Endangered Landscapes & Seascapes Programme | Cambridge Conservation Initiative

Riparian Habitat

Objective: Increase length of restored and connected riparian habitat

Carpathian Mountains

status: improving

Problem: Riparian habitats are important ecological corridors within the landscape. However, they have suffered widespread ecological degradation due to the combined effects of logging in riparian areas and neighbouring forests, grazing near rivers, and decreasing soil moisture due to climate change. This has reduced the occurrence of native tree species (including alder, willow and ash) and characteristic understory vegetation, being replaced by invasive alien species (IAS).

Removal of invasive daisy fleabane (Erigeron annuus) by uprooting. Photo: Foundation Conservation Carpathia.

Action: IAS were removed from riparian habitats by field staff, using a range of techniques including uprooting, selective cutting and mowing. Volunteers also contributed to removal, as well as students during educational activities and media staff during press trips. Alongside this, alder saplings were planted in suitable areas. Saplings were monitored and any dead saplings were replaced.

Indicator: The total length (river kilometres) of riparian habitat restored and the length of riparian habitat in a favourable conservation status indicate recovery of native riparian vegetation and an improvement in ecological connectivity.

Methods

Riparian restoration took place across tributaries of two main river basins: Dâmbovița River Basin and Argeș River Basin, located in the southern Făgăraș Mountains. The valleys surveyed are shown in Fig. 1. Riparian habitats were variable in width and extended up to 100m from the river's edge, bordered by roads, forests or human settlements.

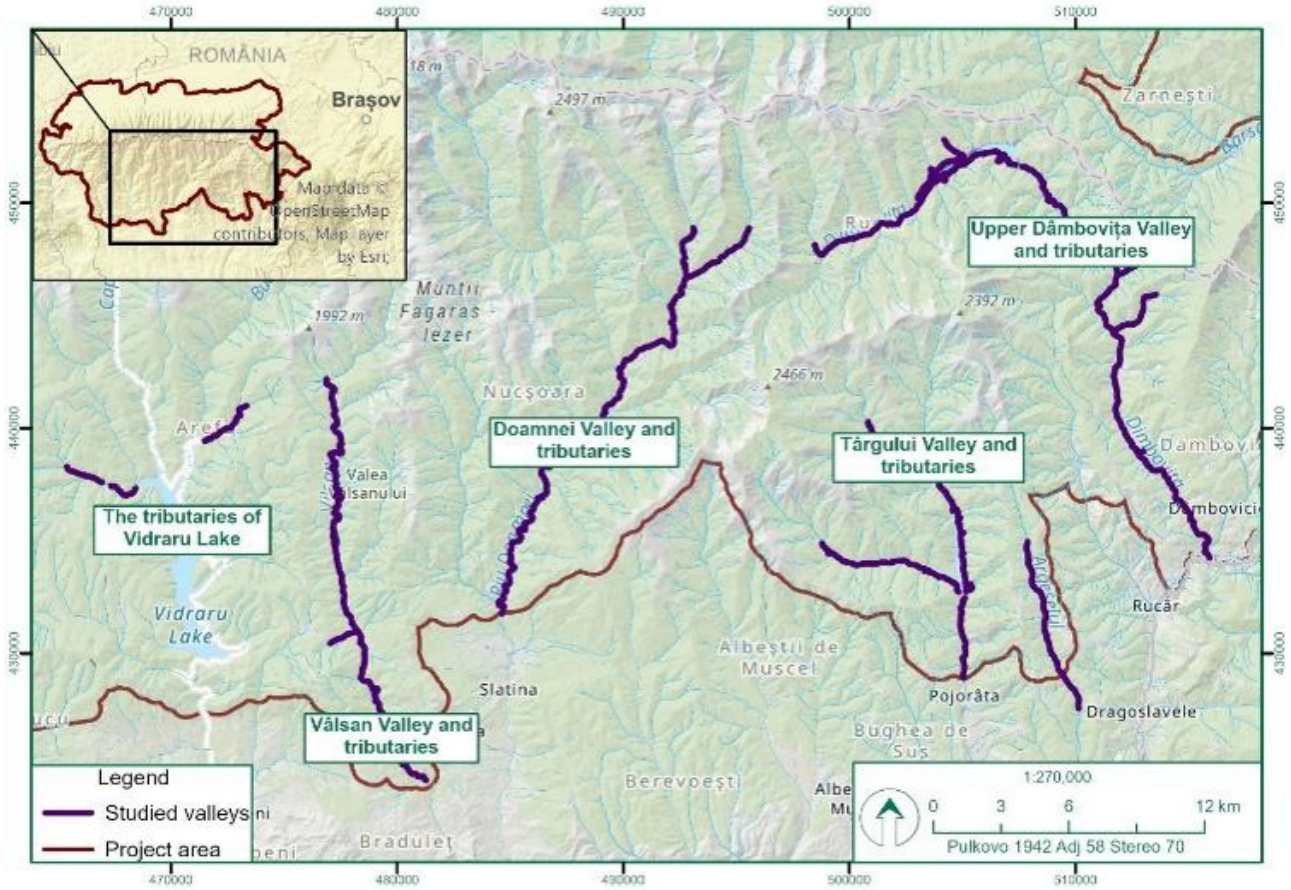

Figure 1: Map of valleys targeted for riparian restoration. Created by Foundation Conservation Carpathia.

The entire lengths of the selected valleys were surveyed for the presence of invasive plants. From a total 164.32km surveyed, 154.57km were classified as riparian habitat based on the dominance of alder trees. Within riparian habitats, the length of sectors containing IAS were recorded. Due to the species' high dispersal capacity, the presence of each species was considered continuous habitat if the distance between plants was less than 500m. If this distance was greater than 500m, the patches were recorded as separate sectors. This resulted in a total of 57 monitored sectors. In initial surveys, these sectors were recorded using GPS devices. For later surveys a purpose-built phone app was developed, which was installed on the phones of rangers and other observers. Within these monitored sectors, % ground cover of each invasive was visually estimated (Kent and Coker, 1992). Sectors were then classified according to invasion intensity:

- Low: IAS cover 1-10%
- Medium: IAS cover 11-50%
- High: IAS cover >50%

Invasion intensity was used to prioritise sectors for IAS removal, with sectors with high invasion intensity the highest priority.

Invasive Japanese knotweed (Reynoutria japonica). Photo: Foundation Conservation Carpathia.

Invasive Himalayan balsam (Impatiens glandulifera). Photo: Foundation Conservation Carpathia.

Invasive daisy fleabane (Erigeron annuus). Photo: Foundation Conservation Carpathia.

Invasive horseweed (Conyza canadensis). Photo: Foundation Conservation Carpathia.

For each sector, habitat condition was assessed by combining IAS invasion level with the structure and composition of native vegetation:

- If characteristic native vegetation structure and composition were present and considered likely to persist for the foreseeable future, the sector was classified as Favourable.
- If these criteria were not met, conservation status was classified as either Unfavourable or Poor.
- Poor status (the lowest quality habitat) was assigned to habitats if any of the below criteria were met. If not, the sector was classified as Unfavourable.
    - The characteristic riparian habitats were completely replaced by spruce monocultures or meadow-like secondary habitats
    - IAS showed a high invasion intensity
    - IAS showed a medium invasion intensity combined with a significant degradation of the characteristic vegetation composition and structure

This habitat assessment was conducted in 2021 and 2024.

Habitat in favourable condition: Grey Alder forest in the Dâmbovița Valley. Photo: Foundation Conservation Carpathia.

Habitat in unfavourable condition: riparian forest in the Cumpana Valley, which did not meet the criteria for favourable status. Photo: Foundation Conservation Carpathia.

Habitat in poor condition: a riparian area invaded by C. canadensis and E. annuus, and with spruce seedlings, in the Targului Valley. Photo: Foundation Conservation Carpathia.

Alongside this broad classification, permanent sampling plots of 25 m^2 were established for detailed vegetation monitoring (Fig. 2). 39 plots were located in IAS-affected areas which underwent restoration through IAS removal, and 19 plots were located in IAS-free reference areas. In each plot, % cover of each plant species (both native and invasive) was estimated by eye. Fixed-point photographs were also taken during each survey. These plots were surveyed annually from 2022-2024 (10 plots were also surveyed in 2021). Each year, plots were surveyed prior to the removal of any IAS from the area. Therefore, data for 2023 and 2024 represent IAS that were not removed by previous clearing or had re-established in the intervening year.

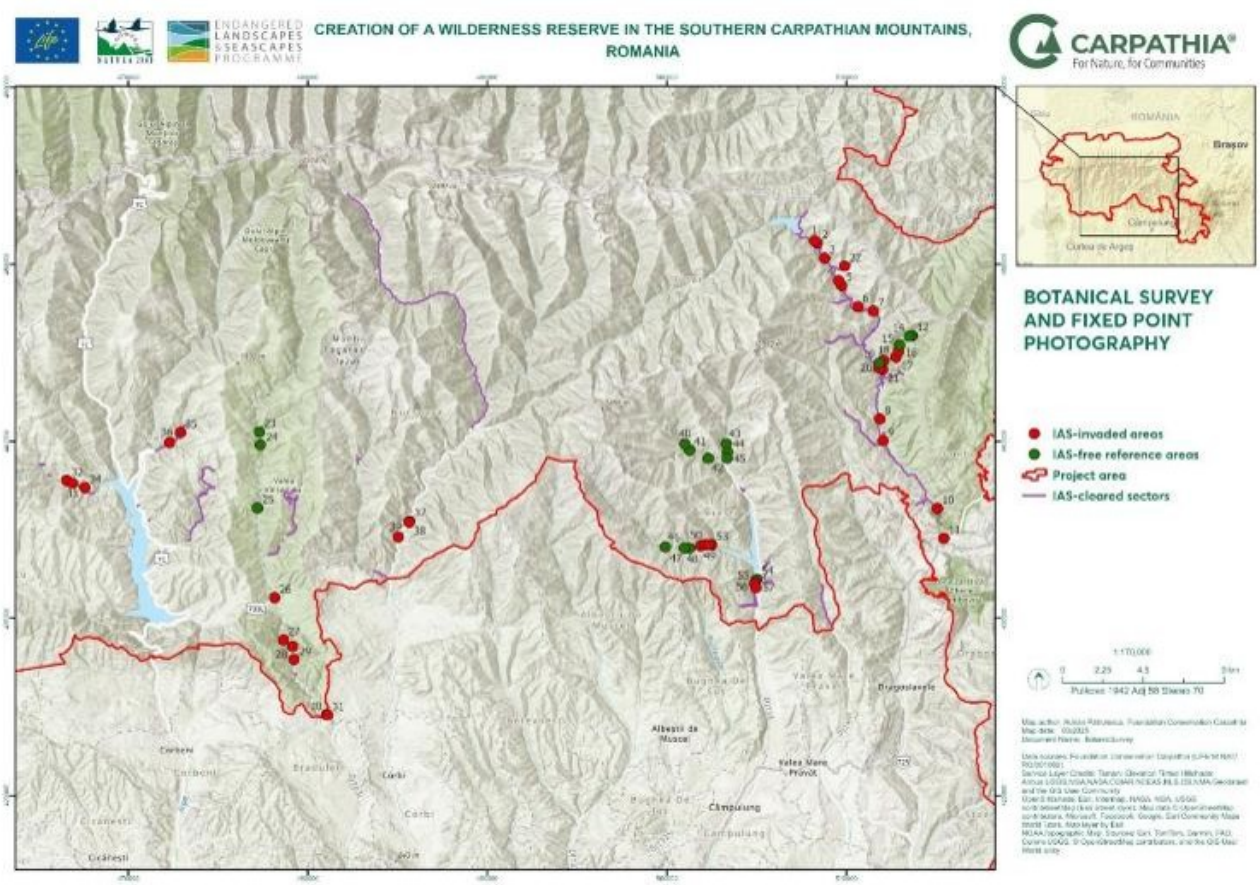

Figure 2: Map of locations for permanent vegetation monitoring plots and fixed point photography. Created by Foundation Conservation Carpathia.

Results

During baseline surveys, seven invasive plant species were identified in riparian habitats: *Erigeron annuus* ssp. *strigosus*, *Conyza canadensis*, *Reynoutria japonica*, *Impatiens parviflora*, *Impatiens glandulifera*, *Xanthium orientale* ssp. *italicum* and *Hemerocallis fulva*. From 2021 – 2024, IAS were removed from a total of 152.19km of riparian habitat; many sectors were cleared in multiple years. In addition, alders were planted along 7.5km of riverbank. This resulted in an increase of habitat assessed as being in favourable quality from 11.58% in 2021 to 24.66% in 2024 (average across the five valleys; Fig. 3).

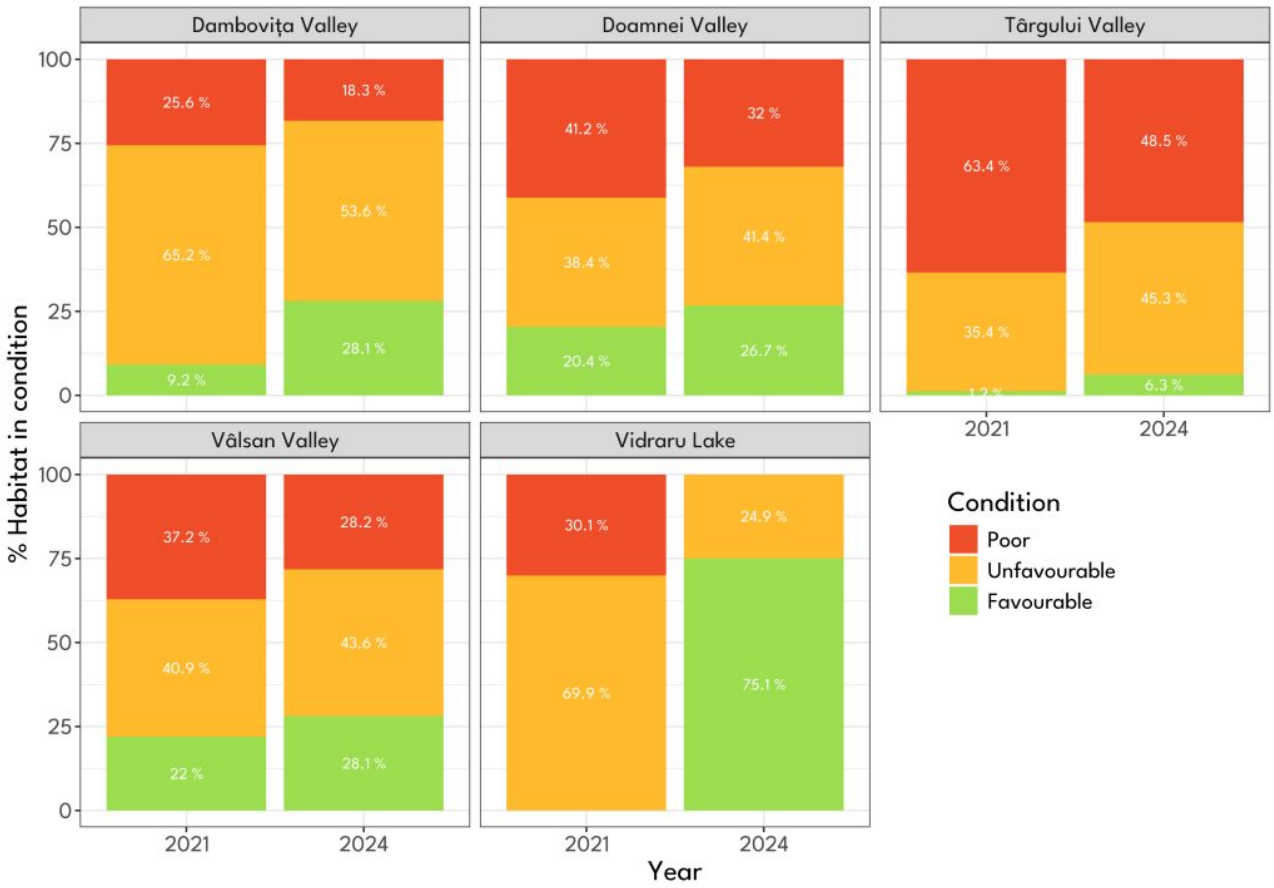

Figure 3: % of riparian habitat in each IAS removal area assessed as being in favourable, unfavourable and poor condition in 2021 and 2024.

With the exception of one plot, all IAS-free reference plots remained free of IAS throughout the monitoring period (2022-2024). In restored plots, % cover of invasive plant species decreased significantly from year to year over the monitoring period, while % cover of native plant species increased significantly over the same period (Fig. 4).

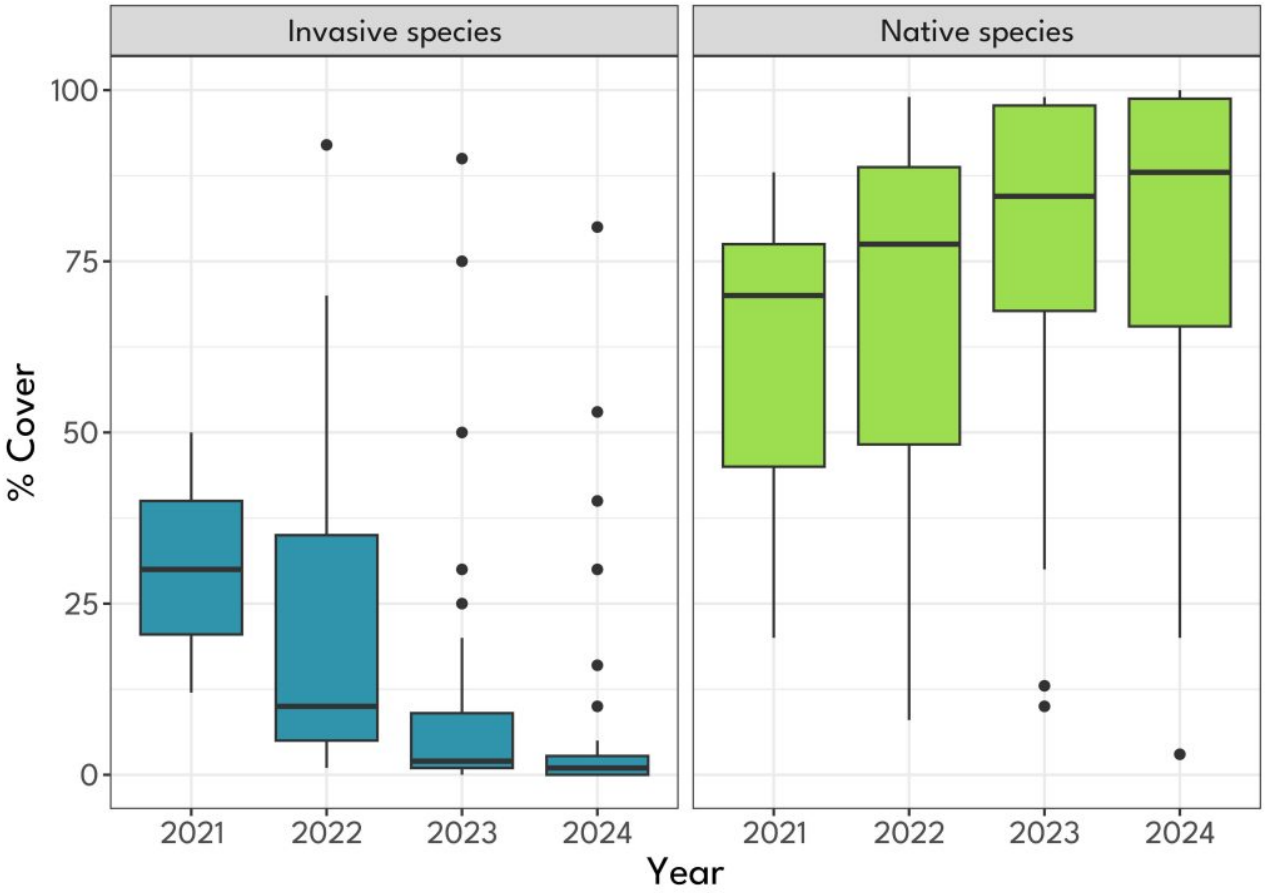

Figure 4: % cover of invasive and native plant species in permanent monitoring plots (restored sites only).

Interpretation

Baseline surveys showed that generally only the most upstream sections of valleys were free of IAS, reflecting the importance of downstream dispersal in their spread.

The initial results showed a high success for invasive IAS removal. During the monitoring period, sectors were re-cleared of IAS every year. This resulted in decreasing percentage cover of IAS over the period. Importantly, the fact that native vegetation also increased in cover over the period suggests that clearing invasives allowed regeneration of native species.

Removal of invasive small balsam (Impatiens parviflora) by mowing. Photo: Foundation Conservation Carpathia.

Removal of invasive Japanese knotweed (Reynoutria japonica) by cutting. Photo: Foundation Conservation Carpathia.

Lessons learned

The techniques used for IAS removal were effective in areas with low infestation. By employing local people they also led to job creation. However, they were not effective against dense infestations, where clearing was extremely costly and time consuming, with little or no impact. Since no herbicides were used (to avoid contaminating rivers), manual control techniques needed to be very well executed to ensure success. Although overall IAS removal was highly effective, it had little impact on Japanese knotweed (*Reynoutria japonica*), for which herbicides appear to be the only effective form of eradication.

Next steps

Foundation Conservation Carpathia plans to continue IAS removal activities in these valleys and will continue to monitor vegetation in the permanent plots established. This will help to improve understanding of how long-lasting the effects of IAS removal may be.

Citations

Kent, M. & P. Coker 1992. Vegetation Description and Analysis. Belhaven Press, London.

Partners

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