„Monitoring of indicator species (*Dendrocopos leucotos, Picoides tridactylus, Ficedula parva*) and other forest birds as part of the continnons monitoring programme of habitat restoration measnres in the Upper Dambovita Valley”

Final Report
of the contract nr. 141/01.05.2015.

implemented by the *„Milvus Group” Association*

As part of the project
LIFE11/NAT/RO/823
„Restanrarea ecologică a pădnrilor și habitatelor acvatice din partea snperioară a Văii Dâmboviței, Mnnții Făgăraș”

implemented by *Fundation Conservation Carpathia*

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Introduction

The aim of the contract is to conduct an annual monitoring scheme in order to obtain trend data for the breeding populations of three indicator species (*Dendrocopos leucotos, Picoides tridactylus, Ficedula parva*) and other forest birds for the period of 2015-2017, as part of a continuous monitoring program of habitat restoration measures in the area of the project „Ecological restoration of forest and aquatic habitats in the Upper Dâmbovița Valley, Munții Făgăraș". The monitoring scheme should reflect on the long term the impact of the three types of management applied in the study area (non-managed forests; mature coniferous forests, which will be transformed in mixed coniferous - broad-leaved forests; and clear-felled areas, where the forest will be replanted using a natural selection of tree species). The monitoring sessions should take place every year between 10th of May and 10th of June on the 150 points selected during the baseline study conducted in 2014, using the same methodology.

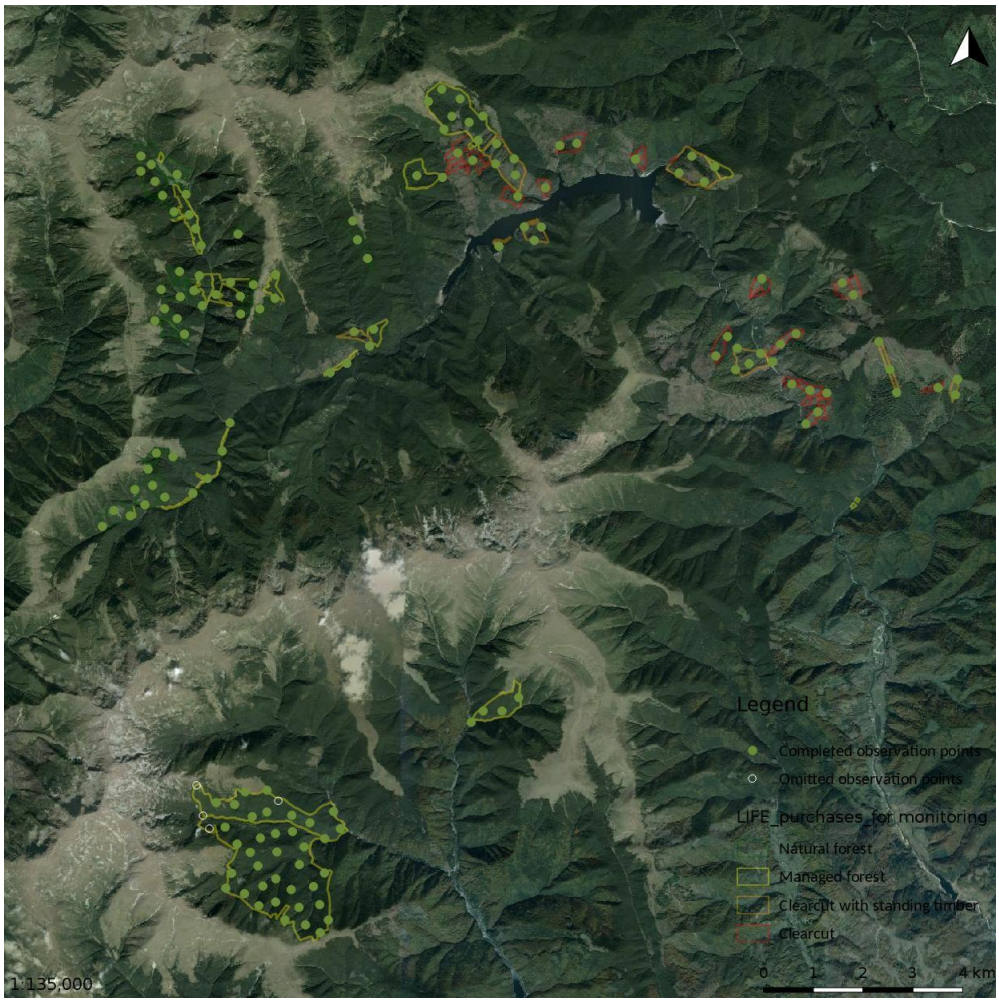


Figure 1: *The study area and the observation points completed in 2017*

A report should be produced annually as the outcome of the activity. The first two annual reports (2015, 2016) should be interim reports addressing the tasks from that year and presenting basic

results including the distribution and abundance of the target species observed during the monitoring session from that year. The third report is foreseen to be a more complex one, summarising the results of the previous years and analysing trend data for the period of 2014-2017.

The present report is the final report presenting the results of the monitoring session completed in 2017, the summary and trend analysis for the period of 2014-2017, as well as recommendations for the future monitoring.

Presentation of the target species

White-backed Woodpecker - *Dendrocopos leucotos* (BECHSTEIN, 1803)

Natura2000 code: A239

Habitat

The White-backed Woodpecker is a resident bird of the temperate zone. It is considered to be specialized on old-growth deciduous forests. In Western-, Central- and South-eastern Europe it breeds in forests dominated by beech *(Fagus)*, whereas in the North-East it uses other forest types.

In Romania it inhabits mainly beech forests or forests mixed with beech, but it can sometimes also breed or feed in other forest types from the distribution range of the beech, like the riparian woodlands dominated by Alder (*Alnus*) or Willow (*Salix*), or even in oak-hornbeam woods. The presence of a large quantity of deadwood (over 50 m^3/ha, Czeszczewik&Walankiewicz, 2006, Czeszczewik, 2009, Bühler, 2009, Kajtoch et al., 2013), both standing and laying, is essential for this species.

Diet

The diet consists mainly of insects, mostly larvae living in the trunk of trees and ants, but sometimes it feeds on hazelnuts and berries as well. Because it's primary source of food are the insects living in the dead wood, the presence of the species is dependent on the amount of coarse woody debris, left in the forest.

Breeding

Monogamous, solitary and territorial bird, with territory size varying between 0,25-2 km^2. In the breeding season it defends it's territory very aggressively against the intruders.

Starting from March one can hear the loud drumming of the males, attracting females. The nuptial flight of the pair is very attractive consisting of aerial races, demonstration flights. In this period they are very loud. The mating happens on the bark of trees. Both parents are excavating the nest hole, where they are incubating 3-5 eggs. The male is sitting mostly during the night. The chicks are cared for by both parents, during their 24-28 days long development period.

Migration

It is a sedentary bird.

Distribution

The White-backed Woodpecker has a Eurasian distribution, inhabiting the broad-leaved forest zone of the temperate and partly the Mediterranean region. In Europe it breeds in Southern Scandinavia, the Pyrenees, and it has a more continuous distribution starting from Central Europe and Italy to the east. The largest populations in Europe can be found in Russia, Romania and Belarus.

In Romania the presence of the species is determined by the distribution of the proper habitat, namely the beech forests. It is an uncommon, but widespread species in the Carpathians and the higher hills surrounding it, but it also breeds in small numbers in the beech forests of Dobrogea and Moldova.

Populations and trends

In Europe, the breeding population is estimated at 180000-550000 breeding pairs. The population is suspected to be in decline throughout much of its range owing to intensive forestry management, removal of dead wood and introduction of conifers. (BirdLife International, 2014). In Romania the breeding population is around 16000-24000 pairs (BirdLife International, 2004). Although there isn't any certain knowledge about the historical populations of the species in Romania, it is very probable that its trend is very similar to the global one.

Protection

In Romania the White-backed Woodpecker is a species of Community interest (OUG 57/2007). It's current IUCN category is „Least Concern" (IUCN, 2014).

Three-toed Woodpecker - *Picoides tridactylus* (Linnaeus, 1758)

Natura2000 code: A241

Habitat

The Three-toed Woodpecker typically inhabits mature boreal or montane coniferous forests with presence of spruce species (*Picea spp.*). Everywhere is a rare species, but occasionally local aggregations can be observed in forest areas recently disturbed by fire, water, wind, and/or infested by phytophagous insects. This suggests that its population size is limited by habitat/food resources hardly found under conventional forest management (Fayt, 2003). Studies in the Alps suggest that it needs old growth spruce dominated forest patches with over 15-18 m3/ha (volume) or 1,3-1,6 m2 (basal area) standing dead wood over at least a 100 ha patch (Bütler et al., 2004a, Bütler et al., 2004b).

Diet

They prey on insects on the dying and recently dead trees. The diet consists of conifer bark beetles, wood-boring beetle larvae and especially longhorn beetle larvae (Coleoptera: Scolytidae, Cerambycidae) (Fayt, 2003).

Breeding

The Three-toed Woodpecker starts reproducing the first year following hatching. It lays it's 2-6 eggs in May-June in a newly excavated cavity in a dead conifer or sometimes a live tree. The fledglings leave the nest in June-July; they start to disperse from their natal habitats mainly from August to November (Fayt, 2003).

Migration

The Three-toed Woodpecker is a resident species.

Distribution

The Three-toed Woodpecker is the only woodpecker to be found in both the Old and New World (although new studies suggest that the Old and New World forms represent two separate species). The breeding habitat is coniferous forests across western Canada, Alaska and the mid-western United States, and across northern Eurasia from Norway to Korea. There are also populations in the Alps, the Balkans and the Carpathian Mountains.

In Romania it is distributed in the natural spruce or mixed spruce-silver fir-beech forests of the Carpathians.

Populations and trends

In Europe, the breeding population is estimated to 350000-1100000 breeding pairs. The Romanian population is estimated at 15000-20000 pairs (BirdLife International, 2004), which is probably strongly decreasing due to logging of old-growth forests.

Protection

In Romania the three-toed woodpecker is a species of Community interest (OUG 57/2007). It's current IUCN category is „Least Concern" (IUCN, 2014).

Red-breasted Flycatcher – *Ficedula parva (BECHSTEIN, 1792)*

Natura2000 code: A321

Habitat

It is a species of the continental temperate climate, but it can be found also in the boreal and alpine regions. It breeds in mature deciduous or mixed forests, with dense undergrowth, preferring forest portions with tall trees. It favours the steeper and more humid areas of forests, often breeding close to small streams (Cramp 1998). In Romania it is strongly linked to beech forests, preferring the montane beech forests.

Diet

The food mainly consists of insects and other invertebrates. These are collected in the middle and lower canopy. It rarely also feeds on the ground eating earthworms or other invertebrates.

Breeding

Outside the breeding season it is usually solitary, except during migration, when sometimes it is associated with other species. It is territorial, in optimal habitat the size of the territory is 0.5-0.7 ha while in less favourable conditions it can reach up to 2 ha. It usually nests in holes or broken, rotten tops of standing trunks, but it may also build an open nest. The 5-6 (4-7) eggs are laid in May which are incubated only by the females for 12-15 days. The parents feed the chicks together, which develop in about 12-13 days. The adults feed the chicks for 8-10 days more after fledging.

Migration

The Red-breasted Flycatcher is a long distance migrant, which winters in south-western Asia (mainly Pakistan and India). In spring it arrives to the breeding ground in early May, and leaves in September.

Distribution

It is a species distributed in Europe and marginally in Asia. Breeds in almost every European country, apart from Western Europe. The largest populations are in Russia, Belarus, Latvia, Ukraine and Romania. Its Romanian distribution follows that of the beech forests. It is a relatively common species in the Carpathians, but it breeds in smaller numbers also in the hills surrounding the Carpathians and in Dobrogea.

Populations and trends

The European population of is very high (3.2 to 4.6 million breeding pairs), and it is considered stable. The Romanian population is estimated to 360000-512000 breeding pairs (BirdLife, 2004), and is probably decreasing due to the massive logging of old-growth forests.

Protection

The Red-breasted Flycatcher is a species of Community interest (OUG 57/2007) in Romania, which is assessed by the IUCN as „Least Concern" (IUCN, 2014).

Results of the 2017 monitoring session

Study area and methodology

Study area and point selection

The study area lies in Argeș County, in the uppermost part of the Dâmbovița and Lerești Valleys, in the Făgăraș and Iezer-Păpușa Ranges and it is part of the Natura2000 site ROSCI0122 Munții Făgăraș. The study area consists of several forest patches purchased by FCC with a total area of 1294.56 ha. Out of this 215.55 ha are natural forests, 775.76 ha are managed forests (some partially felled) and 303.25 ha are clear-cut areas.

All the 148 observation points completed in any of the three previous years were also completed in 2017 (Figure 1).

Field methodology

The fieldwork was carried out between 16-23 May 2017, by the same observers as in the previous years. The field methodology was identical to the one described in the first interim report in 2015.

Table 1: *Results of the 8 minute survey targeting all the bird species*

Species	Nr. of ind. observed	Nr. of points with presence	Nr. of individuals/point	
			Average	SD
Aegithalos caudatus	5	1	0,03	0,41
Anas platyrhynchos	3	2	0,02	0,18
Anthus trivialis	25	13	0,17	0,66
Buteo buteo	7	5	0,05	0,27
Carduelis cannabina	1	1	0,01	0,08
Carduelis spinus	8	6	0,05	0,3
Certhia familiaris	4	4	0,03	0,16
Cinclus cinclus	2	2	0,01	0,12
Circus aeruginosus	1	1	0,01	0,08
Columba palumbus	8	4	0,05	0,43
Corvus corax	1	1	0,01	0,08
Corvus cornix	8	6	0,05	0,28
Cuculus canorus	43	38	0,29	0,52
Dendrocopos major	1	1	0,01	0,08
Dryocopus martius	14	14	0,09	0,29
Emberiza cia	1	1	0,01	0,08
Erithacus rubecula	236	120	1,59	1,19
Ficedula albicollis	3	2	0,02	0,18
Fringilla coelebs	422	137	2,85	1,5

Species	Nr. of ind. observed	Nr. of points with presence	Nr. of individuals/point	
			Average	SD
Garrulus glandarius	7	6	0,05	0,24
Hirundo rustica	1	1	0,01	0,08
Lophophanes cristatus	18	15	0,12	0,39
Loxia curvirostra	42	14	0,28	0,99
Lullula arborea	1	1	0,01	0,08
Mergus merganser	1	1	0,01	0,08
Motacilla alba	1	1	0,01	0,08
Motacilla cinerea	23	16	0,16	0,48
Nucifraga caryocatactes	15	13	0,1	0,34
Parus major	8	5	0,05	0,33
Periparus ater	236	106	1,59	1,45
Phoenicurus phoenicurus	2	2	0,01	0,12
Phylloscopus collybita	180	89	1,22	1,2
Picoides tridactylus	3	3	0,02	0,14
Picus canus	3	3	0,02	0,14
Poecile montanus	15	11	0,1	0,38
Prunella modularis	24	16	0,16	0,52
Pyrrhula pyrrhula	22	17	0,15	0,44
Regulus ignicapillus	54	40	0,36	0,67
Regulus regulus	98	56	0,66	1,02
Sitta europaea	1	1	0,01	0,08
Sylvia atricapilla	51	34	0,34	0,71
Sylvia curruca	16	13	0,11	0,37
Troglodytes troglodytes	43	32	0,29	0,62
Turdus merula	34	28	0,23	0,51
Turdus philomelos	59	42	0,4	0,74
Turdus torquatus	8	6	0,05	0,28
Turdus viscivorus	29	24	0,2	0,48

Table 2: *Results of the 20 minute survey targeting the woodpeckers*

Species	Nr. of ind. observed	Nr. of points with presence	Nr. of individuals/point	
			Average	SD
Picoides tridactylus	5	5	0,03	0,18
Dryocopus martius	26	25	0,18	0,4
Dendrocopos major	1	1	0,01	0,08

Results and discussion of the results

The results of the 2017 session are presented in Table 1 for all species counted during the first 8 minutes and Table 2 for woodpeckers counted during the whole 20 minute period.

White-backed Woodpecker

There were no White-backed Woodpeckers observed in 2017.

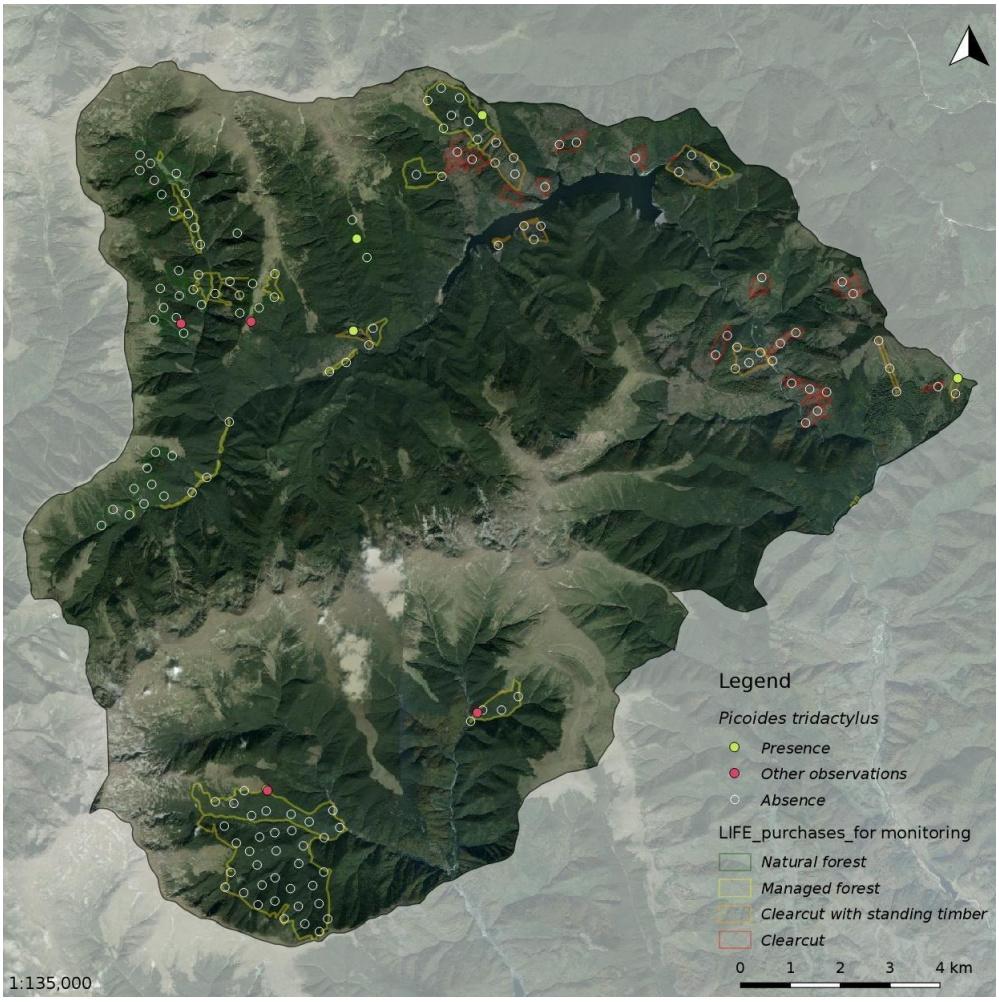


Figure 2: *Distribution of the Three-toed Woodpecker observations in 2017*

Three-toed Woodpecker

There were a total of 5 individuals of Three-toed Woodpeckers observed on 5 points (0.03±0.18SD ind/point). The species was observed from four points situated in the Dâmbovița Valley, and one in the Bătrâna Valley (Figure 2, Table 2). One bird was observed in natural forest, two birds in managed forests (although the forest patch at one of these observations can be easily considered natural forest) and two from clear-cut areas. Additionally there were another 6 birds observed outside the standard observations: 4 in the relatively natural habitats of the Vladului Valley, one in the forest patch

near Cabana Cuca, and one female with nest in the Bătrâna Valley area, very close to the point where its pair was seen during the point count.

Red-breasted Flycatcher

There were no red-breasted flycatchers observed in 2017.

Collared Flycatcher

There were a total of 3 individuals of Collared Flycatchers observed during the 8 minute counts (0.02±0.18SD ind/point, Figure 3). Two observations come from the Dâmbovița Valley, mostly from partially felled beech dominated forests. The third one was observed in the Bătrâna Valley in coniferous dominated managed forest mixed with beech. Individuals observed outside the observation points also come from the beech dominated lower part of the Dâmbovița Valley or from the mixed forests of Bătrâna Valley.

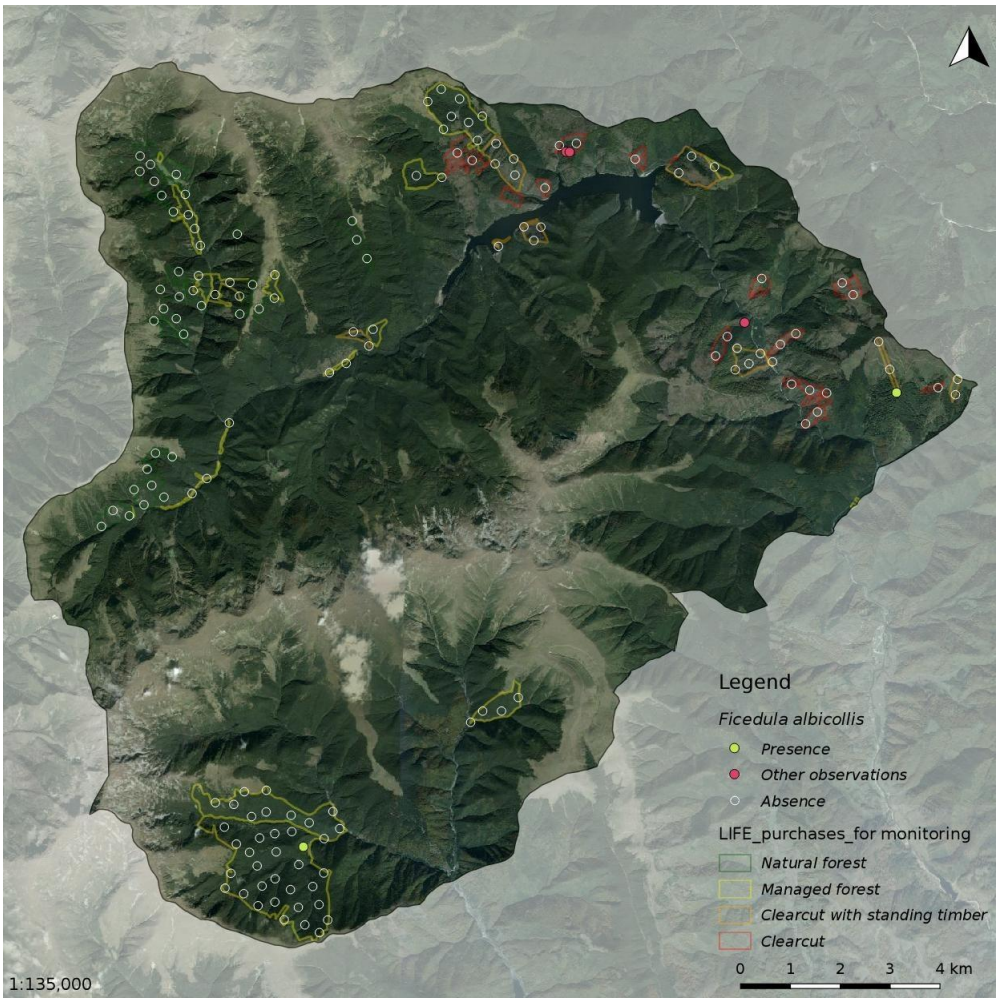


Figure 3: *Distribution of the Collared Flycatcher observations in 2017*

Other species

There were a total of 47 species observed from observation points (Table 1, Table 2). The Chaffinch (*Fringilla coelebs*), the Robin (*Erithacus rubecula*), the Coal Tit (*Parus ater*) and the Chiffchaff (*Phylloscopus collybita*) were the most abundant species, as in previous years. From the more interesting species observed during observations we can mention the Common Merganser (*Mergus merganser*) and the Rock Bunting (*Emberiza cia*).

Other species worth mentioning, observed outside of the survey are the Capercaillie (*Tetrao urogallus*) – birds and excrements, the Hazel Grouse (*Bonasa bonasia*) – bird seen in two places, excrements in 7 locations, the Woodcock (*Scolopax rusticola*,) the Golden Eagle (*Aquila chrysaetos*) – a pair was seen on two days in the Vladului Valley area and the Rock Bunting (*Emberiza cia*) – with also a nest found. The map in Figure 4 presents the distribution of some selected, non-target species.

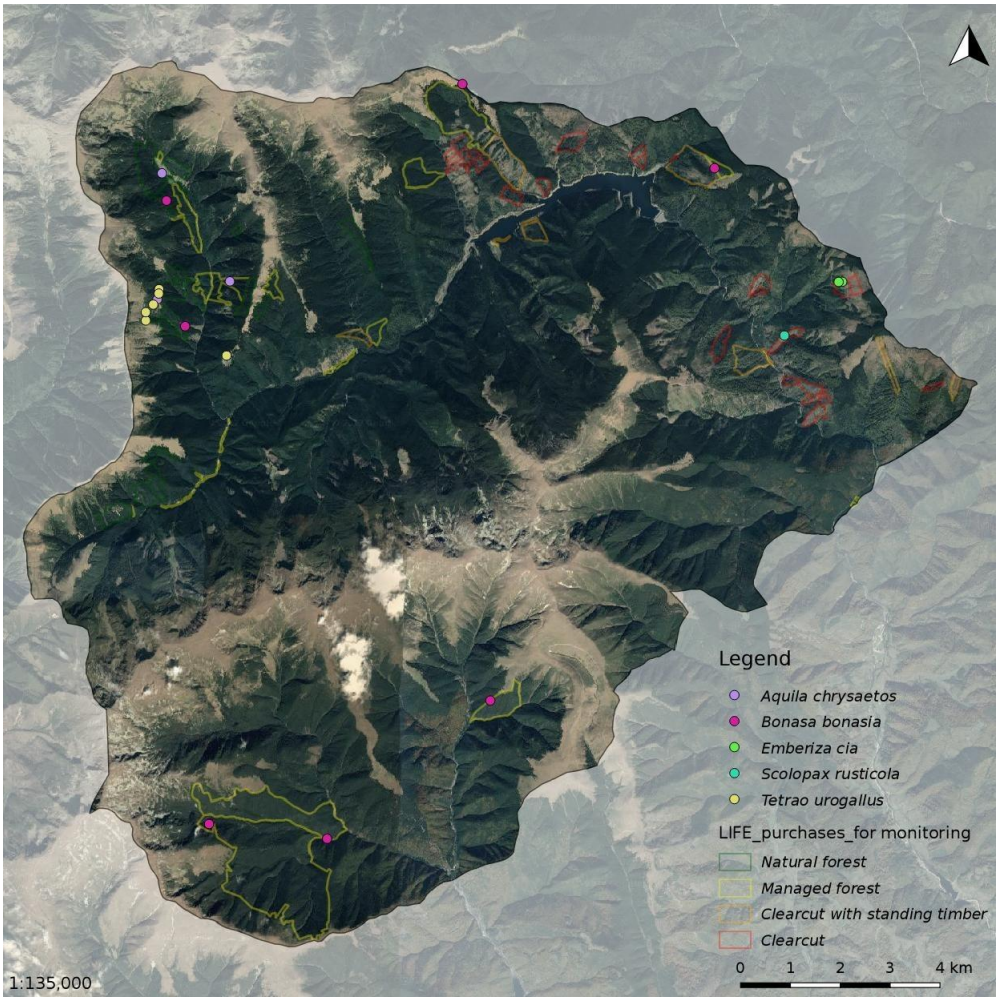


Figure 4: *Distribution of the Golden Eagle, Hazel Grouse, Capercaillie, Woodcock and Rock Bunting observations in the study area in 2017*

Summary and trend analysis for the 2014-2017 period

Data analysis

Trend analysis was performed using the TRIM (Pannekoek & van Strien, 2001).

Results and discussion of the results

White-backed Woodpecker

Trend analysis for the White-backed Woodpecker was not possible due to small sample size (Table 3), in one of the four years the species was even absent from counts.

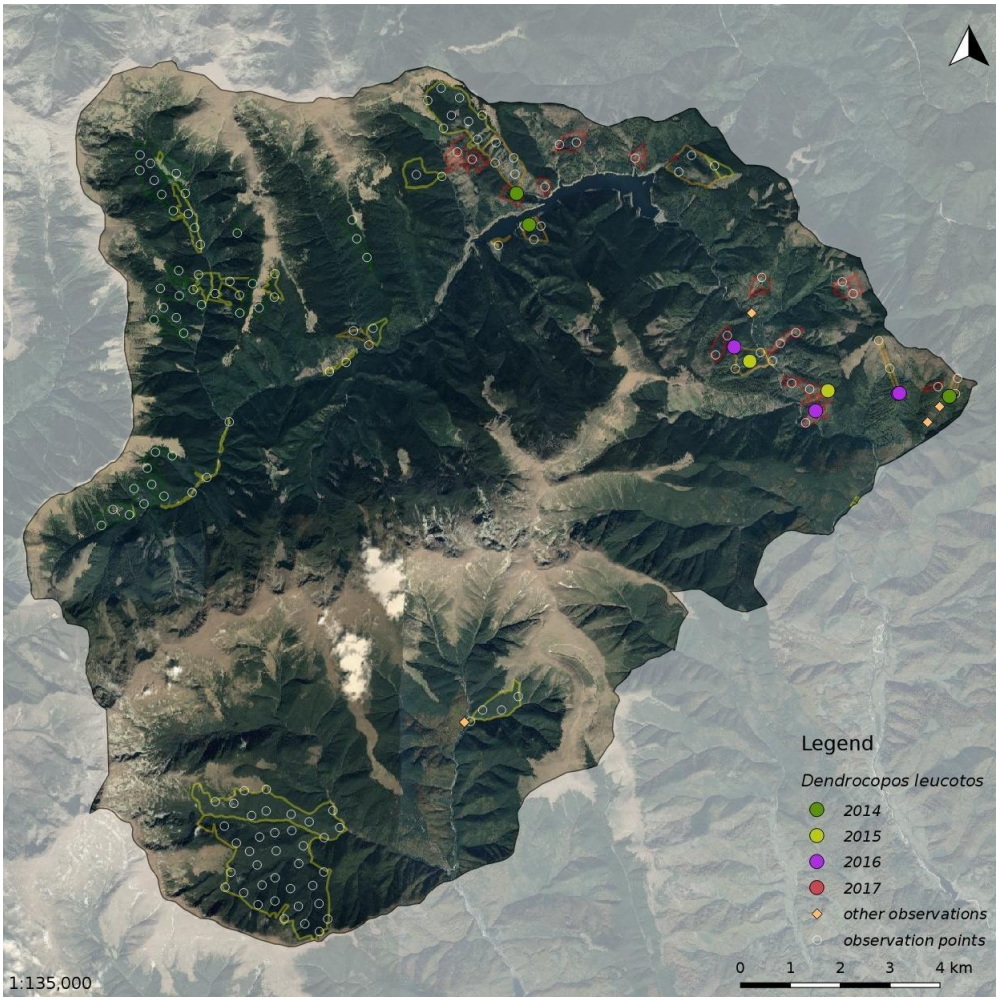


Figure 5: *Distribution of the White-backed Woodpecker observations in 2014-2017*

All the observations of the species from points come from the lower parts of the Dâmbovița Valley, where mixed beech-coniferous forests dominate, from points in clear cut or partially felled areas (Figure 5). This letter result may seem surprising, as the White-backed Woodpecker is a characteristic species of old growth forests with a lot of dead wood (Czeszczewik&Walankiewicz, 2006, Czeszczewik, 2009, Bühler, 2009, Kajtoch et al., 2013). However, this pattern is easily identified as a

bias resulting from the non randomized point selection through the available habitats in the area: on one hand all the point in the suitable altitudes were in clear cuts or partially felled areas and there were no points in the old growth forests, the typical habitat of the species, on the other hand these clear-cut patches are surrounded by old growth forest and actually most of the time the birds were observed at the edge of these, probably often lured by the play-back used to increase detectability. Also some birds often leave the old growth patches to feed in other habitats with dead wood.

The low numbers observed is easily understandable, as mature forests in the study area were spruce forests or heavily spruce dominated forests, while the White-backed Woodpecker prefers mostly beech forests, eventually alder forests. The mixed and beech dominated forests in the study area are either clear-felled, or in some areas, where the natural vegetation should be a mixed forest, the structure is artificially shifted towards spruce dominated forests. As a result of the management measures through which mature coniferous forests will be transformed in mixed coniferous – broad-leaved forests (M2) and clear-felled areas will be replanted using a natural selection of tree species (M3), the breeding population of the White-backed Woodpecker in the study area is expected to increase considerably.

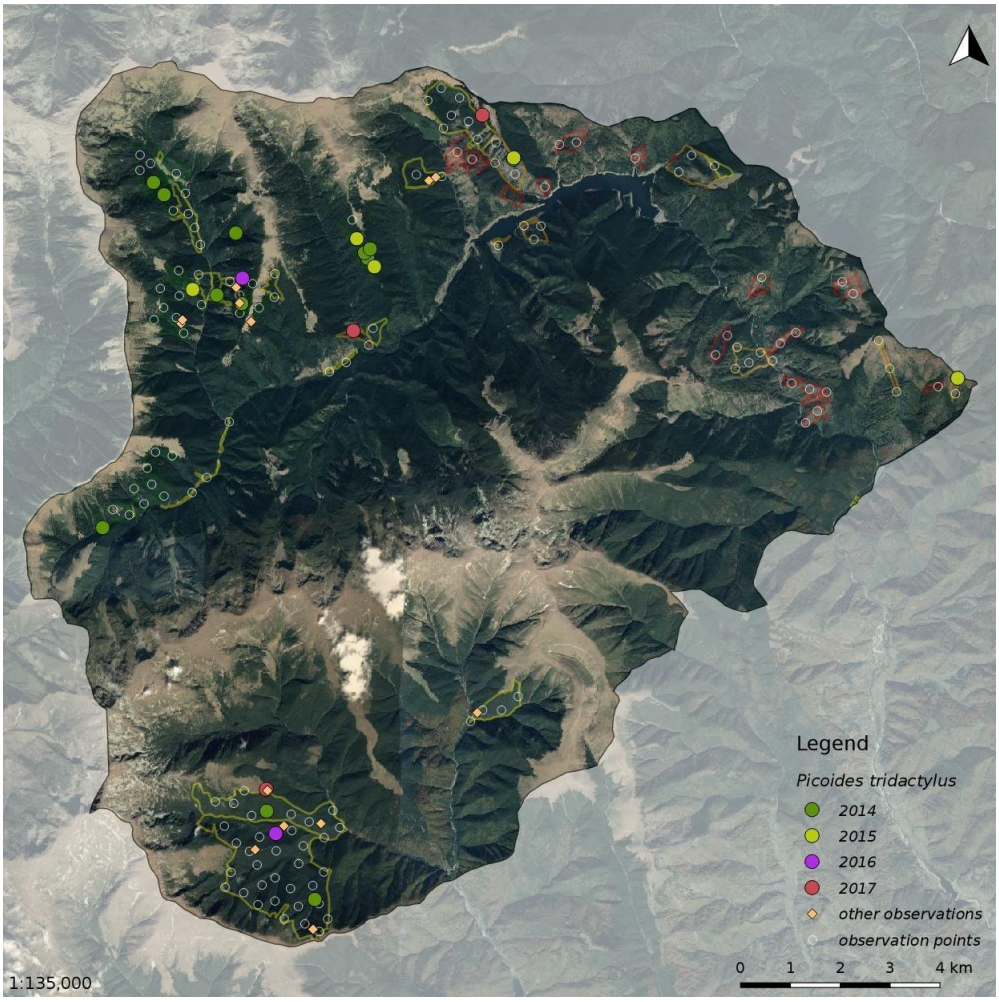


Figure 6: *Distribution of the Three-toed Woodpecker observations in 2014-2017*

Table 3: *Population trend of target (highlighted) and other species during the 2014-2017 period. Trend was calculated using information from the 8 minute point count (method 1) for most species, except woodpeckers. For woodpeckers the combination of 8 minute point count and 12 minute playback count (method 2) was used.*

Species	Method	Nr. of individuals				Slope (multiplicative)	SE of slope	Trend
		2014	2015	2016	2017			
Anthus trivialis	1	35	33	39	25	0.9192	0.0693	Uncertain
Buteo buteo	1	7	9	7	7	0.9650	0.1670	Uncertain
Certhia familiaris	1	6	2	9	4	1.0481	0.2504	Uncertain
Corvus corax	1	6	9	6	1	0.5288	0.1925	Steep decline (p<0.05)
Cuculus canorus	1	61	28	51	43	0.9602	0.0558	Uncertain
Dendrocopos leucotos	1+2	3	2	4	0	-	-	-
Dryocopus martius	1+2	16	14	18	26	1.1783	0.1197	Uncertain
Erithacus rubecula	1	193	230	259	236	1.0818	0.0309	Moderate increase (p<0.01)
Ficedula albicollis	1	9	4	6	3	0.7612	0.1587	Uncertain
Ficedula parva	1	1	0	0	0	-	-	-
Fringilla coelebs	1	530	405	389	422	0.9338	0.0158	Moderate decline (p<0.01)
Garrulus glandarius	1	9	7	11	7	0.9703	0.1718	Uncertain
Lophophanes cristatus	1	14	8	33	18	1.2437	0.1494	Uncertain
Loxia curvirostra	1	109	38	49	42	0.8977	0.0869	Uncertain
Motacilla cinerea	1	22	16	22	23	1.0462	0.0955	Uncertain
Nucifraga caryocatactes	1	12	10	10	15	1.0661	0.1390	Uncertain
Periparus ater	1	238	101	185	236	1.0729	0.0375	Uncertain
Picoides tridactylus	1+2	14	6	2	5	0.6579	0.1262	Steep decline (p<0.05)
Poecile montanus	1	51	12	22	15	0.7413	0.0855	Steep decline (p<0.05)
Phylloscopus collybita	1	229	229	222	180	0.9312	0.0239	Moderate decline (p<0.01)
Prunella modularis	1	40	39	55	24	0.8765	0.0726	Uncertain
Pyrrhula pyrrhula	1	60	12	25	22	0.7992	0.0739	Steep decline (p<0.05)
Regulus ignicapillus	1	27	36	53	54	1.2842	0.0999	Strong increase (p<0.05)
Regulus regulus	1	115	38	66	98	1.0073	0.0486	Uncertain
Sylvia atricapilla	1	55	28	66	51	1.0852	0.0662	Uncertain
Sylvia curruca	1	11	6	16	16	1.2420	0.1706	Uncertain
Troglodytes troglodytes	1	47	43	66	43	1.0306	0.0628	Uncertain
Turdus merula	1	10	16	31	34	1.5568	0.1831	Strong increase (p<0.01)
Turdus philomelos	1	66	74	75	59	0.9709	0.0557	Uncertain
Turdus torquatus	1	21	18	15	8	0.7317	0.1004	Steep decline (p<0.05)
Turdus viscivorus	1	19	25	23	29	1.1175	0.1146	Uncertain

Three-toed Woodpecker

The trend of the Three-toed Woodpecker population was steeply declining through the 4 years of study (Table 3, Figure 8). The number of individuals observed in the first year (14) was considerably higher than in the other three (2-6 individuals). These trend results should be treated with precaution,

though, because in such short term one cannot exclude that this is within the range of the normal fluctuations of the population. Furthermore, at such a low sample size it is also possible that sampling bias has a major role in the observed trend.

The species was present in both main valleys (Dâmbovița and Bătrâna), at higher altitudes where spruce forests dominate (Figure 6). The highest number of observations come from the Vladului Valley area, where also two nests were found. The species was also repeatedly observed in other high altitude forest patches in the Dâmbovița Valley, like the one around points C05, C10 and C25, where it was present in all 4 years, between points C03 and C16 (not from points, but in the purchased forest patch), point C11 and point D21, or in the Bătrâna Valley in the area of the points E41, E18 and E35. Near point E41 also a nest was found with an incubating female at just a few meters distance from the marked tourist track.

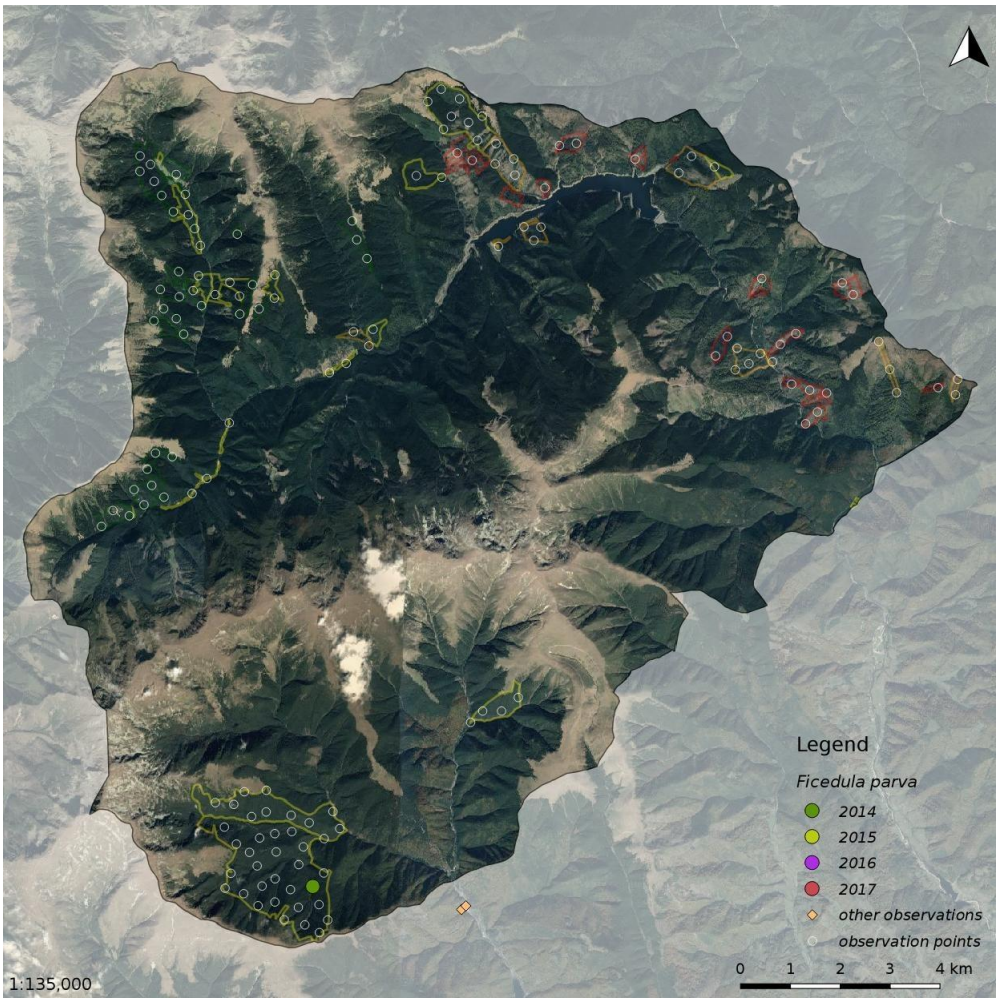


Figure 7: *Distribution of the Red-breasted Flycatcher observations in 2014-2017*

Out of the total of 27 individuals observed through the 4 years 14 were observed from points in natural spruce forests, 7 individuals in managed spruce forests and 6 from points in partially felled

areas. We have to mention, that some of the observations in forests categorized as managed, come from mature patches with a lot of dead wood. Also the observations that come from the partially felled areas come from the edge of spruce forests. There is one exception: the species was observed in two years from point D21. The mature forests in the vicinity of this point (the point is in a clear cut area) seem to be all beech dominated mixed forests.

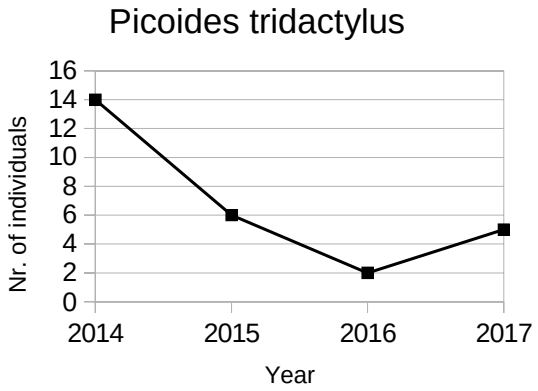
The Three-toed Woodpecker shows a clear preference towards mature, close to natural spruce forests in the study area. The recommended management for these type of forests is that of no intervention or low intervention, always assuring a volume of at least 15 m^3 or a basal area of at least 1,3 m^2 of snags (standing dead wood) over large patches of forests (100 ha) (Bütler et al., 2004a, Bütler et al., 2004b). Due to the forest management measures proposed it is expected that the population of the species will increase slightly in the owned forest patches, especially in the Bătrâna Valley, where most of the forests were managed stands with relatively low volume of snags.

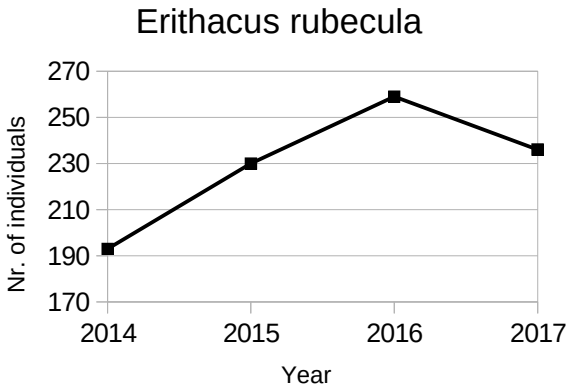
Red-breasted Flycatcher

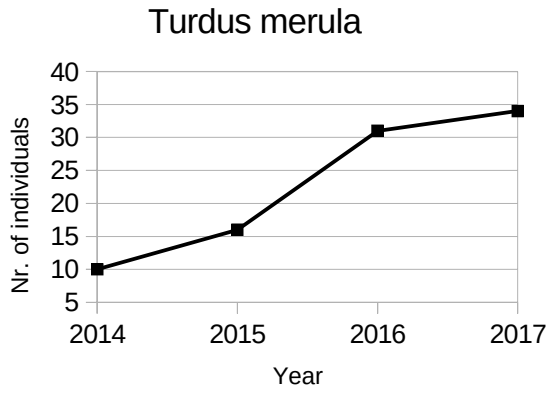
There was only one Red-breasted Flycatcher observed during the four years in a mixed beech-coniferous forest patch in the Bătrâna Valley (Figure 7). Due to the very low sample size trend analysis was not possible for this species.

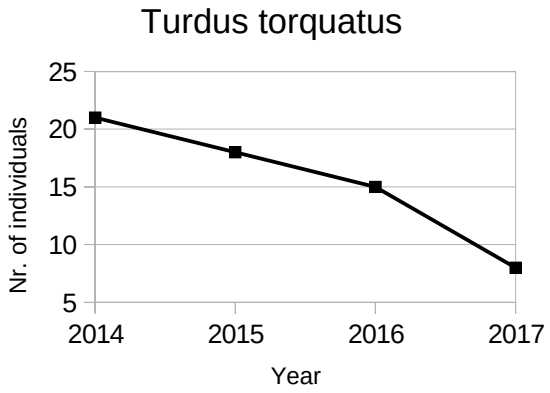
The Red-breasted Flycatcher is a characteristic species of the mature montane beech forests. There were very few observation points, where the presence of the species was possible, most areas where the forest would have been suitable (the lower parts of the Dâmbovița Valley) were clear cut or most trees were felled. Also, even the lower areas of the study area may be at the upper altitudinal limit of the distribution of the species.

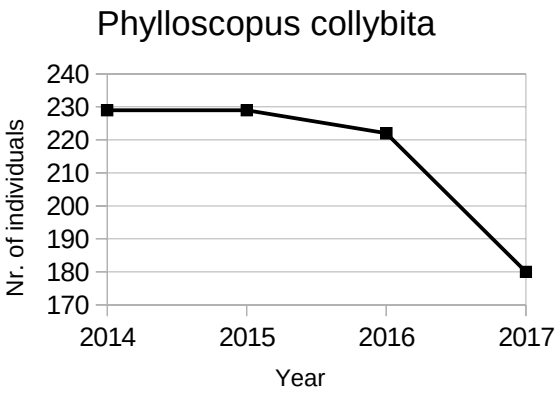
As a result of the management measures through which mature coniferous forests will be transformed in mixed coniferous – broad-leaved forests (M2) and clear-felled areas will be replanted using a natural selection of tree species (M3) it is expected, that at least some Red-breasted Flycatchers will eventually start to breed in the study area on the long term.

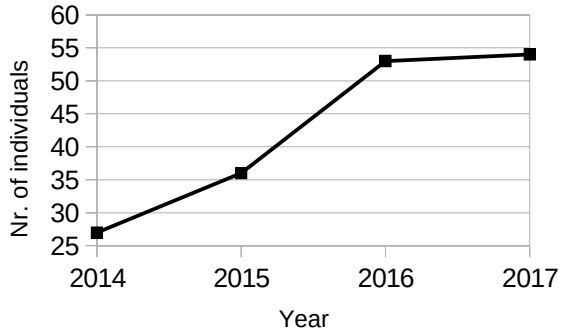

Picoides tridactylus
Nr. of individuals
16
14
12
10
8
6
4
2
0
2014
2015
2016
2017
Year


Erithacus rubecula
Nr. of individuals
270
250
230
210
190
170
2014
2015
2016
2017
Year


Turdus merula
Nr. of individuals
40
35
30
25
20
15
10
5
2014
2015
2016
2017
Year


Turdus torquatus
Nr. of individuals
25
20
15
10
5
2014
2015
2016
2017
Year


Phylloscopus collybita
Nr. of individuals
240
230
220
210
200
190
180
170
2014
2015
2016
2017
Year


Regulus ignicapillus
Nr. of individuals
60
55
50
45
40
35
30
25
2014
2015
2016
2017
Year

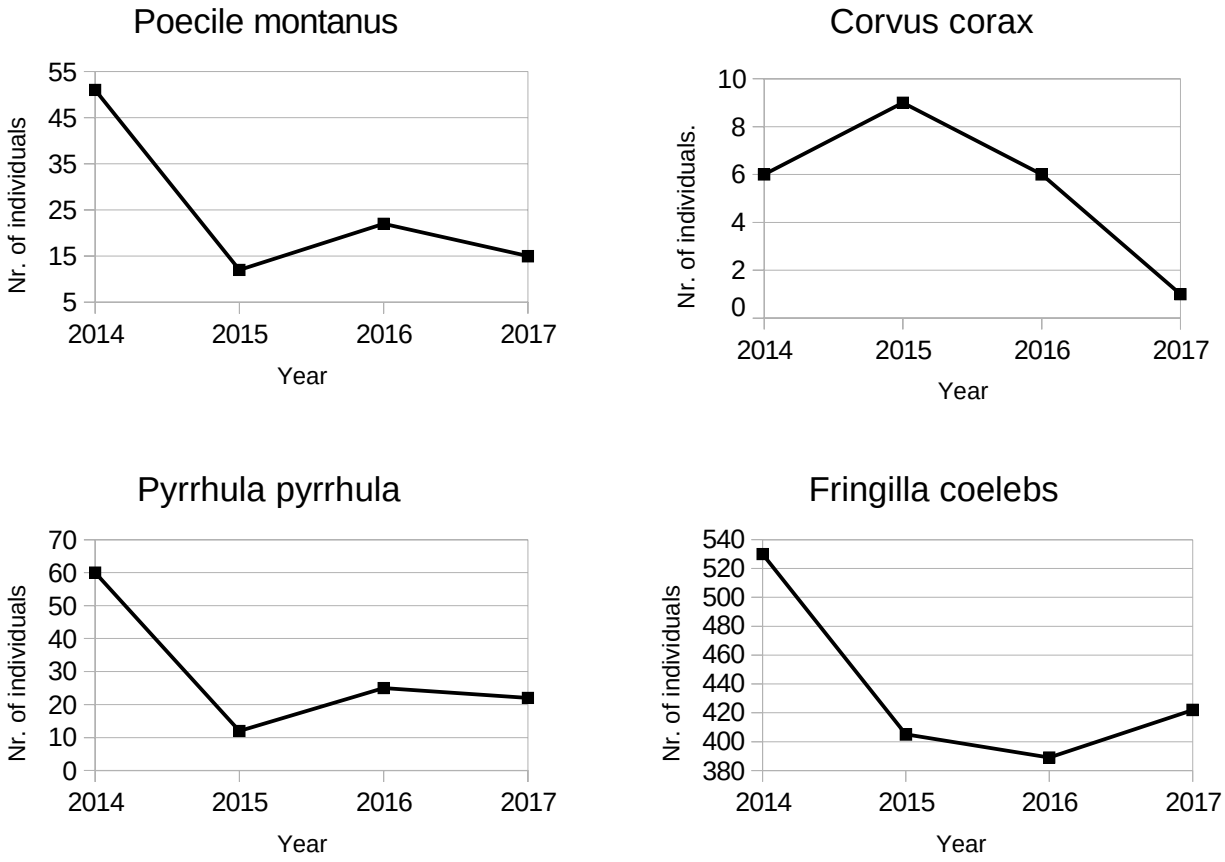


Figure 8: *Population change of the species with statistically significant increasing or decreasing trend*

Collared Flycatcher

The Collared Flycatcher is not one of the main target species of this study, but we consider that it would be a much better indicator of good quality old growth beech forests than the Red-breasted Flycatcher or maybe even the White-backed Woodpecker. The main reason is that it is more abundant than both of the other two species, assuring the necessary sample size for data analysis. It is also more dependent on old trees with holes, that are often excavated in standing dead or partially dead trees by woodpeckers, than the Red-breasted Flycatcher, which may also breed in open nests in younger forests. It is not a good indicator, however, of the amount of dead wood, that is necessary for the White-backed Woodpecker.

The Collared Flycatcher was regularly observed in the lower part of the Dâmbovița Valley, where the abundance of beech is relatively high. There are also a few observations from the few mixed stands of the Bătrâna Valley and in one year it was also present in the alder stands of the upper, otherwise spruce dominated parts of the Dâmbovița Valley (Figure 9). Most observations in the lower Dâmbovița Valley come from points in clear-cut and partially felled areas, mostly from the edge of the old growth forests that surround these.

The trend of the Collared Flycatcher was uncertain in the 4 years of the study, meaning that

differences may be caused by sampling bias.

As the Collared Flycatcher is a species characteristic of mature beech forest, as a result of the management measures through which mature coniferous forests will be transformed in mixed coniferous – broad-leaved forests (M2) and clear-felled areas will be replanted using a natural selection of tree species (M3) the local population of this species is expected to grow on the long term.

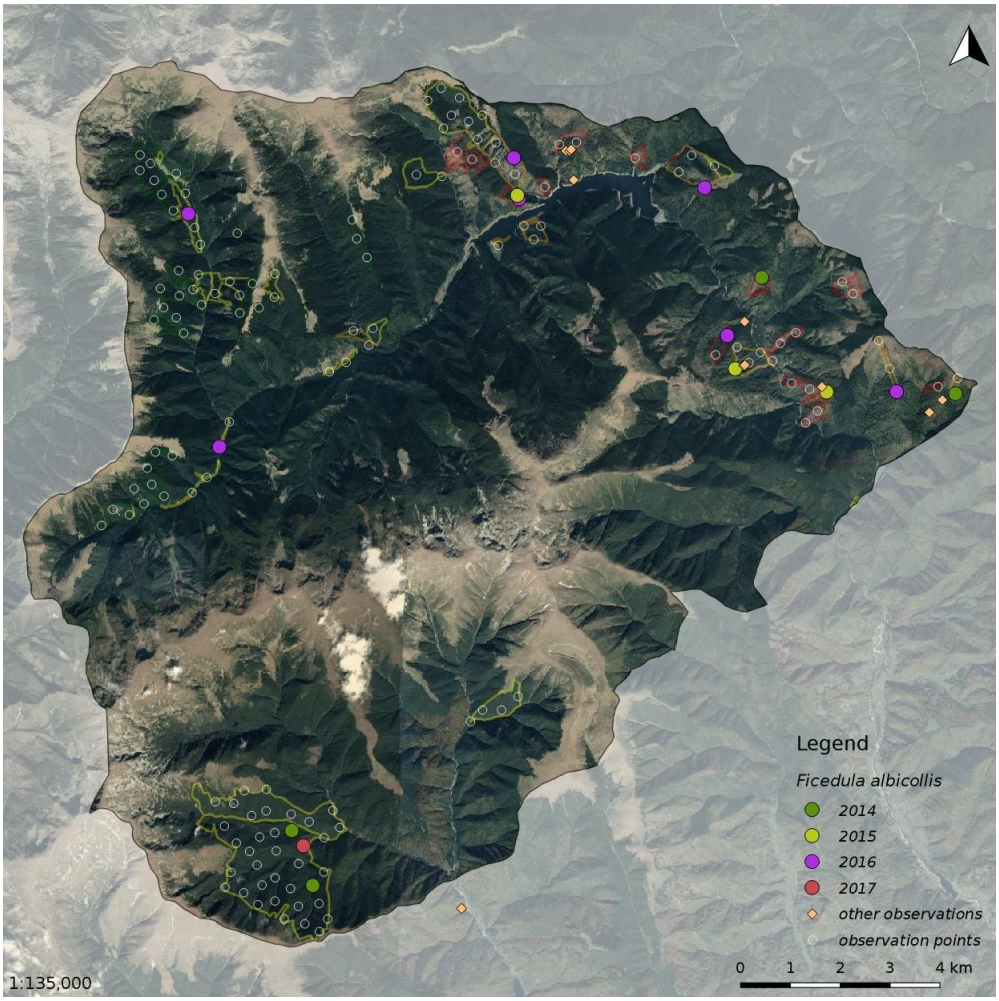


Figure 9: *Distribution of the Collared Flycatcher observations in 2014-2017*

Other species

Annual numbers observed and trends for the other species are presented in Table 3. Additionally to the Three-toed Woodpecker there were another 9 species, that showed statistically significant population increase or decrease. Since the duration of the study was only 4 years, these changes may be well within the range of normal natural fluctuations for all of these species, a longer study is needed to eliminate these. However, some of these changes make sense in relation to the changes in the habitat. For example the Blackbird (*Turdus merula*) numbers showed a marked increase. That is expected as young trees start to reach a certain height in clear-cut areas, offering a suitable breeding habitat for the species.

Future monitoring sessions

Periodicity:

An annual monitoring would give the best possible results, making the interpretation of the trend data possible after only a few years and offering additional insight on the change of bird communities during the process of forest maturation and the changes due to the different management of the neighbouring forest parcels, that are not owned by FCC. An annual monitoring would, however, involve relatively high costs, both of financial and human resources.

Taking in consideration the long time scale on which the management measures are expected to take effect, at least in the case of M2 and M3 measures (indicator species inhabit mature forests, consequently an increase in their population is expected only after the re-planted forest patches will become mature enough to support these species, which is at least 70-80 years), if the aim of the monitoring program is only to follow the population trend of the three target species, a monitoring session once in 3-5 years would be enough. We recommend a periodicity of 3 years, as it would offer already two surveys. Once selected, the periodicity should, however, stay constant.

Point selection and field methodology:

The observations should be repeated on all 148 points. Skipping a small part of the points during some of the monitoring sessions can be dealt with during data analysis, but if possible, this should be avoided. The timing of the survey in future monitoring sessions should be similar to the first survey, and they preferably should take place between 15-31 May.

The field methodology will be identical to that described above. For the stimulation of woodpeckers preferably the same records (attached to the report) and equipment should be used as in the first session.

Data analysis

For data analysis we recommend using the „TRIM" statistical software (Pannekoek, J. & A. van Strien, 2001) at the moment, that was developed to analyse similar long term monitoring datasets. In the future, however, better analysis methods might become available.

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