

A vibrant meadow scene featuring a variety of flowers. In the foreground, there are tall, thin stems with clusters of small purple flowers and larger, dark brown, cup-shaped structures topped with pink flowers. The background is a lush green field extending to a horizon under a bright blue sky with scattered white clouds. A vertical gradient bar on the left side of the image transitions from yellow at the top to blue at the bottom.

MEADOWS OF GORIČKO

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The story of the meadows of Goričko

A meadow is an open habitat dominated by the grass family species. Various herbs and other non-woody plants complement the grasses. They vary greatly from one another mainly due to environmental factors and management. Almost all meadows in Goričko are semi-natural habitats and would not exist here without human intervention. In prehistoric times, the first inhabitants cut down the forest and with sustainable use created many colourful meadows, which can still be admired today.

In Goričko, three types of meadows are protected within the Natura 2000 area. In addition to these, other species-rich grassland habitats also thrive in Goričko. EU priority protected species-rich *Nardus* grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe) (HT 6230*), occur rarely. Broad-leaved cotton grass and the plume thistle grow on oligotrophic and mesotrophic wet meadows. Because of their rarity, they are also among types important for nature conservation.



- 1 Goričko is known for its species-rich meadows
- 2 The plume thistle (*Cirsium rivulare*) grows on moist soil
- 3 Land abandonment threatens meadows in the eastern part of Goričko

Despite their ecosystemic significance, 800 hectares of species-rich meadows were lost between the years 2004 and 2012 solely in the eastern part of Goričko. Main causes include land abandonment and land use intensification. Many of the species-rich meadows became frequently mown and fertilized and consequently also species-poor. Many of them simply disappeared under the plough.

The common quail (*Coturnix coturnix*) is a typical meadow breeder



To be or not to be?

The dry meadows of Goričko mostly belong to the group of Central European dry grasslands on acidic sandy soil (HT 6210*). In Slovenia, this type occurs almost exclusively within the Goričko area, where unlike elsewhere, it grows on acidic soils of sand, gravel and clay. The acidic base contributes to the impoverishment of the species of this plant community, with many of its characteristic species missing. There are also fewer different species of meadow orchids.

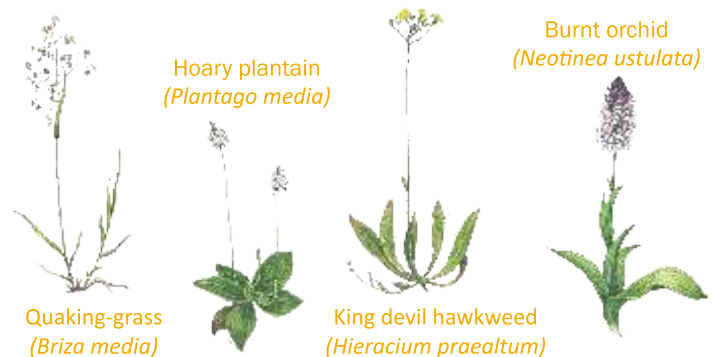
in the vicinity of houses are often transformed into frequently mown lawns with a changed species composition. With the aim to restore abandoned dry meadows, overgrown with shrubs and trees, an extensive renovation of some areas was carried out. Shrubs and trees were removed in the initial phase of the project and four years later the first positive results are visible. Meadow orchids and other characteristic plants started to appear in higher abundance.



Abandoned meadow overgrown with Scots pines (*Pinus sylvestris*) before (2018) and after

Nevertheless, the green-winged orchid and the burnt orchid still thrive. Because these meadows occur on moderately dry and nutrient-poor soils, they are often mowed only once, sometimes twice per year. As this habitat type is rare within Goričko and limited to small areas, it is one of the most endangered habitat types in Slovenia. Because of its low productivity, this type is subject to land abandonment. Shrub-like and Scots pine woods overgrow such meadows in just a few years after abandonment, while small patches

Typical plants of dry meadows



Alien threat

Molinia meadows thrive on soils with occasionally stagnant water and are dominated by tall moor-grass (HT 6410). Such meadows can be found along streams or on poorly permeable nutrient-poor soils. They are mown once or twice per year. As these meadows in Goričko occur mainly in the valleys, they are faced with the pressure to change into intensively used meadows or arable land. Because conditions obstruct land use, they are often subjected to drainage. Such interventions are financially demanding

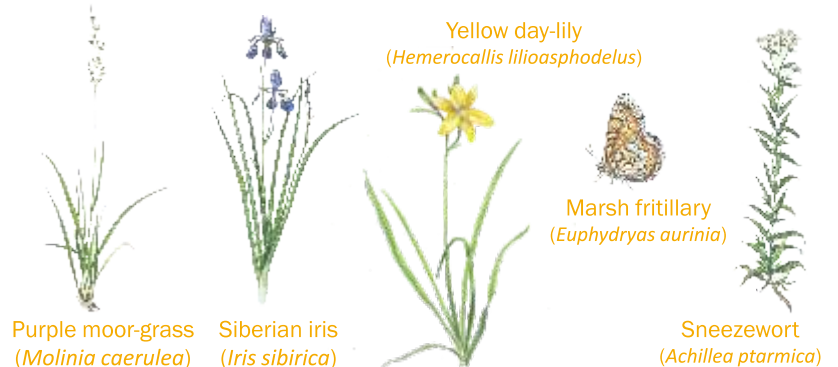
to biodiversity, as they form a monoculture where other plant species almost do not grow. Their suppression of other species demands intensive mowing at least three times per year or even other interventions, such as sowing a grass-seed mixture. The latter is more effective in reducing invasive plant abundance and more time efficient, but the newly-restored meadows are still species poor. Therefore, such restoration requires additional sowing of a species-rich seed mixture or a natural recolonization of species in the following decades.



Meadows fully overgrown with the giant goldenrod (*Solidago gigantea*) were restored by sowing a grass-seed mixture and intensive mowing

and detrimental to species richness. In their natural state, these meadows are less interesting for agricultural production, which leads to land abandonment. Abandoned wet meadows are quickly overgrown with trees, such as the black alder, or even more often with non-native invasive plants, such as the giant goldenrod. This alien threat is increasingly becoming one of the main factors of meadow endangerment. Alien invasive plants represent one of the largest threats

Typical plants and animals of *Molinia* meadows



Colourful meadows return

The most abundant species-rich meadows in Goričko belong to the lowland hay habitat type (HT 6510). These meadows appear on moderately fertilised soils on the plains and slopes of Goričko. Colourful meadows, as we remember them from our childhood, are rich in flowers and are cut two or three times per year. As they occur on wet and semi-dry soil, they can vary significantly. The wet type is characterised by the yellow flowers of the creeping buttercup and the pink flowers of the ragged-robin.

Sanguisorba-rich hay meadows were mown at a suitable time with the aim to improve conditions for target butterfly species. For insects' part were left unmown at the first mowing. If invasive alien plants were present on hay meadows, the intensity and the time of the mowing was adjusted in with the aim to achieve the best possible results. The result of these conservation measures was an evident improvement in plant species richness and butterfly abundance.



A lowland hay meadow restored by intensive mowing and biomass removal is once again a suitable habitat for the dusky large blue butterfly

Colourful again

Management practice is the key factor contributing to the meadows' conservation state – if managed intensively with heavy applications of fertilisers and too frequent mowing or even mulching, the species richness rapidly declines. As these meadows thrive on plains, they are often converted to arable land. To improve the conservation state of these protected meadows within the project, their management was changed. Previously mulched meadows were regularly mown and the biomass was removed, while abandoned meadows were restored by removing scrubland vegetation and mowing.



The project's ending is just a new beginning


After four years, the project Gorička krajina is coming to an end. Many project activities were carried out in this period and results can be seen in the Goričko landscape. The improvement of meadow habitat management for grassland species was the main aim of the project. Meadow restoration for target species and habitat types stopped the decline of grassland species populations. In fact, the numbers and the extent of some target species

and habitats even increased. The project also improved life conditions for the target species of bats and beetles. Nevertheless, the project's ending is just a new beginning on which we will build going forward. Let these positive results be an incentive for all of us in the future.



The scops owl (*Otus scops*) forages for grasshoppers

Main results in numbers

| | | | | |
|---|---|---|--|---|
| 27 | 106 | 950 | 400 | 21 |
| ha of new high-trunk orchards planted | ha of meadows restored by mowing and biomass removal | apple and pear trees rejuvenated by pruning | hunting poles for birds installed and 40 additional solitary tress planted | scops owls tagged with GPS data loggers for ecological research |
| 50 | 79 | 120 | 40 | 340 |
| trees with cavities preserved in the long term as a habitat trees | ha of meadows with improved life conditions for the woodlark, the scops owl and butterflies | habitat trees for the cinnabar flat bark beetle established | willow trees pruned and 50 new willow trees planted | ha of meadows identified as suitable for large blue butterflies |
| 3 | 9 |  | 9 | 48 |
| new thematic trails | buildings with new bat-friendly lights | first permanent exhibition on bats in Slovenia and preserved bat roost in Kančevci | issued popular scientific publications and 5 video clips | 48 guided tours for pupils and the general public |



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