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Seed banking for landscape mitigation and biodiversity recovery in landfill sites

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Habitat restoration require appropriate genetic resources for plant translocations

But plant materials are often not immediately available in the required quantities and quality

Wild seed banks can supply exemplary collections of native seeds resilient at local geographic scale and significantly fulfil the need of certified plant material

Landfilling is the most common method for the disposal of solid waste, that cannot be recycled or reused.

Landfills are often located in the peri-urban areas and countryside, where can strongly interact with biodiversity at local level, having direct or potential impacts on flora and fauna and their habitats.

Landfill sites generate great need for ecological restoration, during and after exploitation, especially in rural and peri-urban areas

Old installations, prior to land protection legislations, can lie close to high-value natural areas

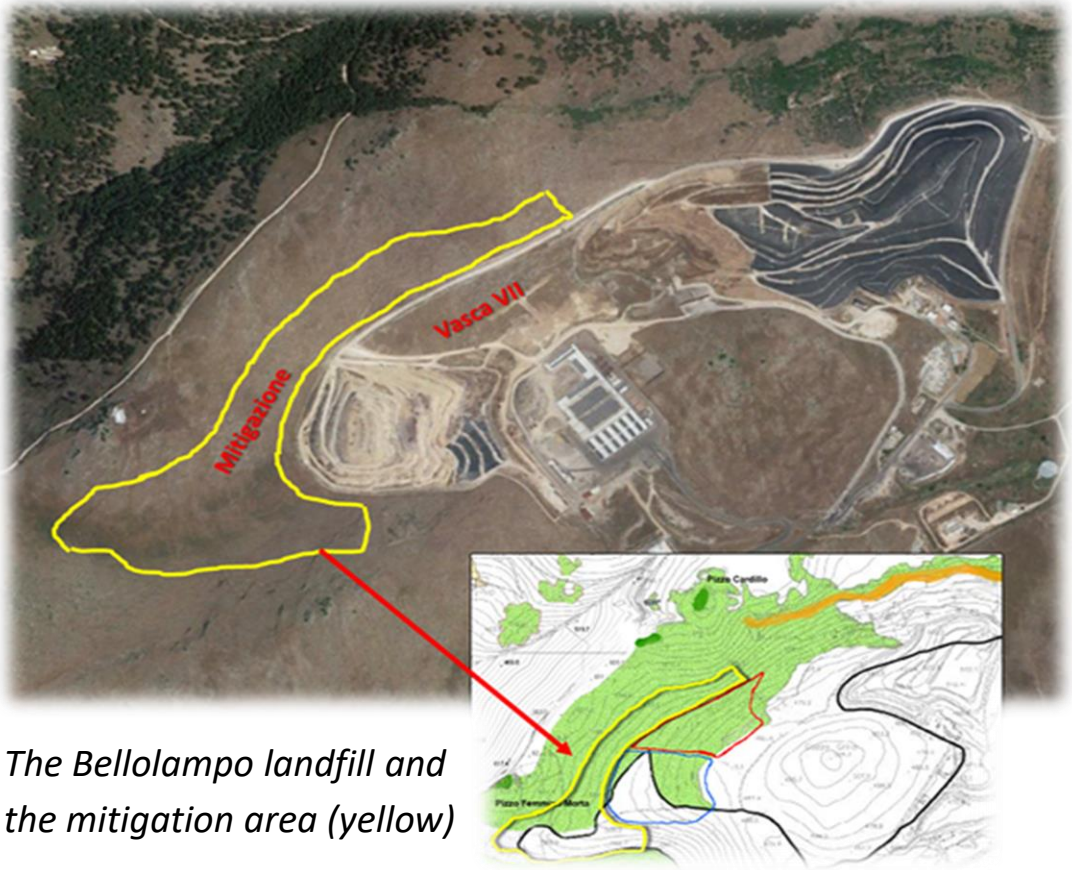
This is the case of the municipal solid waste landfill of Palermo (NW Sicily), still in operation but bordering a “Natura 2000” site

The landfill is located on the hidden side of **Bellolampo** hill (450 m a.s.l.), c. 10 km far from Palermo.

It collects the urban waste of the whole Palermo Province, providing for about 1,250,000 inhabitants

The landfill is adjacent to the Special Area for Conservation (SAC) named “Raffo Rosso, Monte Cuccio e Vallone Sagana (ITA020023)“. This is an area of high naturalistic value, falling in the western part of the “Palermo Mountains”

Though regulated, landfilling activities have impacts on surrounding natural habitats and can affect local biodiversity through habitat degradation and bio-connectivity loss



The Bellolampo landfill and the mitigation area (yellow)

In order to mitigate the impacts on the Natura2000 site and its conservation targets, an ecological requalification has been planned and started in an area of ca. 20 hectares just around the landfill

The mitigation intervention aims at:

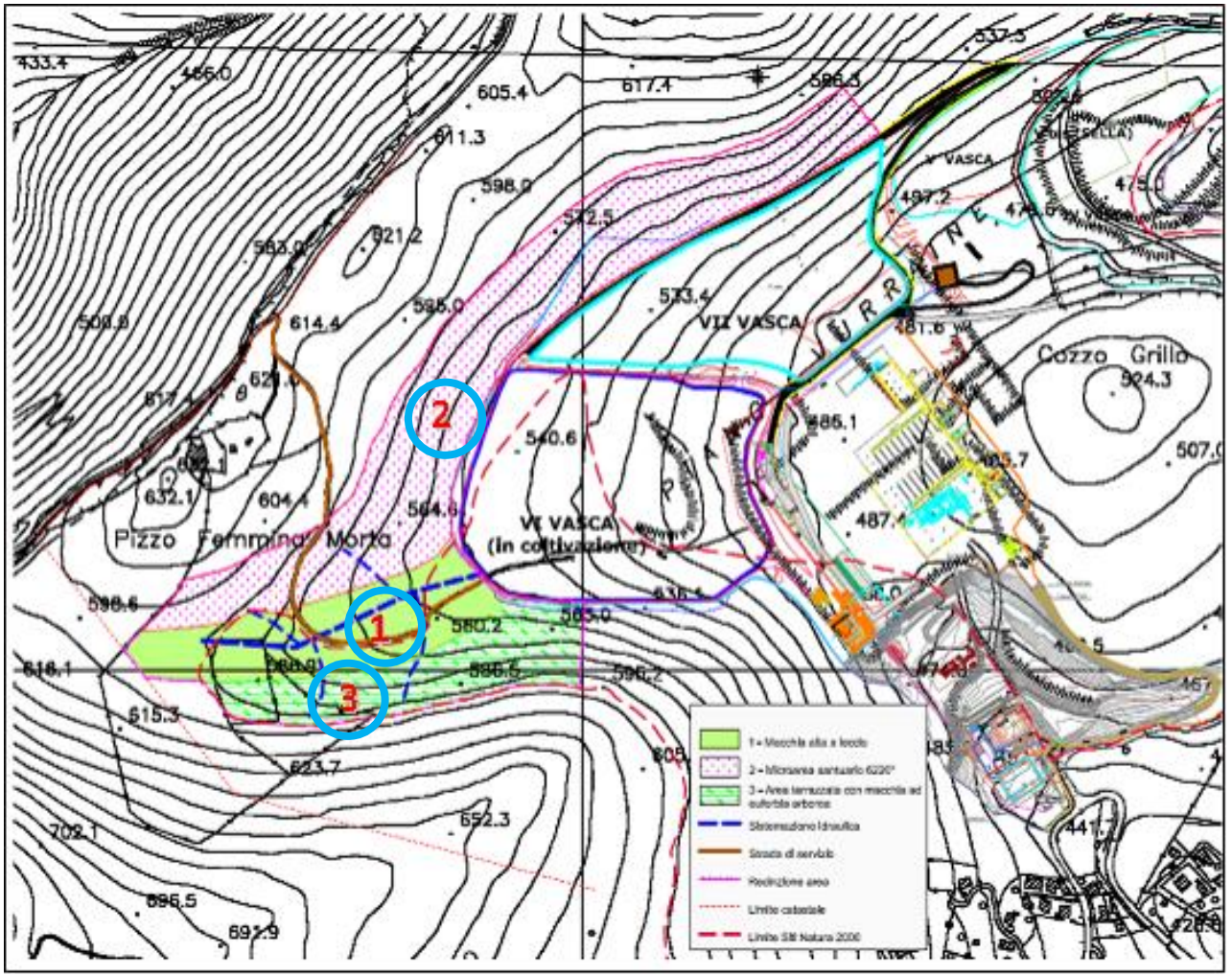
- improving the local flora with typical species of garrigue and maquis, and endemics of steppe grasslands and limestone rocks;
- favouring woody cover by applied nucleation with holm oak vegetation patches;
- enhancing soil bio-permeability and ecological connectivity pivotal to local fauna

Mitigation actions operationally involve 3 types of intervention in 3 different landscape units, in the area surrounding the landfill:

1) Evergreen shrub nuclei

2) Biodiversity sanctuaries

3) Dry-stone wall terraces



Mitigation area and the 3 types of intervention

1) Evergreen shrub nuclei (5 ha)

Realization of vegetation patches with holm-oak wood species (*Rhamno-Quercetum ilicis*), representing the potential wood vegetation of the Palermo Mountains.

Patches will act as primer nuclei, i.e. propagation areas for the natural regeneration of species, once planted, towards next parts not covered by shrubs

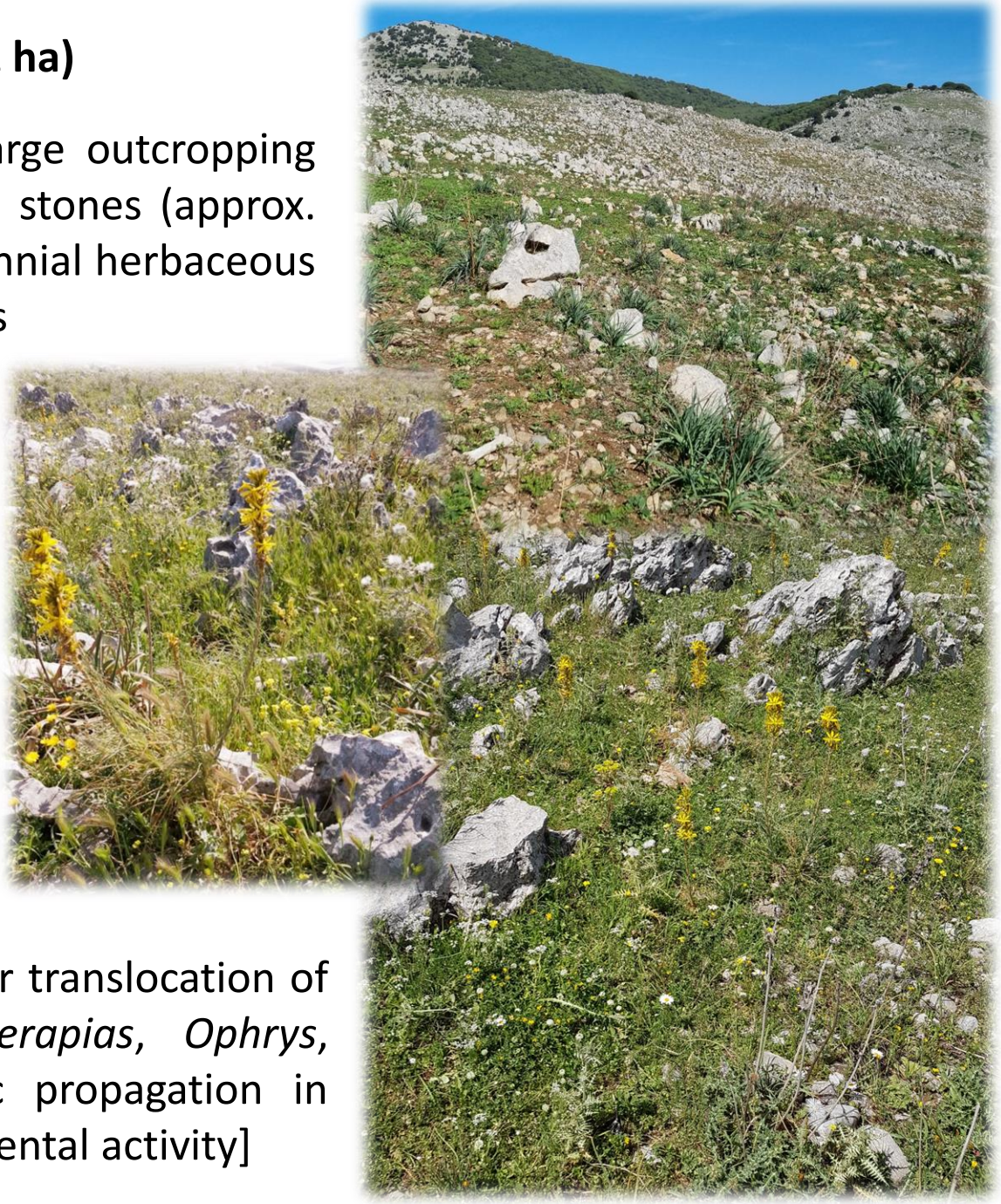
Some of the plants in propagation

Quercus ilex
Celtis australis
Rhamnus alaternus
Viburnum tinus
Fraxinus ornus
Olea europea subsp. *sylvestris*
Phyllirea latifolia,
Pistacia terebinthus
Pistacia lentiscus
Myrtus communis
Crataegus mongyna
Crataegus laciniata
Prunus spinosa
Pyrus spinosa
Cytisus infestus
Medicago arborea
Spartium junceum
Anagyris foetida
Teucrium fruticans
Osyris alba
Asparagus acutifolius
Prasium majus

2) Biodiversity sanctuaries (12 ha)

In the most rocky areas, with large outcropping limestone rocks, clearings among stones (approx. 10 m^2) will be enriched with perennial herbaceous species and endemic ones, such as

Hyparrhenia hirta
Brachypodium retusum
Iris pseudopumila
Thymus spinulosum
Odontites bocconei
Seseli bocconei subsp. *bocconei*
Helichrysum sp.pl.
Anthemis cupaniana
Leontodon siculus, etc….



to prevent soil erosion of steep slopes and increase biodiversity

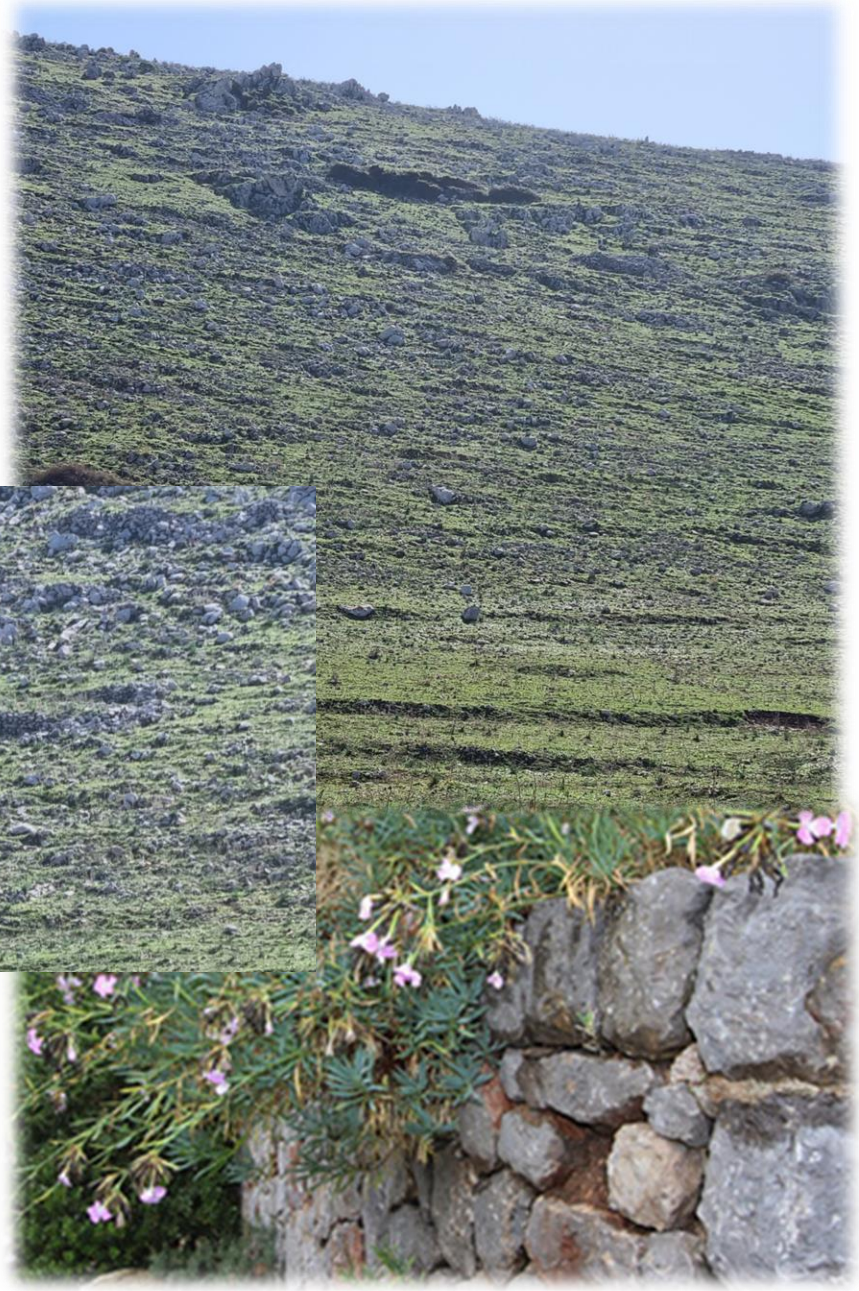
Some patches will be intended for translocation of **orchid** species (*Anacamptis*, *Serapias*, *Ophrys*, *Orchis*) produced by asymbiotic propagation in vitro starting from seeds [experimental activity]

3) Dry-stone wall terraces with maquis (4 ha)

Portions (approx. 15-20 m in length) of the existing dry-stone walls will be reconstructed, restoring the remnants of old agricultural practices

Terraced islands will therefore be created and planted with maquis vegetation:

Euphorbia dendroides
Cytisus infestus
Pistacia lentiscus
Teucrium fruticans
Teucrium flavum
Spartium junceum
Prasium majus
Artemisia arborescens



In cracks and crevices of the dry-stone walls endemic rocky species of the *Dianthion rupicolae* alliance will be transplanted

Wild seed harvesting, seed bank activity and plant propagation (c. 15,000 expected living samples) are baseline tools for such restoration activity

All activities are performed thanks to the "**Sicilian Plant Germplasm Repository**" of the University of Palermo (SPGR/PA)

- collect seeds of native and endemic species in the N2000 site
- carry out germination tests
- grow plants *ex situ*
- translocate *in situ* the propagated plants to locally improve biodiversity

Seed harvesting and plant propagation have already started, waiting to be able to proceed with the translocation in the open field.

Flora and fauna will be yearly monitored at any operation stage of the intervention (at least 5 years)


.....Thank your for attention