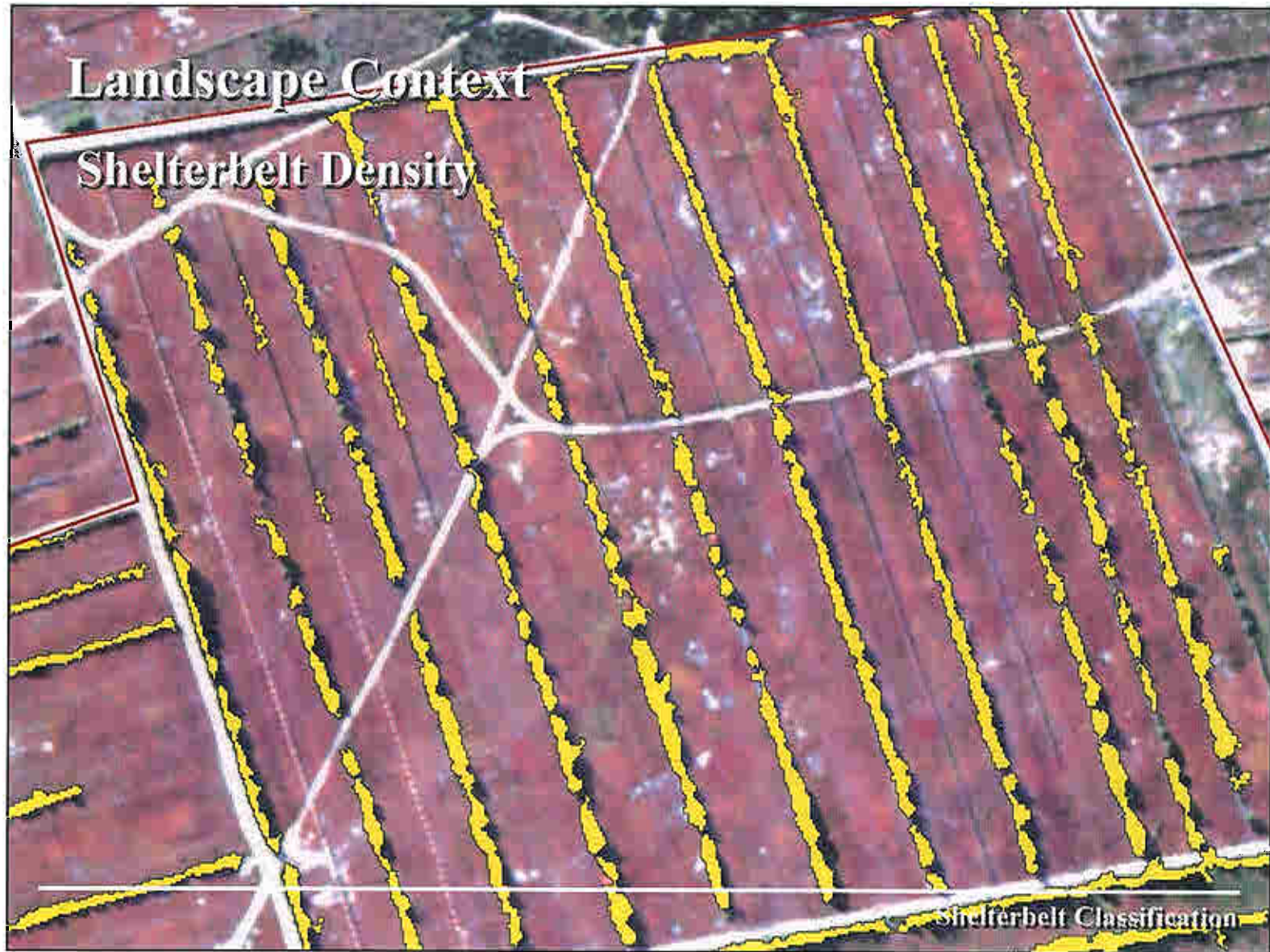
Landscape Context

Proximity to Adjacent Habitat



Shelterbelt Classification





Birds



Biodiversity

Bird Species Associated with Shelterbelts

- | | | |
|------------------------------|------------------------|---------------------------|
| American Crow | Common Raven | Northern Parula |
| American Goldfinch | Common Yellowthroat | Ovenbird |
| American Kestrel | Dark-eyed Junco | Purple Finch |
| American Redstart | Eastern Kingbird | Red-Breasted Nuthatch |
| American Robin | Eastern Wood-Peevee | Red-eyed Vireo |
| American Tree Sparrow | European Starling | Rose-breasted Grosbeak |
| Bay-breasted Warbler | Evening Grosbeak | Ruby-crowned Kinglet |
| Black-and-white Warbler | Golden-crowned Kinglet | Ruby-throated Hummingbird |
| Black-capped Chickadee | Gray Partridge | Ruffed Grouse |
| Black-throated Blue Warbler | Hairy Woodpecker | Savannah Sparrow |
| Black-throated Green Warbler | Hermit Thrush | Sharp-shinned Hawk |
| Blackburnian Warbler | House Sparrow | Sharp-tailed Grouse |
| Blue Jay | Killdeer | Song Sparrow |
| Brown Creeper | Least Flycatcher | Swainson's Thrush |
| Brown-headed Cowbird | Magnolia Warbler | Tennessee Warbler |
| Cape May Warbler | Merlin | White-throated Sparrow |
| Chestnut-sided Warbler | Mourning Dove | Yellow Warbler |
| Chipping Sparrow | Mourning Warbler | Yellow-rumped Warbler |
| Common Grackle | Northern Flicker | |



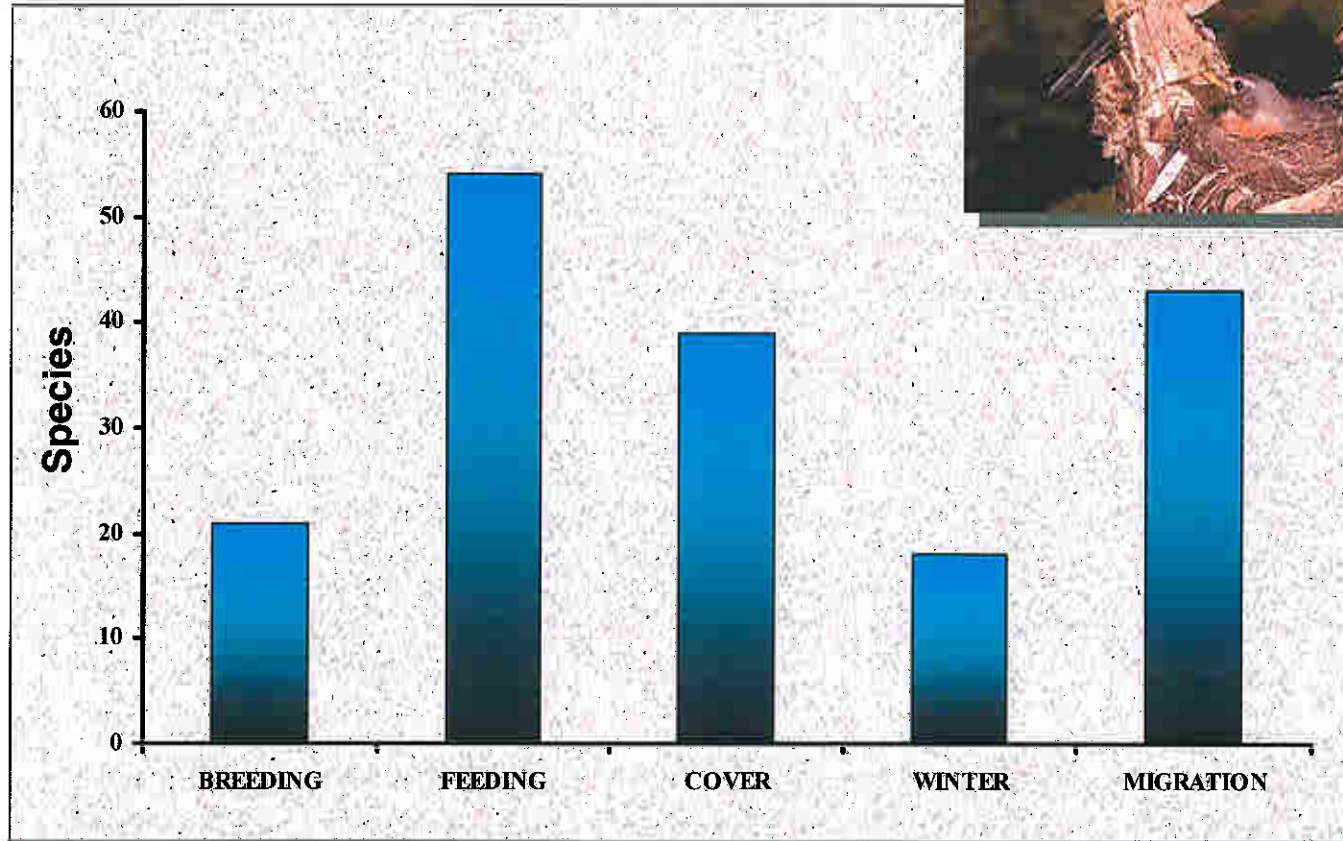
58 Species

1567 Individuals

22 Breeding

Shelterbelt Usage

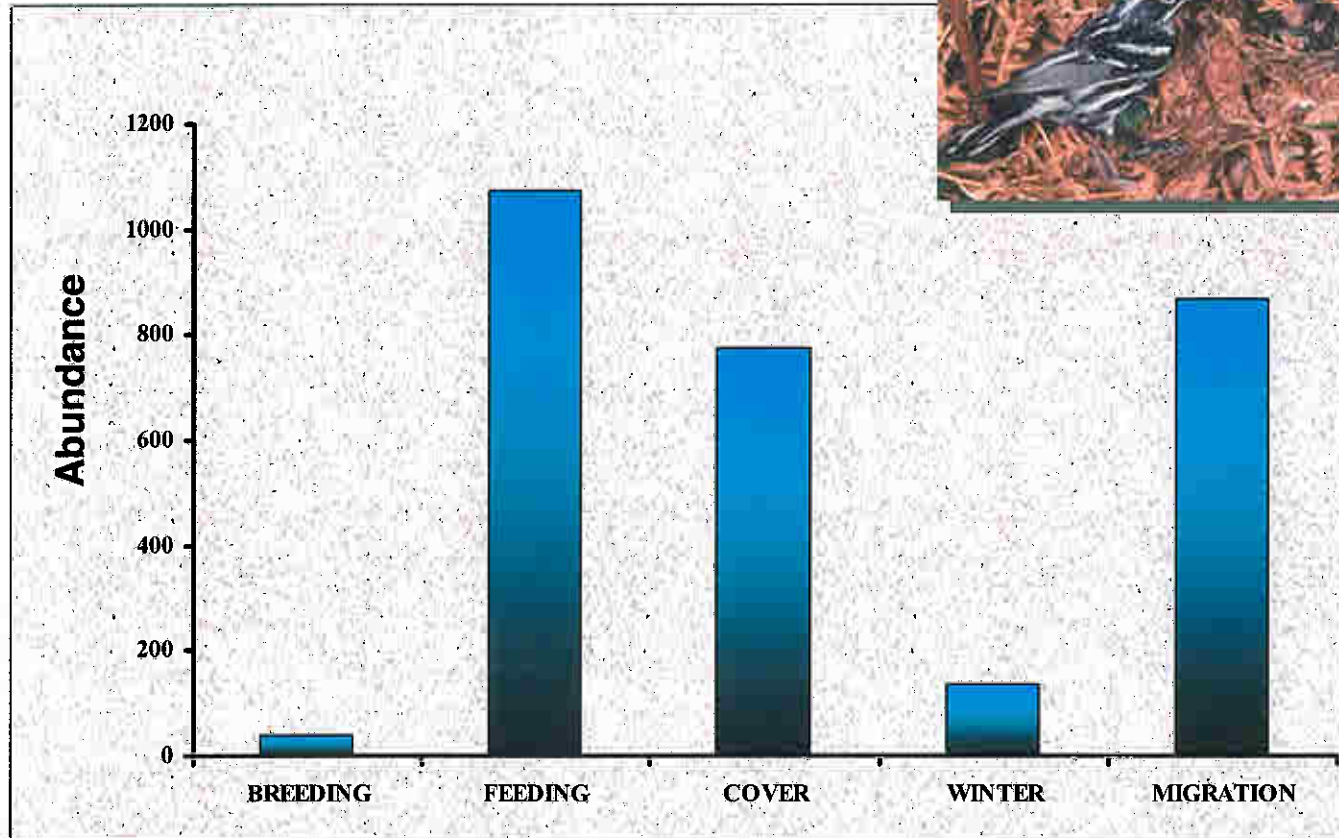
Species



Birds

Shelterbelt Usage

Abundance

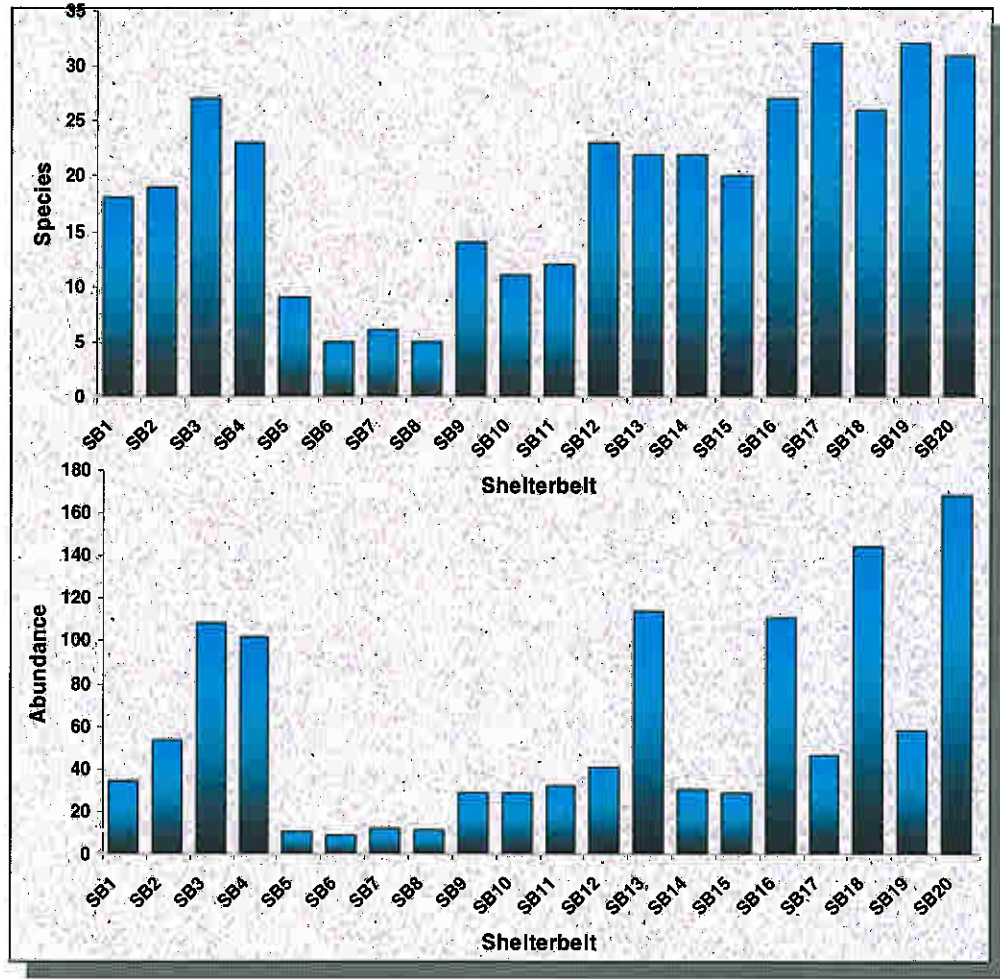


Birds

Bird Usage: Differences Among Shelterbelts (Spring)

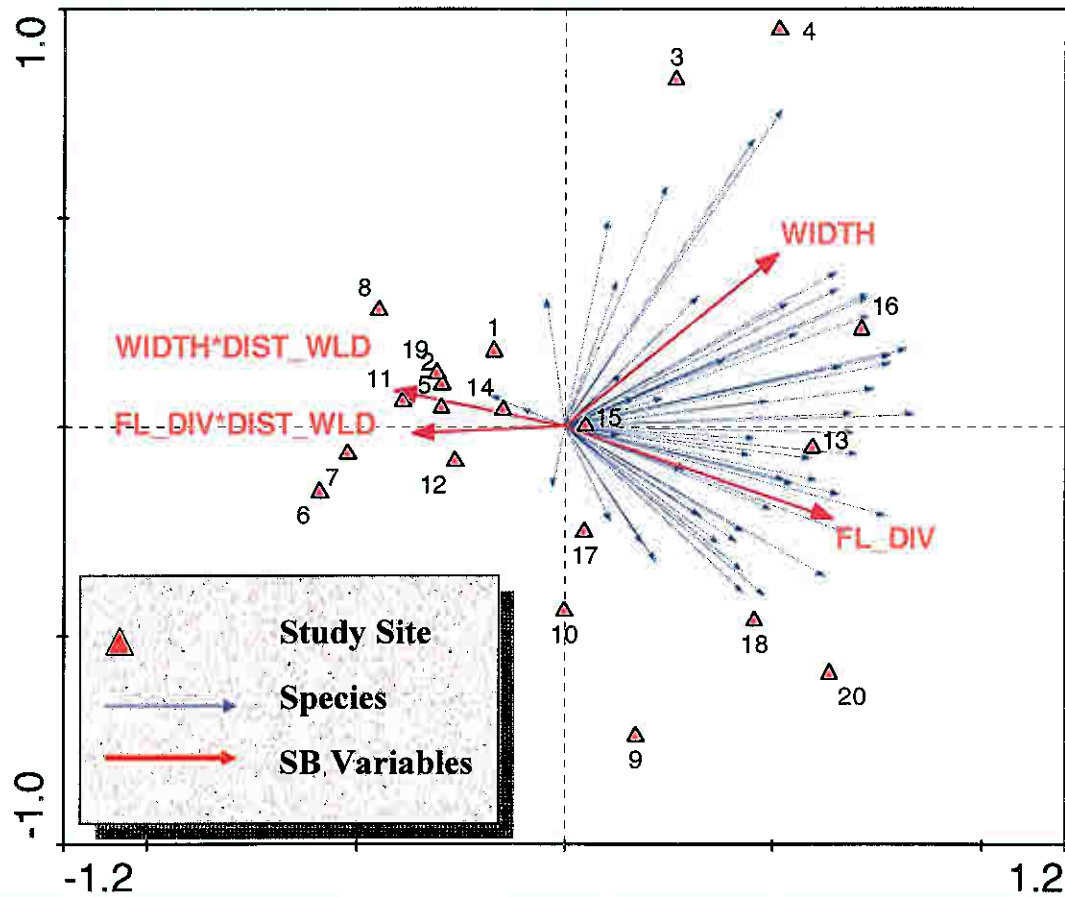
Species

Individuals



Birds

Effect of Shelterbelt Variables on Bird Communities

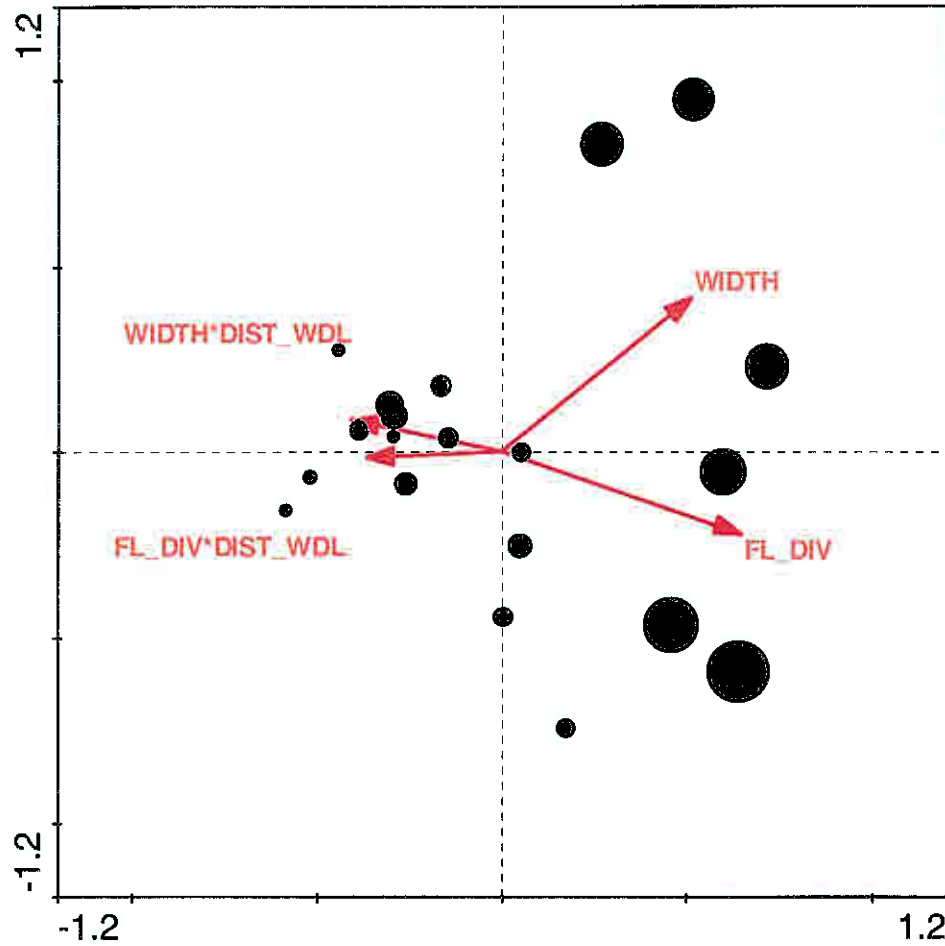


Main
Width
Floral Diversity

Interactions
Width*Distance
FL_DIV*Distance

Birds

Effect of Shelterbelt Variables on Bird Communities

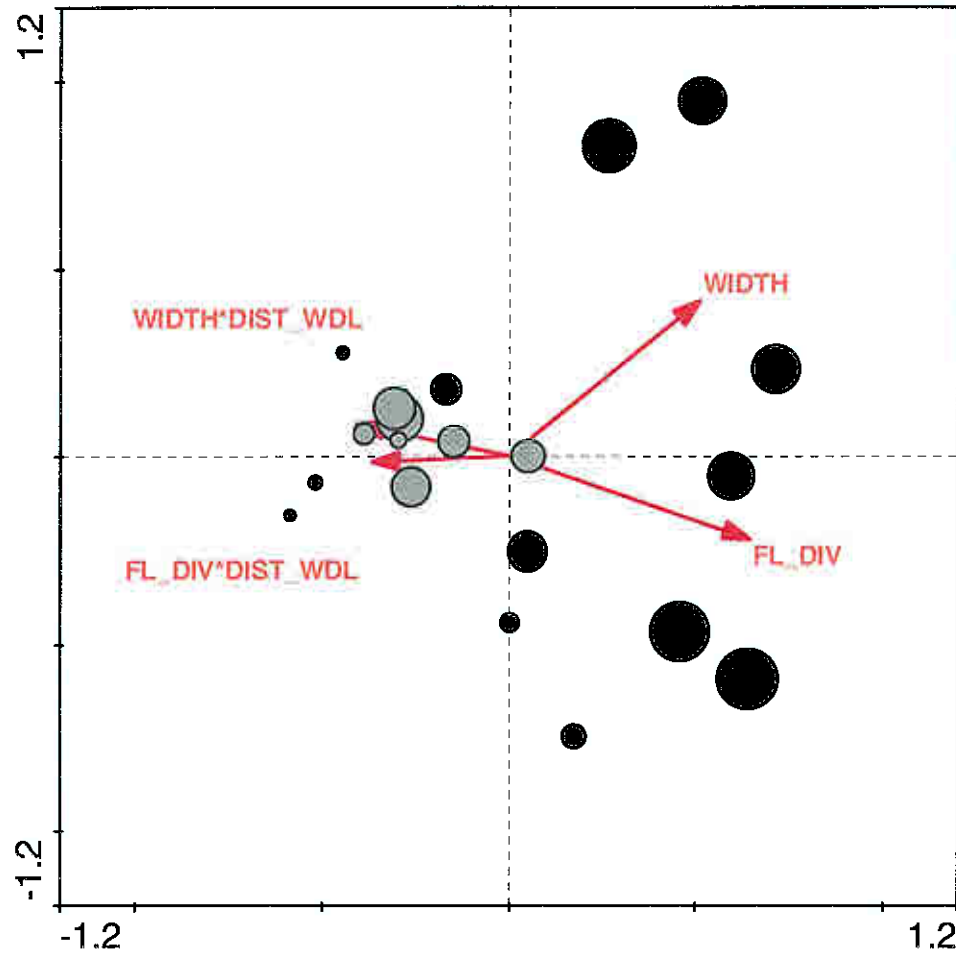


Abundance



Birds

Effect of Shelterbelt Variables on Bird Communities

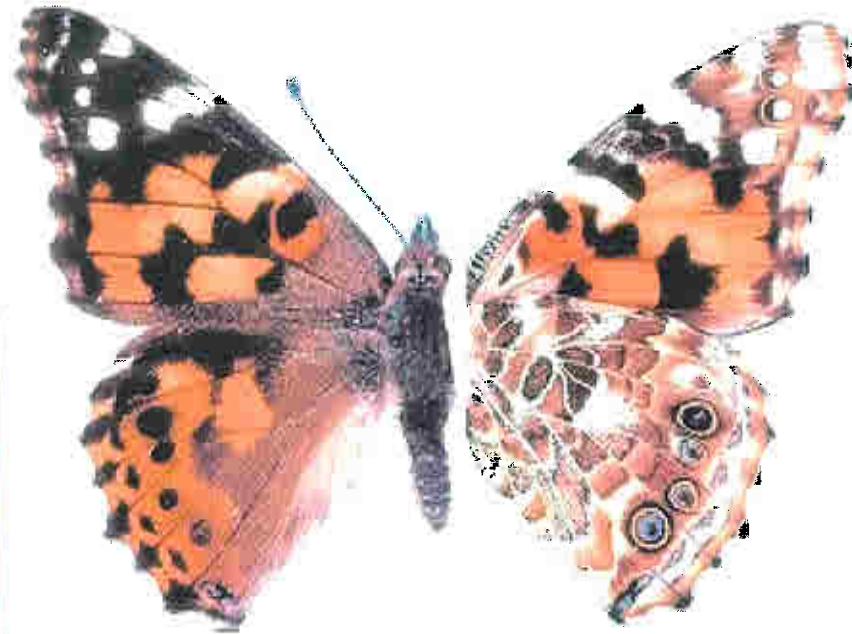


Diversity



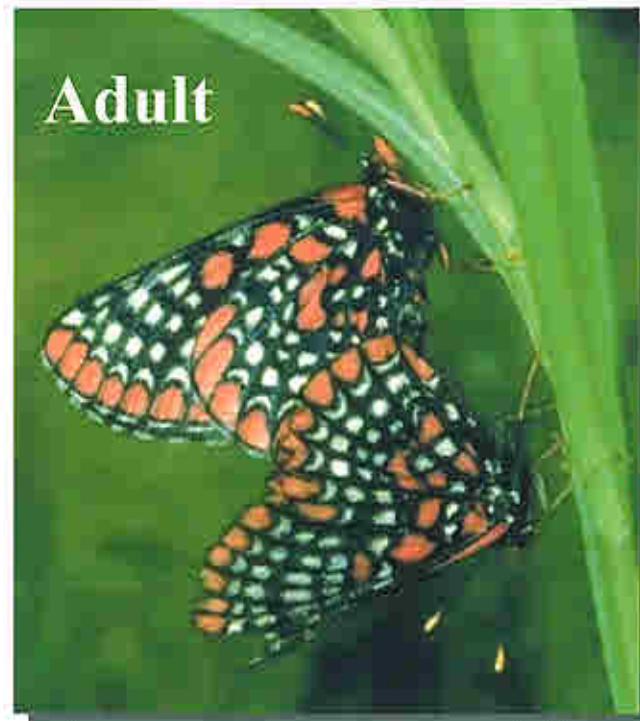
Birds

Butterflies



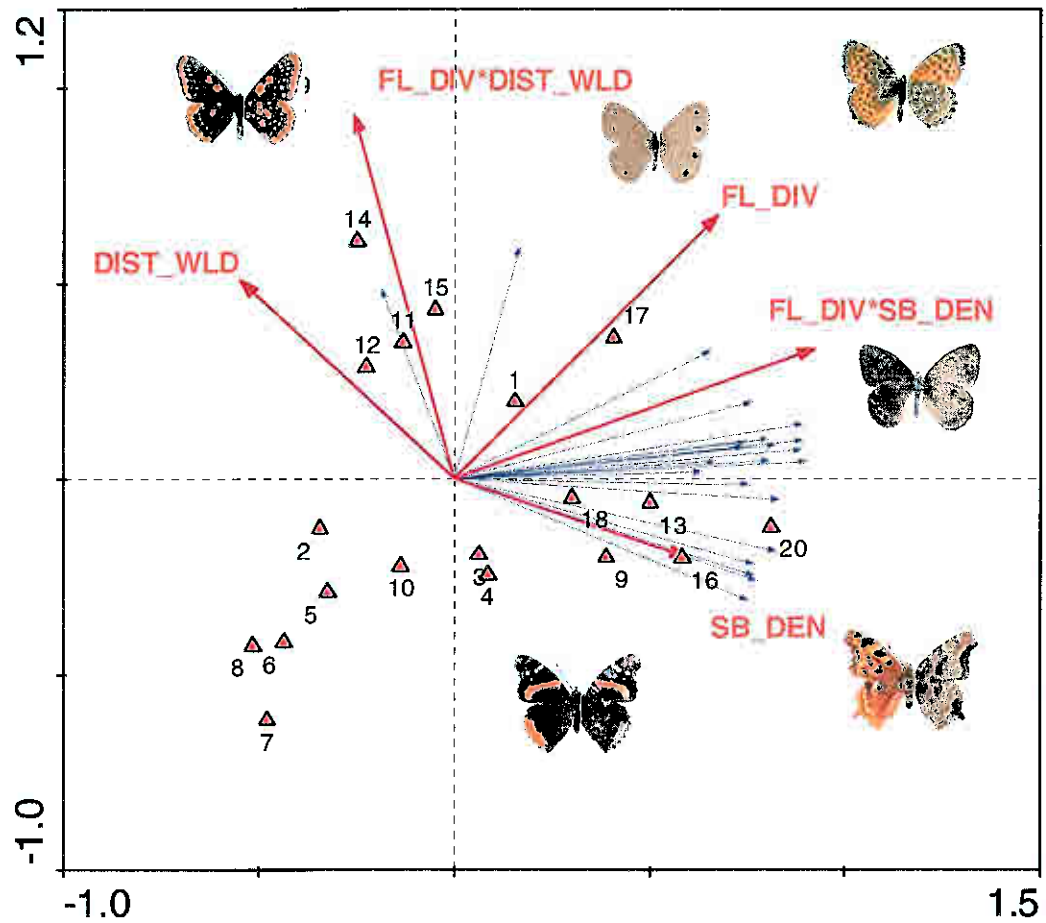
Biodiversity

Today's discussion ...



Butterflies

Effect of Shelterbelt Variables on Butterfly Communities



Main Effects

Shelterbelt Density

Floral Diversity

Interactions

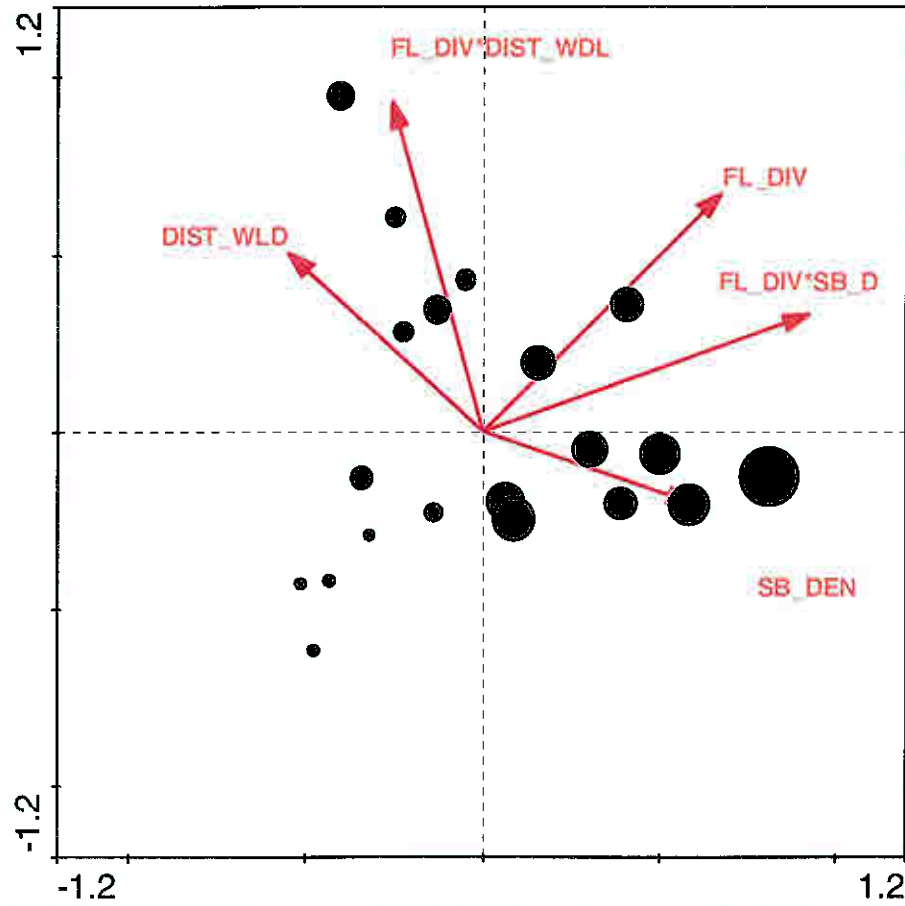
FL_DIV*Distance

SB_DEN*Distance





Effect of Shelterbelt Variables on Butterfly Communities

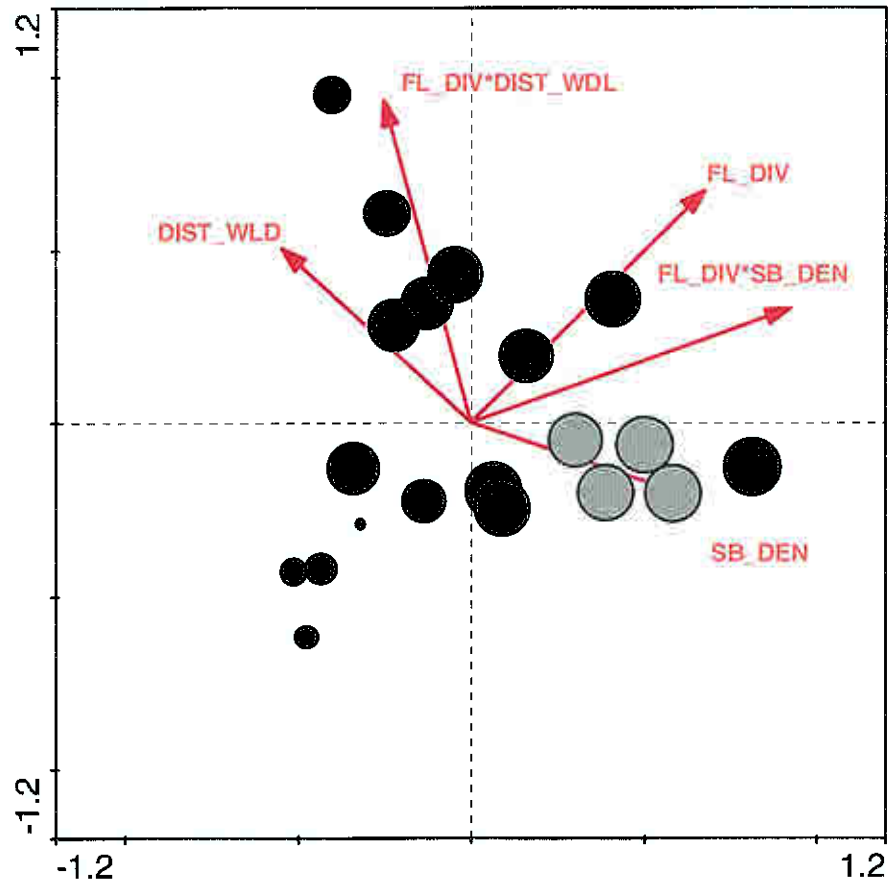


Abundance



Butterflies

Effect of Shelterbelt Variables on Butterfly Communities



Diversity



Butterflies

Native Bees



Biodiversity



... 273 species in the Maritimes

Bees



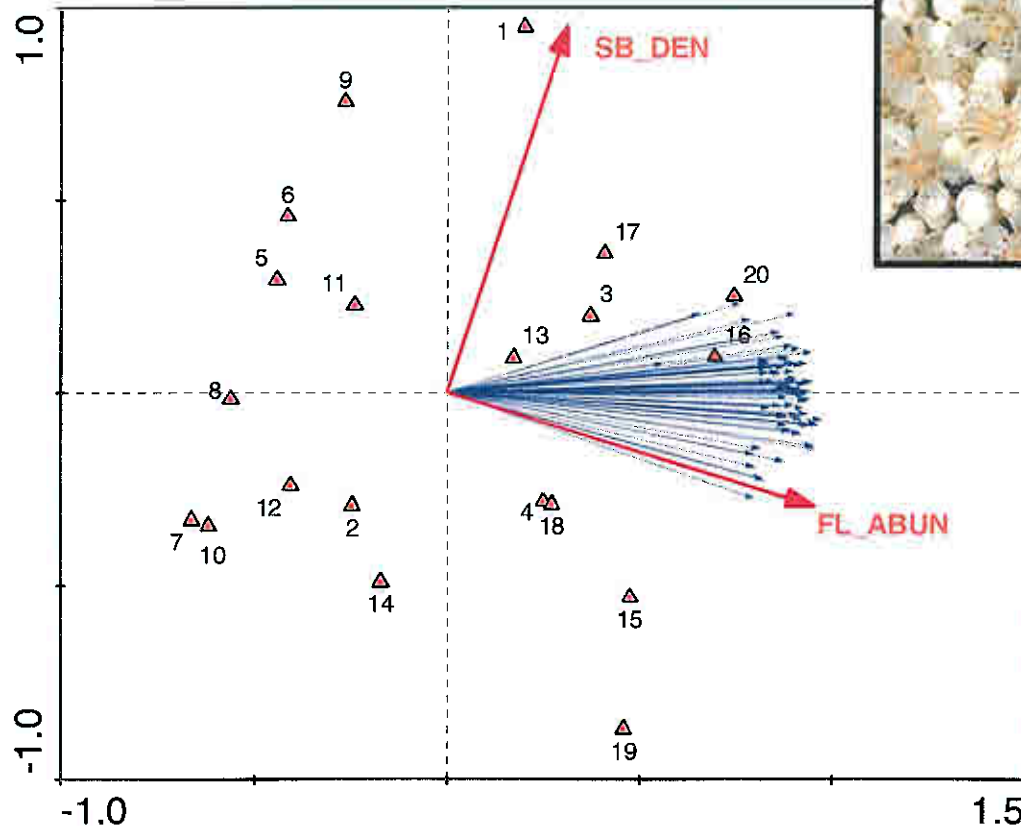
... 67 species pollinate blueberry

Bees

... 147 found in blueberry agro-ecosystems



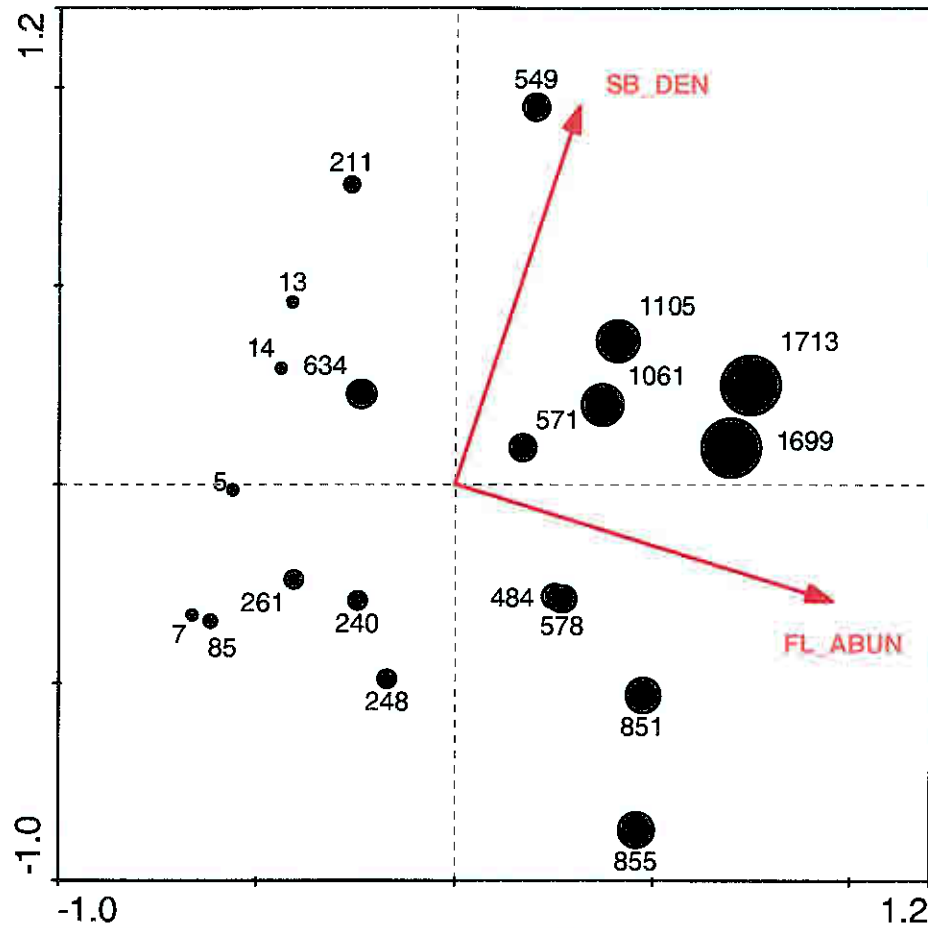
Effect of Shelterbelt Variables on Bee Communities



SB Variables
Floral Abundance
Shelterbelt Density

Bees

Effect of Shelterbelt Variables on Bee Communities

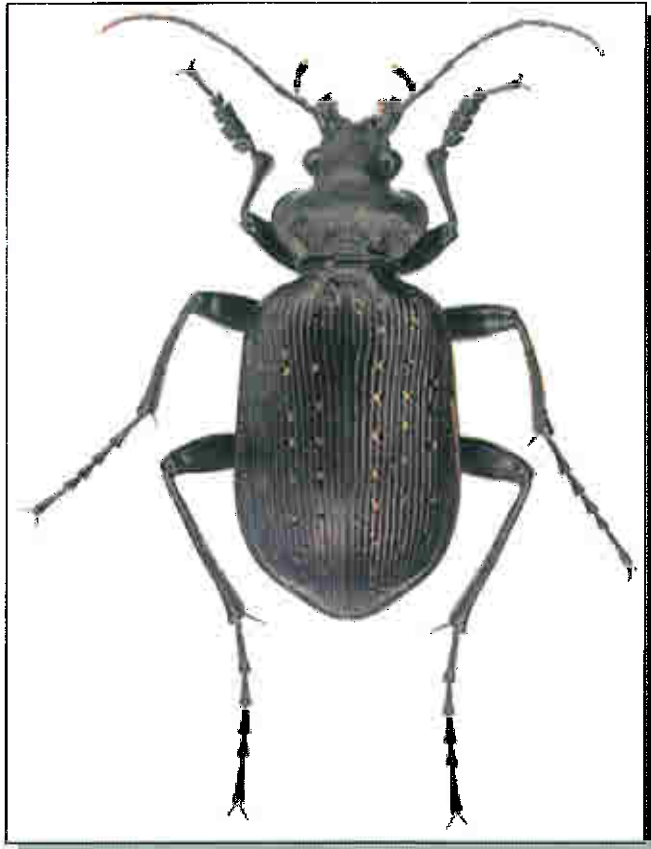


Abundance



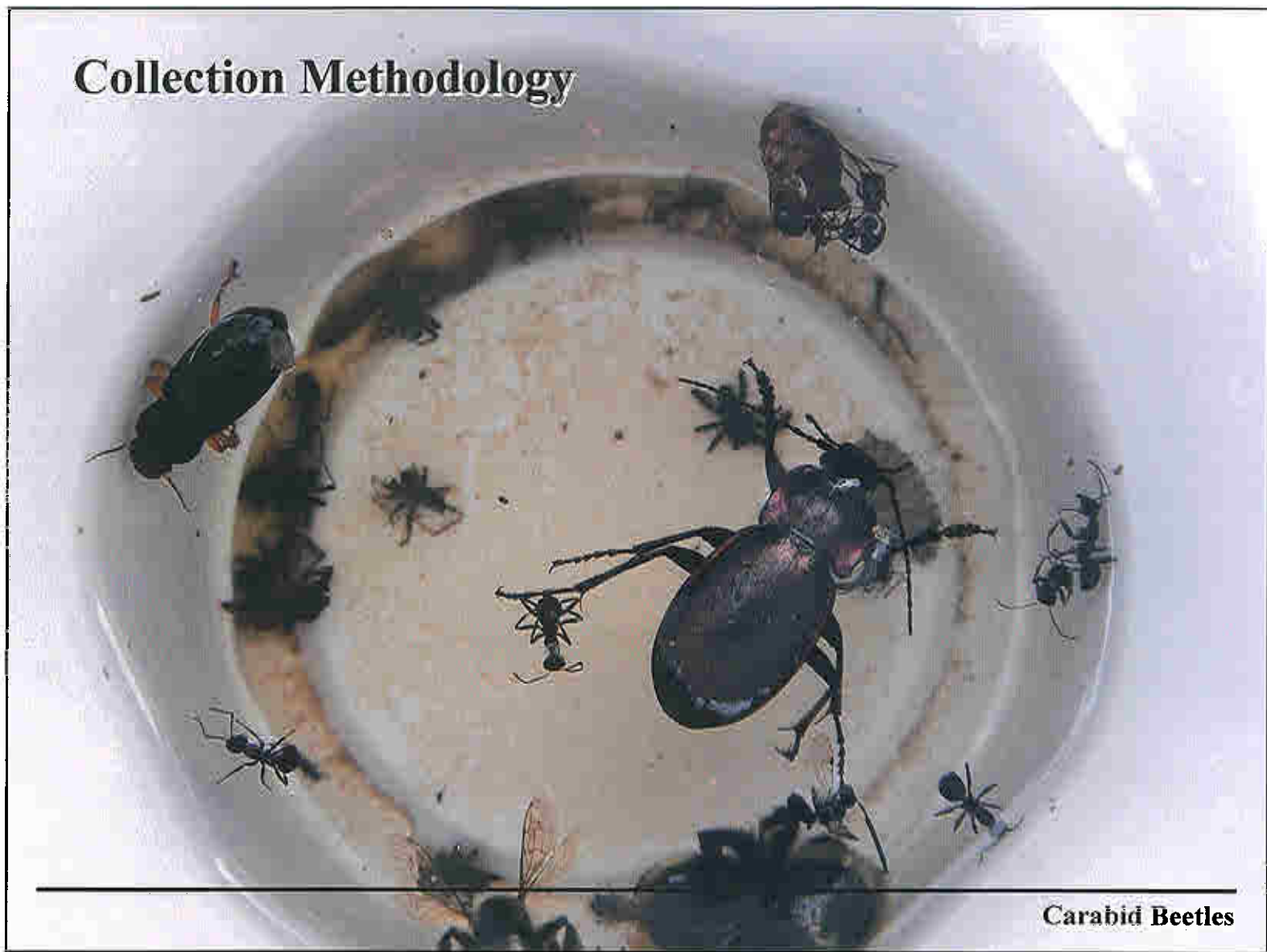
Bees

Carabid Beetles



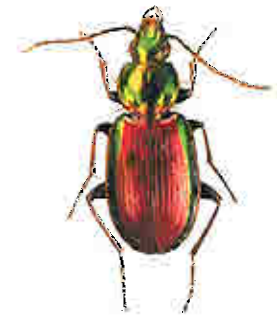
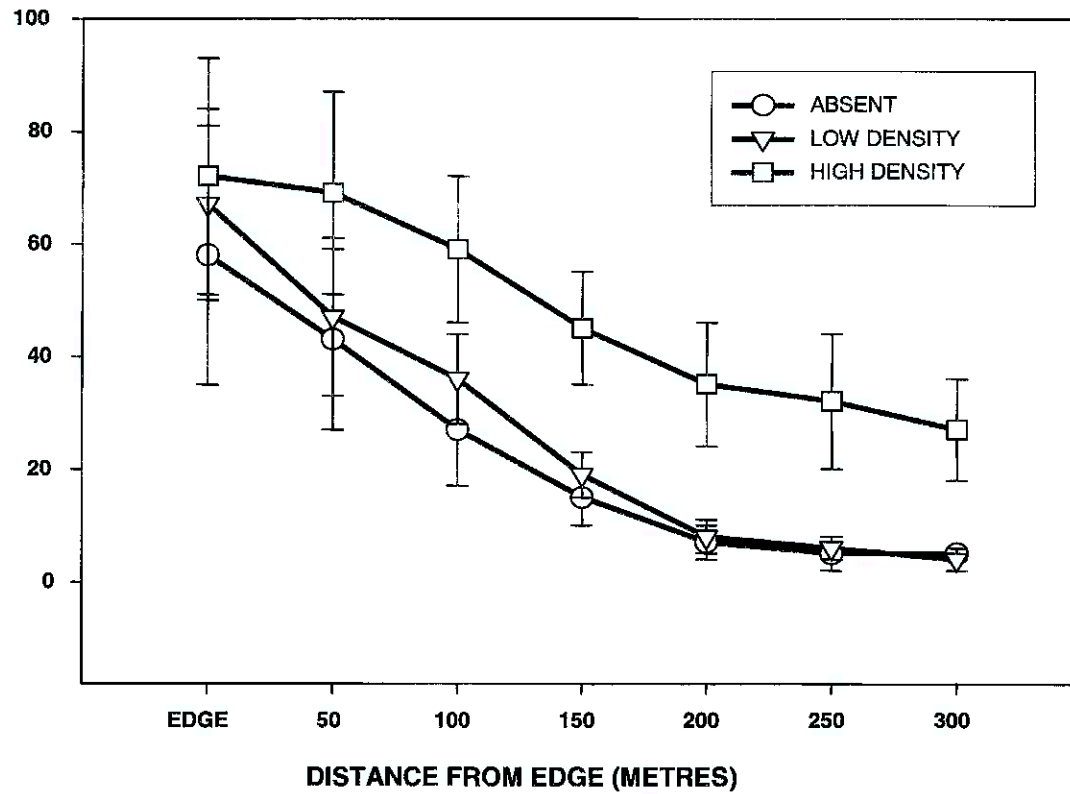
Biodiversity

Collection Methodology



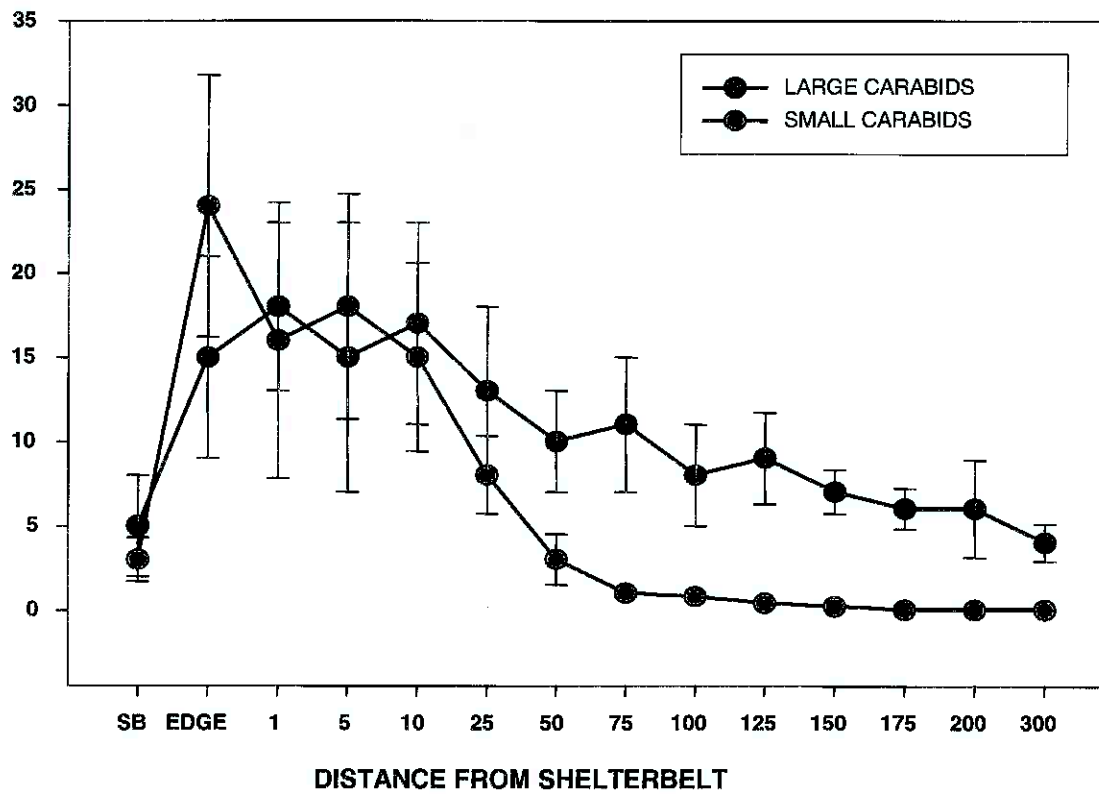
Carabid Beetles

Shelterbelt Density



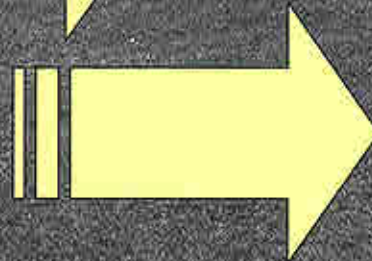
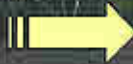
Carabid Beetles

Edge Effect



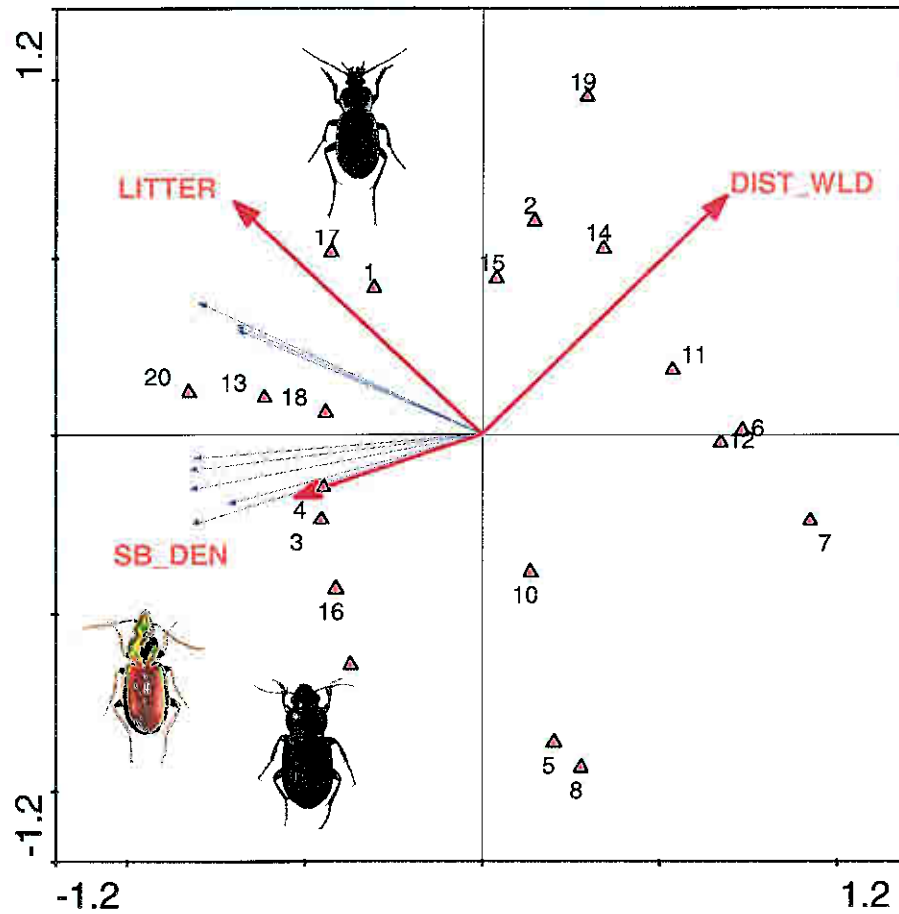
Carabid Beetles

Edge Effect



Carabid Beetles

Effect of Shelterbelt Variables on Carabid Communities

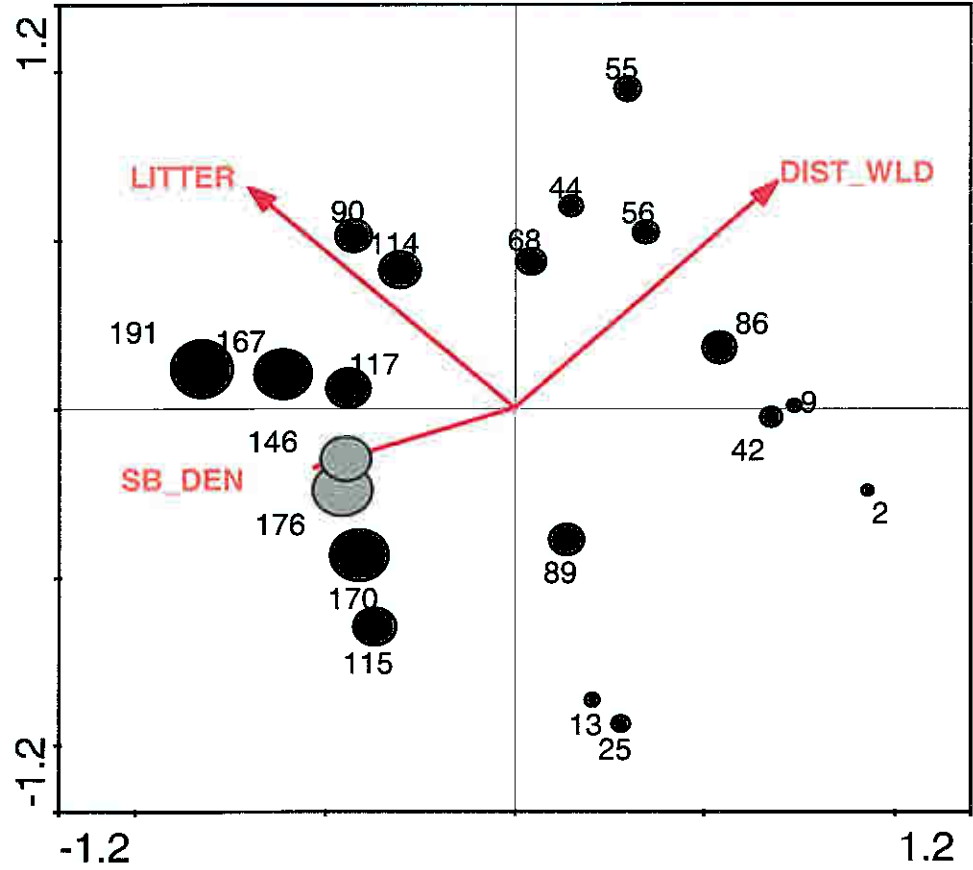


Variables
 Shelterbelt Density
 Distance from Woodland
 Litter



Carabid Beetles

Effect of Shelterbelt Variables on Carabid Communities



Abundance



Carabid Beetles

Continuing Research ...

Beneficial versus Pest Species.

Different shelterbelt structure and composition.

Landscape context.



Agroforestry in different agricultural landscapes.

The Impact of Agroforestry Buffers on Biodiversity

Summary

Shelterbelts have the potential to increase biodiversity in agro-ecosystems.

Structure, composition and landscape pattern are important.

For Birds, Butterflies, Bees and Beetles:

WIDTH

FLORAL DIVERSITY

PROXIMITY TO WOODLAND

SHELTERBELT DENSITY

FLORAL ABUNDANCE

LITTER

The Impact of Agroforestry Buffers on Biodiversity

... thank you for your attention



The Impact of Agroforestry Buffers on Biodiversity