

Bird species diversity in hybrid poplar plantations in Northern Italy

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THE PROJECT

Aims

- To investigate species diversity in hybrid poplar plantations (SRF)
- Birds (Small mammals, Butterflies and Ground beetles)
- To compare SRF to other arboriculture stands and crops
- To analyse the importance of SRF location

The project started in April 2008 and ended in May 2010



SHORT ROTATION FORESTRY



- Monoculture
- Fast-growing trees
- High density planting
- Cut every 2/5 years
- Different grid patterns
- Single row
- Double row

- Woodchips
- Woody biomass for heating or electric power stations



POSITIVE EFFECTS OF SRF

SOCIO-ECONOMICS

- Reduction of petrol importation (Pitcher et al. 1998)
- Work opportunities in rural areas (Verani & Sperandio 2006)

ENVIRONMENTAL

- Reduction of emission of GHG (Sabatti et al. 2000)
- Reduction of leaching of soil nutrients (Malik et al. 2000)

ANIMAL DIVERSITY

- Increase landscape heterogeneity (Whittingham 2007)
- New colonizable habitats (Christian et al. 1997, Sage et al. 1998)
- Cover of canopy provides shelters (Giordano & Meriggi 2009)



OTHER ARBORICULTURE STANDS



REFORESTATIONS

- Polyspecific culture
- Noble-hardwood

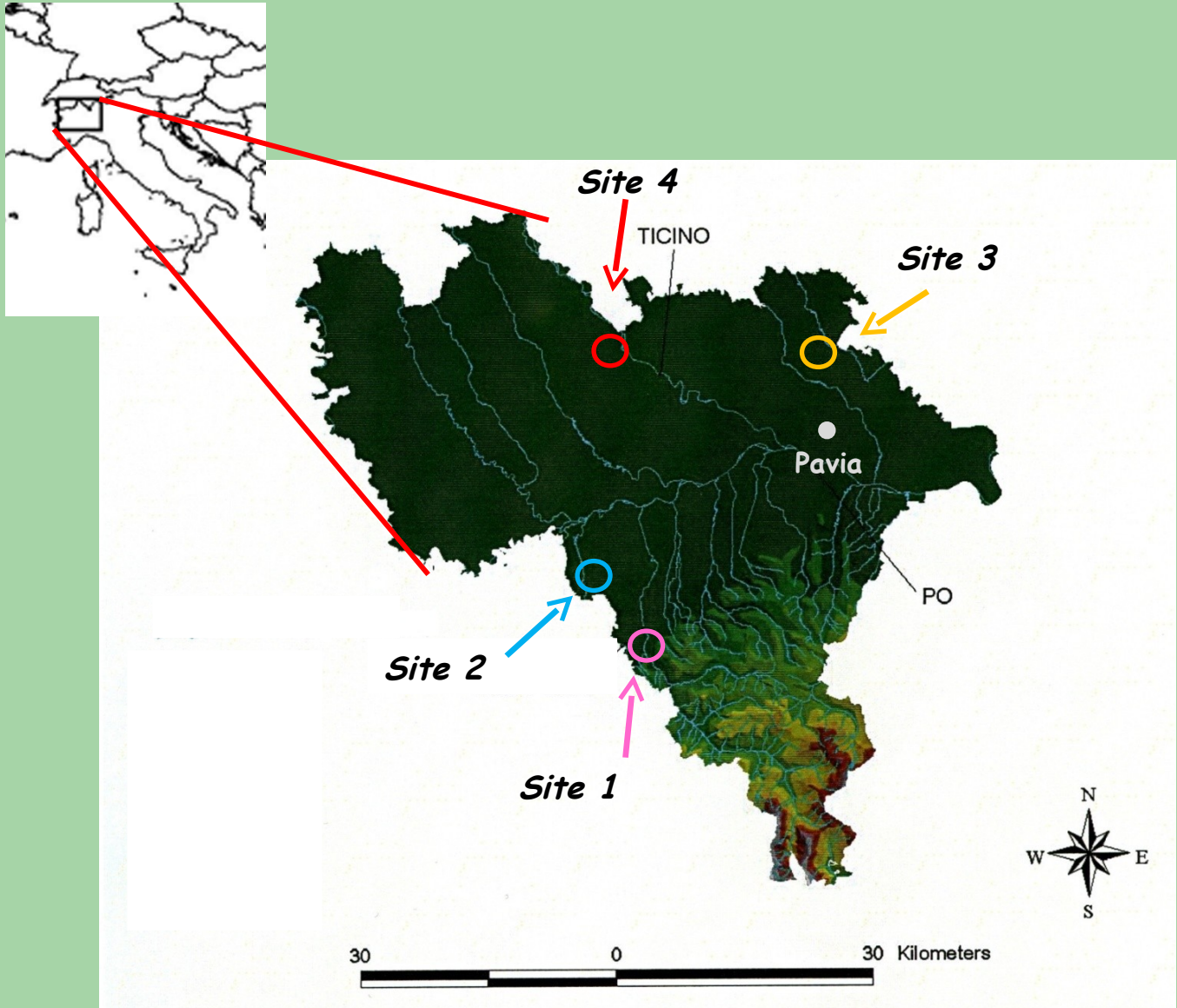


TRADITIONAL POPLAR PLANTATIONS

- Monoculture
- Cellulose for paper factories



STUDY SITES



SURVEY AND ANALYSES

SURVEY

- Point count technique
 - 230 casual points proportional to extensions land use types
 - Hearing time: 10 min

ANALYSES

- Description of bird community
 - N° species, density of species
- Pearson coefficients
- Shannon diversity index con correzione con procedura Jackknife (Barabesi & Fattorini 1998)
- Spatial analysis (*P.colchicus*)



RESULTS

2008

59 species

- SRF:27
- Reforestations: 16
- Traditional poplar plantations:18
- Crops:26

2009

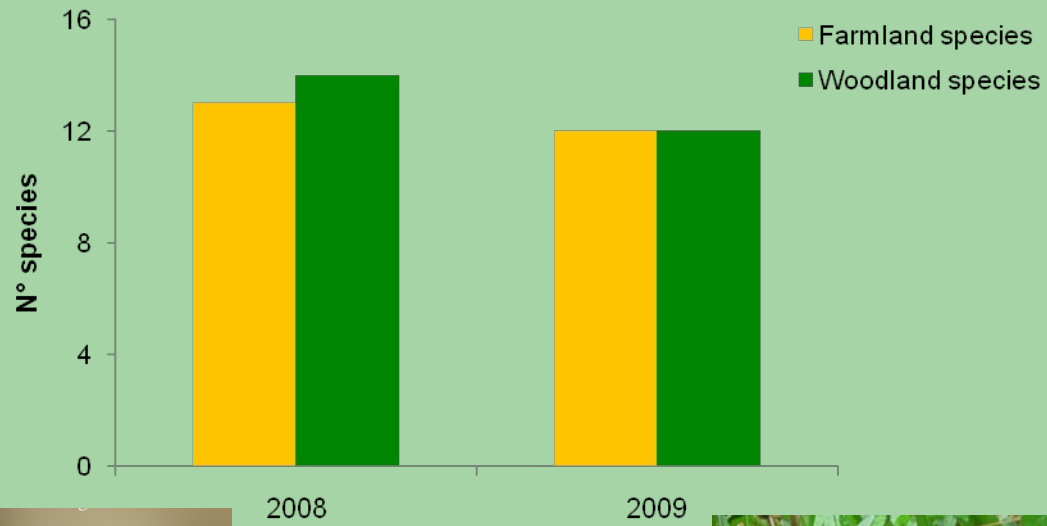
61 species

- SRF:24
- Reforestations: 18
- Traditional poplar plantations: 14
- Crops: 22

SPECIES IN SRF

Blackbird	Magpie
Blackcap	Melodious warbler
Blue tit	Nightingale
Bobwhite quail	Pheasant
Carrion crow	Pigeon
Cetti's warbler	Red-backed shrike
Chaffinch	Reed bunting
Collared dove	Spotted flycatcher
Corn bunting	Starling
Cuckoo	Tree sparrow
Golden oriol	Turtle dove
Great tit	Whinchat
House sparrow	Wren
Jay	Yellow wagtail
Long-tailed tit	



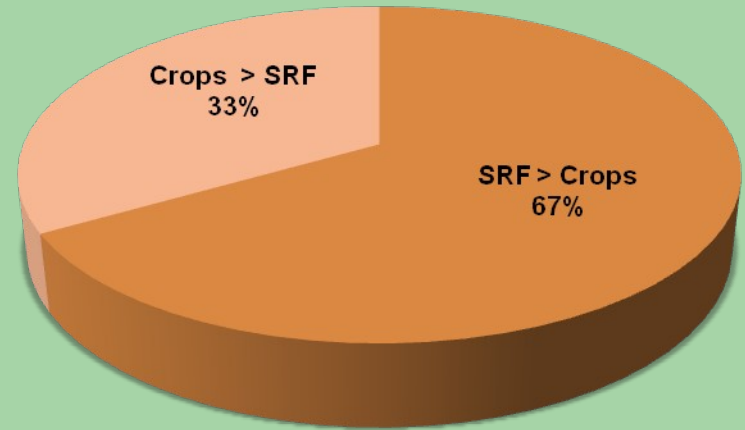


Bird community

2008

- Species present both in SRF stands and traditional crops, have higher density in SRF stands.

($N_1=175$, $N_2=152$, $U= 9212$, $p<0.0001$)



2009

- No significant differences



Pearson coefficients

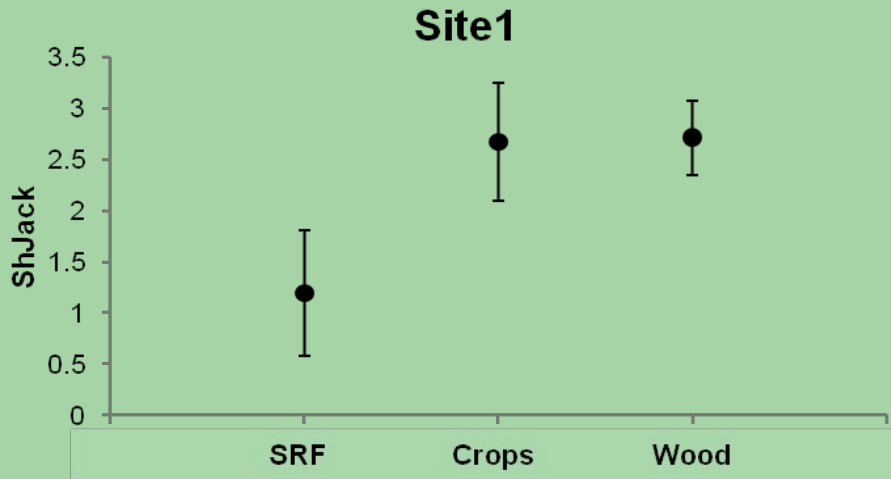
2008	Traditional poplar plantations	Reforestation	D.R. SRF	S.R. SRF	Cut SRF	Tot SRF	Crop
Blackcap		(+)0.001		(+)0.047			(-)0.009
Carrion crow	(+) 0.004					(-)0.023	
Cukoo		(+)0.035		(+)0.011	(+)0.007	(+)0.001	(-)0.004
Great tit		(+)0.044		(+)0.014			(-) <0.001
Melodious warbler	(-)0.040				(+)0.000	(+)	<0.001
Nightingale			(+)0.028		(+)0.002	(+)0.001	(-)0.009
Pheasant	(+) <0.001	(-)0.004	(+)0.003				(-) <0.001
Spotted flycatcher				(+)0.007			
Tree sparrow	(+)0.018						
Turtle dove				(+)0.050			

2009	Traditional poplar plantations	Reforestation	D.R. SRF	S.R. SRF	Cut SRF	Tot SRF	Crop
Blackcap	(-)0.001				(+)0.033		(-) <0.001
Cukoo		(+) <0.001			(+)0.003	(+)0.009	(-)0.023
Golden oriol		(+)0.003		(+)0.003			(-)0.004
Log-tailed tit		(+)0.006					
Melodious warbler					(+) <0.001	(+)0.022	
Nightingale					(+)0.018		
Pheasant	(+)0.027						
Spotted flycatcher			(+) <0.001			(+)0.002	
Tree sparrow			(+)0.005				
Turtle dove			(-)0.048				

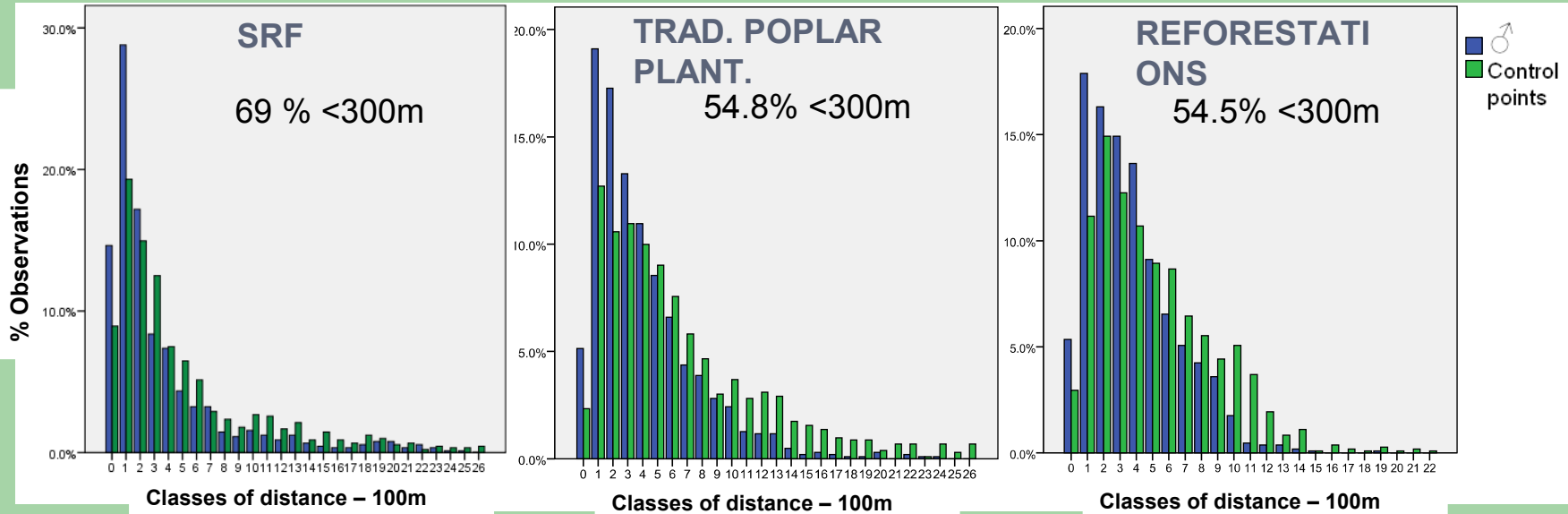


Shannon diversity index

2008



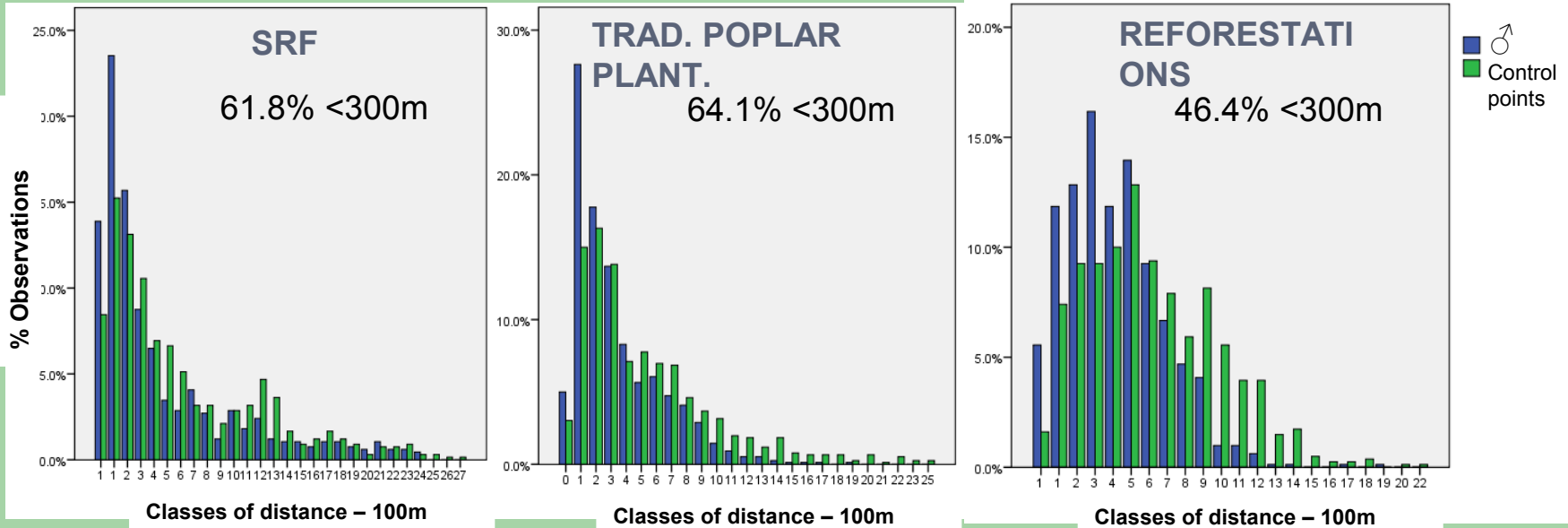
Spatial Analysis



2008							
Distances from	Observed	Expected	$N_1 - N_2$	U	p	Z	p
Reforestation	326.4 (8.20)	463.9 (11.07)	1085	1050602	<0.001	3.950	<0.001
Trad. poplar plant	361.8 (11.01)	592.8 (16.86)	1031	393057	<0.001	4.404	<0.001
S.R. SRF	353.1 (15.21)	533.5 (18.17)	896	308793.5	<0.001	3.898	<0.001
D.R. SRF	1136.6 (36.24)	1302.9 (39.46)	611	355933	0.004	1.859	0.002
Cut SRF	966.3 (25.99)	1230.7 (30.29)	896	737555	<0.001	2.929	<0.001
SRF	313.4 (15.28)	460.1 (18.03)	2404	719096	<0.001	3.921	<0.001



Spatial Analysis



2009							
Distances from	Observed	Expected	$N_1 - N_2$	U	p	Z	p
Reforestation	365.4 (9.47)	556.8 (12.91)	810	226743.5	<0.001	4.621	<0.001
Trad. poplar plant	295.3 (10.80)	474.1 (16.42)	760	217209	<0.001	3.488	<0.001
S.R. SRF	180.1 (12.52)	317.9 (18.33)	227	16946	<0.001	2.910	<0.001
D.R. SRF	1038.2 (30.89)	1185.3 (32.39)	633	178322.5	0.001	2.108	<0.001
Cut SRF	537.8 (26.49)	721.4 (27.16)	486	92174	<0.001	3.272	<0.001
SRF	416.3 (20.99)	455.1 (25.83)	1346	178265	<0.001	3.048	<0.001



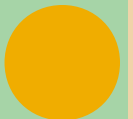
CONCLUSIONS

- SRF harbour a higher number of species than other stands and crops. → Higher species diversity
- Presence of both woodland and farmland species
 - Woodland species exploit stands as *arboreal patch* in an open matrix
 - Farmland species have benefits thanks to **limited anthropic disturbance** and use of pesticides.
- **Extension and location** of arboriculture stands seem to be important for birds.



CONCLUSIONS

- Increase in landscape heterogeneity → Increase biodiversity
- Effects of SRF are linked to landscape context → It seems **important** to create **continuum** between natural woodland and artificial arboreus stands





**Thanks for
your attention!**