Bridging the Gap Between Seed Banks and *in situ* Conservation

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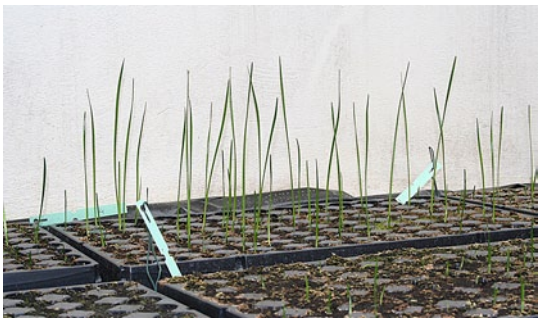
Above: ***Leucojum aestivum* in the wild on the river Po plain**
PHOTO: G. PAROLO



Top right: **One year old *Leucojum aestivum* in the University of Pavia's botanic garden**
PHOTO: : G. PAROLO

Bottom right: **- Germinating *Leucojum aestivum* seeds**
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Plant re-introductions are a vital component in the conservation biology of threatened species. However, re-introductions are expensive and often have high rates of failure due to poor horticultural practices, poor ecological understanding and lack of post-planting monitoring. An effective way to provide propagation material to re-establish, or reinforce wild plant populations, is to collect and bank seeds of species at risk of extinction, as well as endemic and locally rare plants. Seed banks provide seeds that have been collected, tested and stored following high quality protocols.[1,2]

As a practical example of how *ex situ* collections can contribute to *in situ* conservation, we present the case of *Leucojum aestivum* L. (Amaryllidaceae), a wetland species from Central-Southern Europe under threat due to the intensification of agriculture and the reduction of wetland habitats. As a consequence, *L. aestivum* has been the target species of several restoration projects in Northern Italy, carried out by the University of Pavia with seed provided by the Lombardy Seed Bank.[3] We want to reinforce about 15 relict populations of the species in the Po Plain, enlarging their population size and genetic variability.

Seeds from more than 20 populations growing in the valley of the River Po were used for germination tests. Some of the plants obtained have already been used in restoration projects, whilst others are currently growing in the Botanical Garden of the University of Pavia and will later be reintroduced into the wild. The aim is to grow individuals of different ages, from seedlings, to 3-4 year old plants, in order to simulate a natural population.

To avoid the high failure rate typical of most re-introduction programs, the whole species life cycle needs to be understood and controlled, along with the species ecology and reproductive traits. Long-term studies are usually required for this, but we were able to infer the species population structure by analysing natural populations spatially instead of temporally, thus studying several populations in one year, with the aim of developing a rapid procedure to make re-introductions more effective in terms of species survival, costs and management.

Our results can be summarised at two levels: 1) a general level, where a rapid assessment of the species population structure can be applied to other taxonomically related species and/or growth forms; and 2) at a species-specific level, where controlling the most important phases of the reproductive cycle allows knowledge of the population structure, dynamics, size and density. *L. aestivum* is self-incompatible, thus its reproductive success is strictly connected to the attractiveness of populations to pollinators and can be related to plant density. This trait is extremely important when planning a re-introduction/ reinforcement or restoration program.

In conclusion, *ex situ* conservation, and in particular seed banks, represent an important opportunity for improving the results of *in situ* conservation through the refining of germination and cultivation protocols, by producing high numbers of propagules that can ensure higher rates of success in re-introduction programmes and can advance the effective conservation of the target species.

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References

1 ENSCONET (2009) *Seed collecting manual for wild species.* [England] ENSCONET

2 ENSCONET (2009) *Seed banking manuals.* [England] ENSCONET (both manuals are available online via the ENSCONET website)

3 Other ongoing projects include LIFE+, Pianura Parmense, Corinat and Pot Plant