

CUORE report: naturalistic features and proposals for the management and enhancement of the former Santa Giustina quarry woodland in Castenedolo.

Naturalistic overview (taken from Cigognetti *et al.*, 2007).

The Castenedolo hill is a geomorphological formation that is elevated from the surrounding plain due to a neotectonic process dynamically linked to the Alpine orogeny. Along with the Ciliverghe hill, Mount Netto and the Pievedizio hump, the Castenedolo hill consists of a cluster of fragments originated from an ancient plain level in which, owing to a rising process, the clay and loam deposits have been preserved, whereas erosion annihilated them in the rest of the plain. The sediment layer of aeolian origin (*loess*) thus formed, which covers the local uplands, preserves prehistoric artefacts in various other locations, as well.

The Castenedolo hill is several tens of metres high and has an ENE-WSW orientation. Its original morphology has been partially altered by clay quarrying, agricultural activity and the development of residential areas. Therefore, it appears that the morphology and nature of the hillside sediments have influenced the land usage, allowing semi-natural areas, woods, hedges, rows and crops of perennial plants to coexist and form a diverse landscape.

In the environmental context thus outlined there still exist, albeit sparsely, habitats in which the plant species that are strictly protected under Regional Law 10/2008 grow; some of them are even included in Annex IV of Directive 92/43 EEC. These species are mainly found in woods, pristine grasslands, along watercourses and especially in marginal humid areas, where water flow may only be transient and limited to a few months of the year. The former quarry woodland is considered a favourable environment for the spread of valuable fauna; moreover, the presence of some of the species included in Annex IV of Regional Council Resolution 7/4345 of 20.04.2001 has been ascertained and some of them are also included in Annex I of the "Birds" Directive (EEC 79/409) or in Annexes II and IV of EEC 92/43; other species are considered vulnerable, endangered or critically endangered according to the national red lists (IUCN) and included in Law 157/92.

Considerations and proposals for the management and enhancement of the area.

The geographical position, morphology and nature of the Castenedolo hill sediments are crucial in the landscape constitution and environment diversification, which, as a whole, constitute an agro-ecosystem with high biodiversity in comparison to the surrounding plain, which is generally characterised by simple landscapes dominated by short-cycle monocultures. Such features render the Castenedolo hill a second-tier element¹ in the regional Ecological Network ('Rete Ecologica regionale' – RER), which links the hill to the southern priority areas of the low plain, located to the south of Ghedi. In the north, on the other hand, the area forms a direct extension of the Brescian Quarry Park. The latter, in accordance with the requirements of Regional Council Resolution 6148/2007, aims at the ecological connection between the Brescian Hill Park and – through strategic agricultural

¹ *Second-tier areas: areas of biodiversity importance that are not included amongst priority areas, but are considered functional for the connection between first-tier elements. In the lowlands, the second-tier element network is particularly developed and closely linked to the dense hydrographic network.*

areas – the southern areas of the Brescia Municipality, i.e. the Castenedolo Hill and the Mount Netto Regional Park. In this part of the territory, which is still partially ecologically decayed, the enrichment of the ecosystem value is enabled both by the renaturalisation interventions already carried out and by those that the Brescia Municipality envisages in its town-planning regulations as part of the Municipal Ecological Network and Local Green Network.

The recent reforestation measures carried out on the disused mining areas of the Castenedolo hills currently resemble large open patches with an ecotonal character, constituting transitional environments in which shrub rows and small trees partially superimpose herbaceous communities, which bear a strong resemblance to stable meadows when it comes to floristic composition. On the edges of these communities, *Dorycnium pentaphyllum* (= *Lotus herbaceus*) is widespread: a small suffrutex that is commonly found in the Alps and is sporadic in the lowlands (Natural Science Museum of Brescia archives, Ge.R.T. project). The newly established ecotonal environments are potentially suitable for the reproduction of vertebrate fauna and the spread of multiple invertebrate species, including wild pollinators.

In line with the needs of the wood species dwelling in the recent plantations, it is recommended that mowing be limited to no more than once a year, generally between late summer and early autumn. This management direction is in accordance with a project that has been underway for several years at the Quarry Park and whose intervention protocol has been shared with bee-keepers, hunters and environmental associations (LIPU), for the purpose of allowing the reproduction and spread of wildlife in such habitats. Due to the same reasons, special attention should be paid to the remaining stable meadows and future clearings within the plantations. In fact, such areas preserve the most endangered wild animal species, both locally and globally. The maintenance of shrub vegetation on the woodland border (including bramble patches) is recommended, as well. To encourage the development of xylophagous insects, it is also advisable to keep dead wood in situ.

Lastly, it would be advisable to carry out management interventions on the (even if temporary) wetlands that lie on the edges of the recently forested zones in the area between the hills and the plain. In these areas, which are particularly suitable for the spread of fauna, rather peculiar plant communities grow: they have disappeared almost everywhere in the lowland pre-hill area, whose floristic composition includes plant species that are considered rare throughout the Po Valley. In particular, the wetland located at the foot of the hill, near the distal section of lot 1, which is easily recognisable from the access of via Garibaldi/strada del Nespolo, is characterised not only by the species already mentioned by Cigognetti et al. (2007), but also by *Eleocharis palustris* and *Bolboschoenus planiculmis* (*Bolboschoenus maritimus* aggr.), which are typical species from aquatic (hygrophilous) environments that were surveyed during one of the excursions planned as part of the project. Such species have an extremely fragmented distribution throughout the central-eastern Po Valley, which is why it is not recommended to intervene with systematical mowing, but to instead arrange interventions aimed at containing the most invasive plant species and allowing the conservation of the typical flora of such biotopes, also favouring the direct illumination of the latter through the containment of the surrounding tree species.

The monitoring activity through *Citizen Science* will carry on with the direct involvement of citizen volunteers in the data collection of nature surveys through the Ge.R.T. (Generating Territorial Networks) project².

In view of the above, in order to allow the fruition of the area by limiting human impacts, it is proposed:

- that the Castenedolo Municipality initiate the procedure for uniting the PLIS ('Parco Locale di Interesse Comunale' – Local Park of Municipal Interest), which includes the Santa Giustina woodland, with the Quarry Park PLIS in the Brescia Municipality, so that there can be unvarying management and common enhancement;
- that, similarly to the Quarry Park, not all the area be made available to the public, providing zones where access is restricted to workers, particularly the north of the former quarry, where an important jackdaw (*Coloeus monedula*) roost has been surveyed. The possibility of inhibiting errant hunting and the installation of fixed huts in this particular area should be assessed, providing for the application of the 'closed fund' regulations pursuant to Article. 15 – section 8 – of Law 157/1992 (rules for the protection of wildlife);
- that maintenance be regulated as detailed in the previous section, avoiding interference with the breeding seasons of fauna and birdlife, in particular;
- that special attention be paid to preserving the wetlands, permanent meadows and future clearings within the plantations;
- that special attention be paid to the maintenance of the shrub vegetation on the edge of the woodland (including bramble patches) and that dead wood be kept in situ to foster the development of xylophagous insects;
- that recreational activities be regulated by limiting them only to the south-east quadrant and banning those with greater impact (e.g. mountain bike training);
- that, in order to encourage the use of soft mobility in the area, the cycle-pedestrian access routes be upgraded with the establishment of the 'CUORE route' devised by the 'Amici della bici' Italian federation from the Brescian subdivision as per the attached map;
- that signs be set up at the entrances to the woodland, prompting people to keep dogs on a leash and prohibiting access to motor vehicles.

² *Ge.R.T. is a Citizen Science project launched by the Brescian Civic Museum of Natural Sciences in 2016. Thanks to a costless collaboration with the University of Trieste, the Ge.R.T. project has been included in the CSMON-Life project funded by the European Union and a campaign specifically for Brescia has been set in motion. By means of an APP, it is possible to participate in the data collection campaign by taking georeferenced photographs (even with regular smartphones), and obtain the name of the reported species via email. The data feed into the national biodiversity database, contributing to the mapping of the national territory. A Scientific Committee and a pool of expert validators, coordinated by the Museum's botany section and drawn from Brescian naturalist associations and scientific groups, were set up to identify the reported species. In 2019, the Ge.R.T. project was amongst the winners of the Sustainable Public Administration Award '100 projects for achieving the UN 2030 Agenda objectives', promoted by ASVIS ('Alleanza per lo Sviluppo Sostenibile' - Alliance for Sustainable Development). What is more, in 2021 the project applied for the Cresco Award held by the Sodalitas Foundation and won the 'Land Development Award enhancing public-private partnerships', in collaboration with ANCI ('Associazione Nazionale Comuni Italiani' – National Association of Italian Municipalities).*

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Attachment: 'CUORE route' map.

