

Use of chlorpyrifos in apple orchards: 3-year field study on bird & mammal populations (2012-2014).

INTRODUCTION

The aim of this study is to provide information on the status of bird and mammal communities in 10 different pome fruit orchards treated with chlorpyrifos. To add information to this scientific project 3 untreated organic orchards are also included. The study orchards are all in Herefordshire, UK (Figure 1). The methodology and preliminary results from 2012 & 2013 are presented below.

METHODS

Mammal Trapping

50 live traps were set within the orchards and in an adjacent habitat.



Bird Surveys

Observations were made with binoculars of presence and behaviour of birds

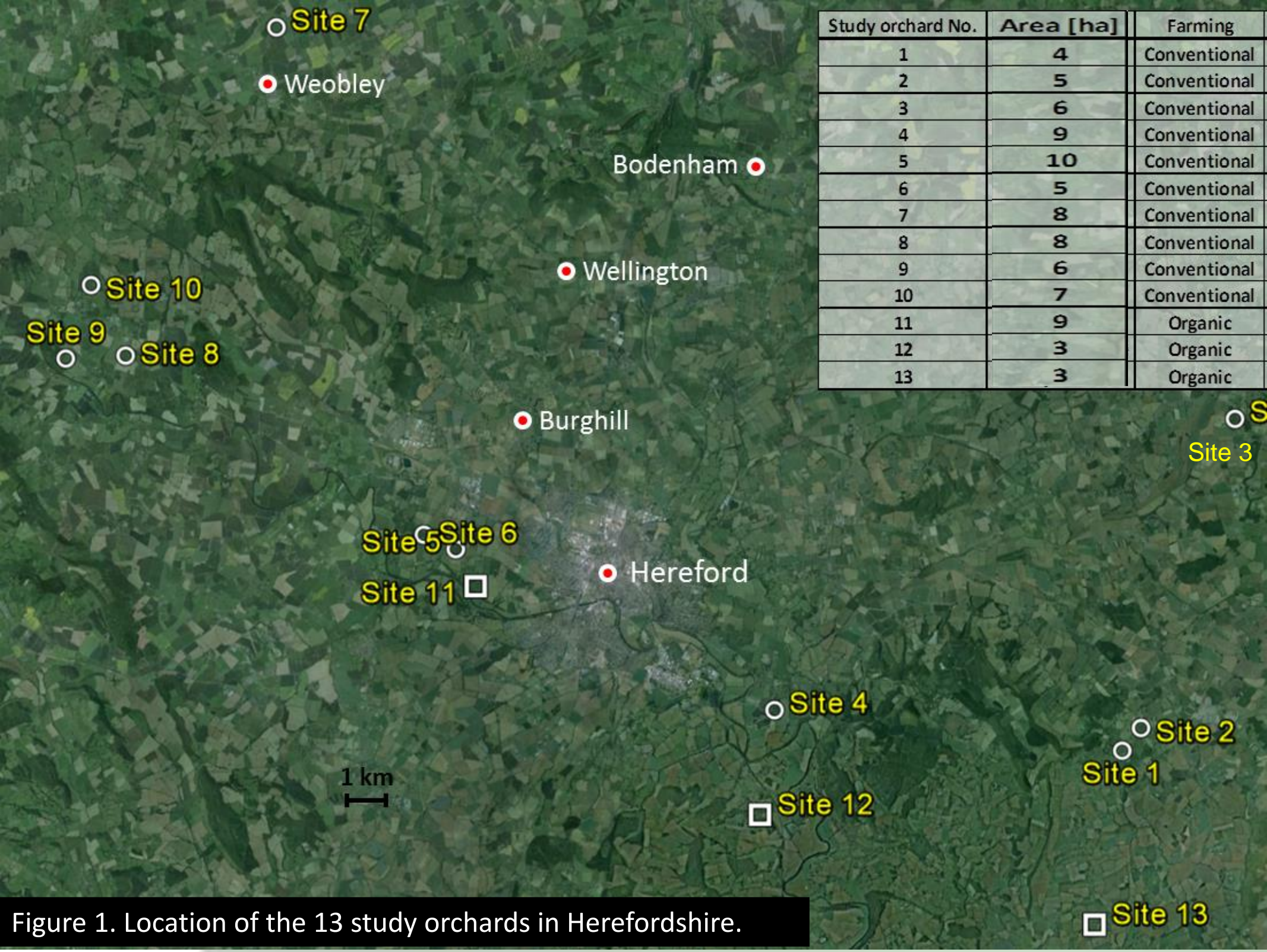


Figure 1. Location of the 13 study orchards in Herefordshire.

Bird trapping/ringing



Birds were trapped using mist nets and individually marked with rings from the BTO (British Trust for Ornithology)



Predator Surveys

Motion-sensitive cameras were used



Abundance of insects and other arthropods



Nest Searching and Nest Monitoring

Trees and vegetation within and around each orchard were searched for nests. Cavities in trees were checked with an endoscope camera. The fate of all active nests was monitored until fledging or nest failure. In 2013, 530 nest boxes were fitted. Cameras were also fitted to some nests



Radio Tracking

To check if birds change their habitat selection in response to chlorpyrifos sprays some Blackbirds, Robins, Great and Blue Tits were tagged with a radio transmitter and tracked before and after the spraying.



RESULTS

Mammal Trapping (only 2012)

423 individuals were trapped
Most common were:
Bank Vole (n = 185)
Wood Mouse (n = 127)
Yellow-necked Mouse (n = 91) .
0.91 captures per night and trap in the **off-crop**
0.03 captures (nearly exclusively Wood Mouse) per night and trap **inside** the orchards.

Predator Survey (only 2012)

Most common potential predators by automatic camera:
Dogs (n = 44 observations)
Badgers (n = 42 observations)
Red Foxes (n = 25 observations)
Carrion crows (n = 22 observations)

Arthropod Abundance (only 2013)

A great variety of different arthropod groups was found inhabiting the orchards. The application of chlorpyrifos reduced the abundance of arthropods especially of foliage dwellers. Because the food for insectivorous birds was reduced the orchards were temporarily less attractive for foraging.

Bird Survey (2012 and 2013)

2012: 636 sightings of 33 species
2013: 988 sightings of 49 species

Radio Tracking (only 2013)

119 tracking sessions of 39 individuals. Potentially due to reduced food abundance, tracked insectivorous birds seemed to adapt their home ranges towards off-orchard habitats after chlorpyrifos application.

Bird Trapping/Ringing (2012 and 2013)

Number of individuals trapped:

2012

	Study site no.										
Species	1	2	3	4	5	6	7	8	9	10	Total
Great Tit	17	18	26	11	15	26	19	37	23	3	195
Blue Tit	13	14	18	2	23	19	15	36	39	11	190
Robin	23	20	7	13	6	15	21	8	13	1	127
Blackbird	16	23	3	11	8	4	13	8	5		91
Chaffinch	9	7	6	4	3	1	7	7	1		45
Other	19	38	6	33	19	23	43	28	50	6	265
Total	97	120	66	74	74	88	118	124	131	21	913

2013

	Study site no.										
Species	1*	2*	3	4	5	6	7*	8	9	10	Total
Blackbird	46	41	12	13	18	15	32	15	15	2	209
Blue Tit	17	10	17	15	28	30	23	22	23	11	196
Robin	38	27	6	8	12	18	15	10	20	1	155
Great Tit	13	15	10	6	20	14	8	30	22	10	148
Chaffinch	5	8	2	3	5	3	11	6	5	3	51
Other	57	42	15	14	48	22	36	23	46	10	313
Total	176	143	62	59	131	102	125	106	131	37	1072

Species list of trapped birds in 2012:

Great Tit, Blue Tit, Robin, Blackbird, Chaffinch, Goldfinch, Chiffchaff, Mistle Thrush, Common Redstart, Blackcap, Jay, Treecreeper, Song Thrush, Long-tailed Tit, Spotted Flycatcher, Coal Tit, Willow Warbler, Wren, Marsh Tit, Greenfinch, Goldcrest, Nuthatch, Bullfinch, Dunnock, Great Spotted Woodpecker, Linnet, Pied Wagtail, yellowhammer, Cuckoo, Garden Warbler, Sparrowhawk, Whitethroat, House Sparrow, Kingfisher, Reed Bunting, Tree Pipit, Woodpigeon
(37 species)

Nest Search and Monitoring (2012 and 2013)

Number of nests found and monitored:

2012

	Study site no.										
Nest type	1	2	3	4	5	6	7	8	9	10	Total
Cavities		2	1	1		8		31	25	5	73
Open nests	1	2	3	10	6	9	4	5	6	4	50
Total	1	4	4	11	6	17	4	36	31	9	123
Species [n]	1	3	4	7	3	7	3	7	7	4	20

2013

	Study site no.										Sub-Total				Total
Nest type	1	2	3	4	5	6	7	8	9	10	(1-10)	11	12	13	
Nest boxes	13	7	10	15	21	12	10	8	12	9	117	21	5	12	155
Cavities			1			3		20	12	1	37	22	7	5	71
Open nests	2	5	4	10	9	4	8	8	7	2	59	2	2	5	68
Total	15	12	15	25	30	19	18	36	31	12	213	45	14	22	294
Species [n]	4	5	6	7	9	8	8	10	11	4	19	8	4	12	25

Nest Boxes (2013)

530 nest boxes were fitted in the 13 orchards. 155 were used by birds for breeding. In 127 nest boxes (82%) young successfully fledged .

Nest cameras (2013)

By setting up cameras close to nests it was possible to monitor their fate and to identify causes of failure. In some cases nest abandonment was observed i.e. parents left the nest and have not been observed thereafter. In one case a Great Spotted Woodpecker built another hole in a tree to place the chicks in a natural cavity.

CONCLUSIONS SO FAR:

The 10 orchards sprayed with chlorpyrifos have a diverse and stable bird community (37 species) including successful breeding. Great tits, blue tits, robins and blackbirds are the most abundant birds as determined by mist-netting.

Addition of nest boxes in 2013 in the 10 treated orchards and 3 organic orchards increased the number of successfully fledged juveniles. Work will continue in 2014.