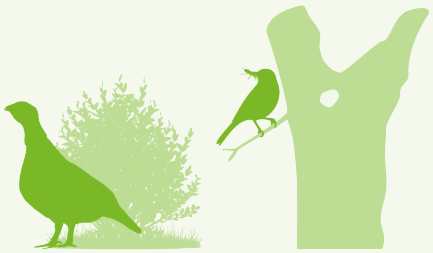
Endangered Landscapes & Seascapes Programme | Cambridge Conservation Initiative

Birds

Objective: Increase abundance of specialist bird species

Carpathian Mountains
status: no change observed



Problem: Much of the forest habitat across the Fagăraș Mountains has become ecologically degraded due to forestry practices, including clear-felling, planting with spruce monocultures instead of diverse native tree assemblages, and clearing vegetation in alpine habitats, leading to a shift in bird communities.

Action: Foundation Conservation Carpathia is restoring vegetation across habitats. In clear-cut forest areas, Foundation Conservation Carpathia is planting saplings of native trees that occur naturally in mixed intact forests in the area. In spruce monocultures, some trees are being removed to thin out the dense monocultures and allow natural regeneration of native species, as well as planting saplings. In alpine and sub-alpine habitats, Foundation Conservation Carpathia is replanting dwarf pine and juniper.

Indicator: Changes in the composition and abundance of bird species indicate ecological recovery. Species characteristic of degraded habitats are expected to decrease in abundance, while specialists of restored, natural habitats are expected to increase.

Greater spotted woodpecker. Photo: Dan Dinu.

Methods

Bird populations were surveyed in three habitat types: spruce monocultures, clear-cut areas (in which clear-cutting occurred between 2005 and 2012), and alpine areas. Where possible, for each of these

habitat types sampling occurred in both areas that were undergoing restoration, and control areas not undergoing restoration. These control sites were included so that the effects of restoration, which would occur only in restoration areas, could be distinguished from other factors such as climate change and landscape-level effects, which would occur in both restoration and control areas. The survey was designed so that each observer covered equal numbers of restoration and control areas, to control for any subjective differences between observers. As far as possible, control sites were selected that had the same exposure, altitude and forest composition and age as restoration sites. Due to the ongoing process of acquiring land for restoration and initiating restoration activities, restoration started at different times in different sample plots.

Planting juniper saplings in alpine habitat. Photo: Codrut Voinescu.

Planting beech and sycamore in spruce monoculture. Photo: Foundation Conservation Carpathia.

Planting native species in a clear-cut forest area. Photo: Foundation Conservation Carpathia.

In all habitats, sampling points were a minimum of 290m apart. Baseline surveys were conducted in 2019, with baseline surveys at further sites added in 2021 to increase the sample size. Follow-up surveys across all sites were conducted in 2022 and 2023. Since changes in bird communities are expected to be slow, because they will lag behind forest recovery, this was envisaged as a long-term dataset. Therefore, more sampling points were included in the baseline surveys, to obtain a robust baseline sample for long-term comparison, than were included in follow-up surveys. Sample numbers are shown in Table 1.

	Baseline (2019 - 2021)		Follow-up (2022 - 2023)	
Habitat	Control	Restoration	Control	Restoration
Spruce monoculture	40	40	4	6
Clear-cut	40	40	5	12
Alpine	50	50	18	5

Table 1: Sample numbers for each habitat and sampling period.

Sampling was conducted in the morning to coincide with periods of highest bird activity. During sampling, firstly an 8-minute point count was conducted at each sampling point, in which all bird species and individuals observed were counted and noted. In spruce monocultures and clear-cuts, but not alpine areas, this was followed by a 12-minute session that

included 2 x 2 minutes of playback of white-backed woodpecker (*Dendrocopos leucotos*) calls followed by 1 minute of listening in silence, followed by 2 x 2 minutes of three-toed woodpecker (*Picoides tridactylus*) calls followed by 1 minute listening in silence. During this additional 12 minutes of observation, all newly observed individuals of all bird species were recorded. This phase was intended to improve detection of these intact forest indicator species which both require a large amount of dead wood. The white-backed woodpecker is characteristic of old-growth beech and mixed forests, while the three-toed Woodpecker is characteristic of old-growth spruce forests. The total observation period for spruce monocultures and clear-cuts was therefore 20 minutes at each point, while for alpine areas it was 8 minutes.

Conducting a bird monitoring survey. Photo: M. Druga.

Data from multi-year surveys was plotted using non-metric multidimensional scaling (NMDS) and analysed using PERMANOVA. These are statistical methods to compare differences in observations between groups, based on results from multiple variables – in this case abundance of different bird species.

Results

No significant differences were found in the way bird community composition or abundance changed over time in control sites compared to sites undergoing restoration, in any of the three studied habitat types.

Bird monitoring. Photo: M. Druga.

In alpine habitats, there were no significant changes over time in either treatment, although there were significant differences in both community composition and abundance between the treatments across all sampling periods (Fig. 1).

In clear-cuts, there were no differences between the treatments, but there was a significant change in community composition over time across both treatments (Fig. 2).

In spruce monocultures, there were no significant effects of either treatment type or time on community composition or

abundance (Fig. 3).

Looking at individual species, no significant trends over time were found for any species.

Alpine

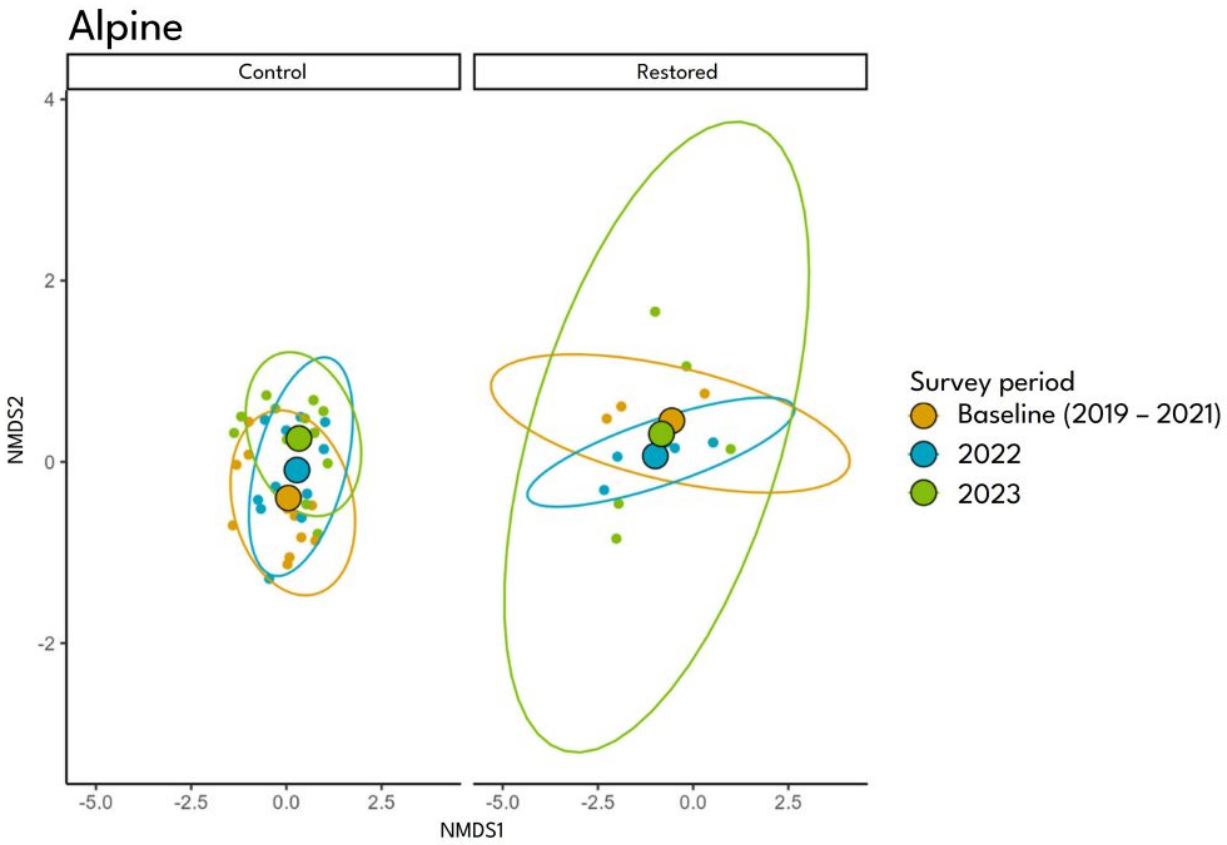


Figure 1: Bird community composition in control and restored sites in alpine habitats, over the three survey periods. Points that cluster more closely together have more similar community composition. Each point represents one survey, at one site and point in time. Ellipses represent the grouping of points from each time period. The centre of each ellipse (marked with a larger coloured point) represents the mean of the group, while the size and shape of the ellipse represents dispersion of points around the mean.

Clear-cut

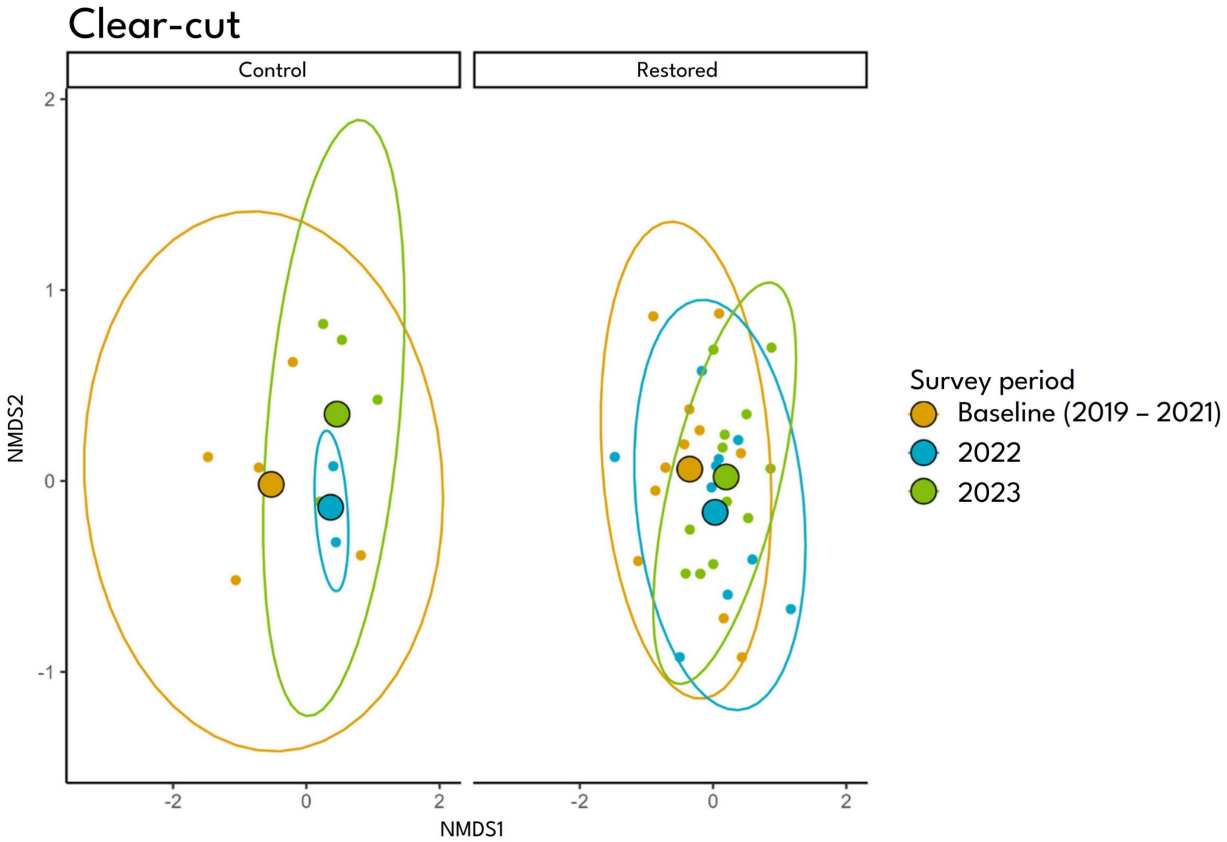


Figure 2: Bird community composition in control and restored sites in clear-cut habitats, over the three survey periods. Points that cluster more closely together have more similar community composition. Each point represents one survey, at one site and point in time. Ellipses represent the grouping of points from each time period. The centre of each ellipse (marked with a larger coloured point) represents the mean of the group, while the size and shape of the ellipse represents dispersion of points around the mean.

Spruce monoculture

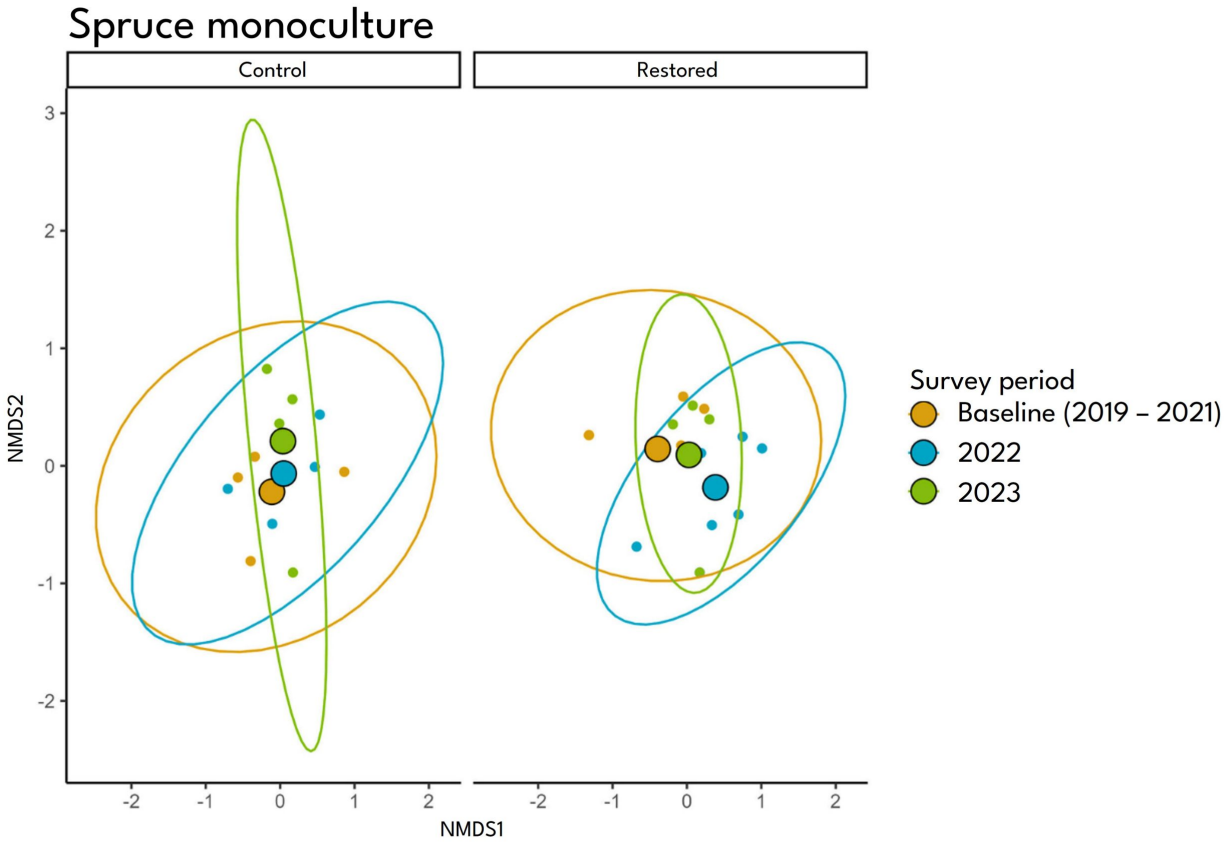


Figure 3: Bird community composition in control and restored sites in spruce monocultures, over the three survey periods. Points that cluster more closely together have more similar community composition. Each point represents one survey, at one site and point in time. Ellipses represent the grouping of points from each time period. The centre of each ellipse (marked with a larger coloured point) represents the mean of the group, while the size and shape of the ellipse represents dispersion of points around the mean.

Interpretation

The fact that there was no statistically significant interaction between the effects of time and treatment on bird community composition suggests that restoration took place too recently to see a full ecological recovery yet. The differences between control and restored sites for alpine habitats may be due to the unbalanced experimental design, with different numbers of restored and control sites, rather than a real effect. Differences between years for clear-cuts may reflect natural interannual fluctuations in bird populations rather than a directional response to restoration. Reaching a close-to-natural state for forests will take at least a century, and the habitat must pass through several succession stages. This means that any shifts in bird communities towards species characteristic of intact forests is likely to take quite some time to be detected, and may not be a linear process as ecological succession takes place. While no change is yet evident, these results will provide essential baseline data to compare against future surveys.

Next steps

Foundation Conservation Carpathia will continue to monitor bird populations in the long term, using these results as a baseline. They also plan to combine the survey techniques described here with acoustic

monitoring, which can sample over longer time periods without the need for the presence of human observers. In such a large and inaccessible landscape this could be very helpful for improving the quantity and quality of data that can be efficiently collected.

Partners