

A REVIEW OF PLANT REINTRODUCTION PRACTICE

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ABSTRACT - Plant reintroduction or population strengthening of threatened species is an effective tool for plant conservation largely credited by the scientific community at European level but not so widely implemented as it deserves. Specific targets of the GSPC and the EPCS urge contracting parties to actually undertake plant recovery programmes on varying proportion of threatened species.

Reintroduction can be considered an ideal follow up activity for *ex situ* conservation initiatives such as seed banking projects. In this way there is no need to heavily impact on threatened populations, collecting individuals or parts of them, and the genetic diversity might be effectively maximised taking advantage of the large quantity of seeds that can commonly be stored in seed banks.

However from a practical point of view only general guidelines have been published so far by the IUCN in 1998. Well documented activities and structured projects on reintroduction (e.g. in the context of Life projects) are scarce and very few reports or papers are available to guide plant conservationists.

To bridge this gap the Italian Botanical Society launched a project to document plant recovery and reintroduction activities carried out by botanists and wild life managers, aimed at compiling a national database. It is hoped that this initiative will contribute to discuss and adopt scientifically sound and widely agreed guidelines and standard operating protocols for plant reintroduction in Europe.

In Europe plant conservation is getting a well deserved attention in comparison to what happens in other developed and developing countries, thanks to a significant presence of protected areas. As a matter of fact, approximately 15% of the European territory has a binding legal protection, being included in Sites of Communitarian Importance in the Natura 2000 network and in other local protected areas. According to the 1997 IUCN Red list of threatened plants (the outdated but only global assessment to date valid for Europe), approx. 10 % of the European flora is threatened, the figures increase to approx. 14% in Australia, 29% in the US and 40% in Mauritius (Walter & Gillet, 1998). This might seem comforting news, however there are persisting threats that cannot be easily controlled or eliminated locally as they operate on a global scale. Credited projections estimate that by 2080 up to 60% of the European flora might be at risk particularly in the European mountains that are at present relatively cool environments but that will be badly affected, more than other parts by global change (Thuiller et al., 2005). In these areas, the upward migration will be limited by the relatively low altitude and isolation of these mountains. This phenomenon has been observed for some years, and in selected study areas in the central Italian Alps over the past 50 years, here the local flora showed a shift up to 450 meters in altitude (Parolo & Rossi, 2007; Parolo et al., 2007). Global and regional agreements for plant conservation are already in place and include specific targets for *in situ* and *ex situ* conservation and for recovery and restoration programmes (i.e. reintroductions) to be met in a given timescale through specific actions plans (Bramwell et al., 1987; Cheney et al, 1999; CBD Secretariat, 2002; Planta Europa, 2002). However specific legislation and updated guidelines on reintroduction are still wanted at European and also at national level to the best of our knowledge. Existing guidelines are outdated, too vague and do not provide case studies to assist conservationists willing to carry out specific actions (Oliver, 1979; Moggi, 1981; Akeroyd & Wyse Jackson, 1995; IUCN, 1987, 1998; IUCN-SSC, 2002). However the new EU Life Plus initiative plans to support conservation projects also aimed at reintroduction, drawing on a total budget of about 2 billion Euros. For the approximately 15 thousand European plants, an agreed EU legal framework and specific operating protocols for reintroduction are an ambitious but essential feature that should be achieved in the short term with the cooperation of all interested stakeholders in the research and plant conservation community. Outside Europe various documents in this directions recently appeared at global and regional level thanks to the joint efforts of IUCN, BGCI, ANPC-Australia, etc (Vallee et al., 2004; Guerrant et al. 2004; Heywood & Dulloo, 2005). Among the others, key documents can be considered the 1995 IUCN Guidelines for re-introductions prepared by the SSC Reintroduction Specialist Group (RSG), published in 1998 (IUCN, 1998) that are a general document addressing both plants and animals, even if biased towards animal reintroduction that has a long standing tradition.

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National and regional manuals were also produced by scientific societies and national governments (e.g. Switzerland CPS/SKEW, 1997) and scientific institutions (Kew Gardens, SID, MSBP). In the last twenty years the scientific community contributed to the debate on the topic of reintroductions particularly in the US, Australia and Europe (Falk & Holsinger, 1991; Goldsmith, 1991; Anonym, 1995; Falk et al., 1996; Hodder & Bullock, 1997; Bowles & Whelan, 2003; Montmollin & Strahm, 2005; Seddon et al., 2007).

Reintroduction practice today is built on a sound scientific basis, and this solid foundation cleared the way from many methodological doubts and perplexities that were often raised in the past on its feasibility and ethics.

Attempts to compile databases and directories on reintroduction projects were made in the past (Soorae & Seddon, 1998) and a new one has recently been launched by the IUCN in 2007. Listing and documenting reintroduction is important to provide examples and case studies to clarify aims, operating procedures and expected results. In this way it is possible to debate, define and update common standards and methodologies. Still, both at global and European level, many examples of reintroduction are not sufficiently illustrated to the plant conservation community; case studies, best practice and experience are not sufficiently circulated and known by the actual conservationists at work in the field (Vignali et al., 1998; Morgan, 1999; Rich et al., 1999; Bonafede et al., 1999; Sgarbi et al., 2001; Bonafede et al., 2002; Forte et al., 2002; Cerabolini et al., 2004; Kepar, 2004; Dominione et al., 2005; Raimondo & Schicchi, 2005; Rinaldi e Rossi, 2005; Wagner et al., 2005; Accogli et al., 2006; Aplin, 2006; Del Prete et al., 2006; Rossi et al., 2006a; Waldren, 2006; Wenham, 2007).

In order to collate and circulate a key selection of case studies, many different approaches need to be considered and scientists from different backgrounds need to work together. The present urgency and complexity makes this a demanding task, also considering that plant reintroduction is effectively a cross cutting discipline. The expected outputs of this expected international cooperation should reflect on:

- Legal protection: providing the general principles and the specific regulations to be implemented both at EU and national level;
- Applied land management: promoting a tight connection between scientists, conservationists and land managers;
- Conservation: providing prioritisation criteria and producing a validated target list of conservation priorities;
- Ecological models: employing a multidisciplinary ecosystem approach in order to deliver predictor models.

From a global perspective reintroduction can be summarised with a specific plant conservation cycle where *in situ* and *ex situ* techniques integrate in a complementary way (fig. 1).

Ex situ activities can play a pivotal role if they are used to support *in situ* conservation, contributing to the long term survival of the natural populations of threatened plants, reinforcing the diminishing ones and reintroducing the extinct ones.

In Italy the scientific community had been rather cold in the past with respect to this issue, but a new interest recently emerged (Filipello, 1981, Garbari, 1996; Bonomi et al., 2007), with many scientists willing to get involved in integrated plant conservation programmes, showing a strong commitment to contribute to draft specific guidelines on reintroduction that should then be validated at European level. In this direction the working group for plant conservation of Italian Botanical Society (www.societabotanicaitaliana.it see *Gruppi di lavoro, Conservazione della Natura*) launched two key initiatives in 2005 (Rossi et al., 2005, 2006b; Rossi, 2007).

1 - The first initiative aimed at creating a national inventory of plant reintroduction projects (data collected so far showed that reintroduction was experimented on 50 different species - fig. 2).

2 - The second initiative aimed at drafting specific guidelines and operating protocols for plant reintroduction, as a starting point for more detailed protocols.

Considering that the EPCS reserves a special attention to recovery and restoration programmes (§8.1 and §8.2), it would be advisable to experiment and collect case studies from all over Europe, with a contribution from each European country. It would also be important to have a legal framework to regulate plant reintroduction and translocation considering that a specific discipline in this sense it wanted both at national and European level. This is particularly important considering that the EU itself is contributing to these activities, through Life projects, in the absence of a specific regulation.

In conclusion the authors wish to urge the European plant conservation community to get actively involved in a pan European reintroduction Initiative providing data and case studies in order to support the 1997 IUCN SSC/RSG Reintroduction project database (www.iucnsscrsg.org) and lay the foundations for the future development of updated guidelines for reintroduction practice.

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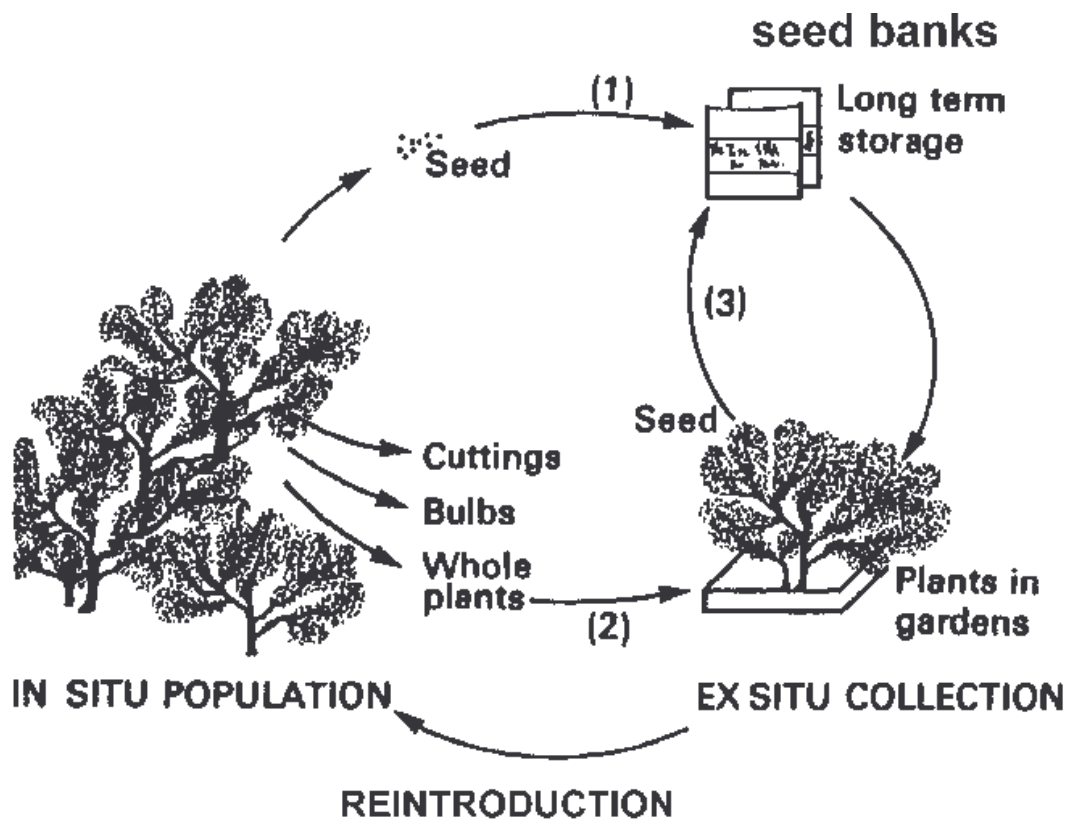


Fig. 1 - The reintroduction cycle (modified from Guerrant et al., 2004)

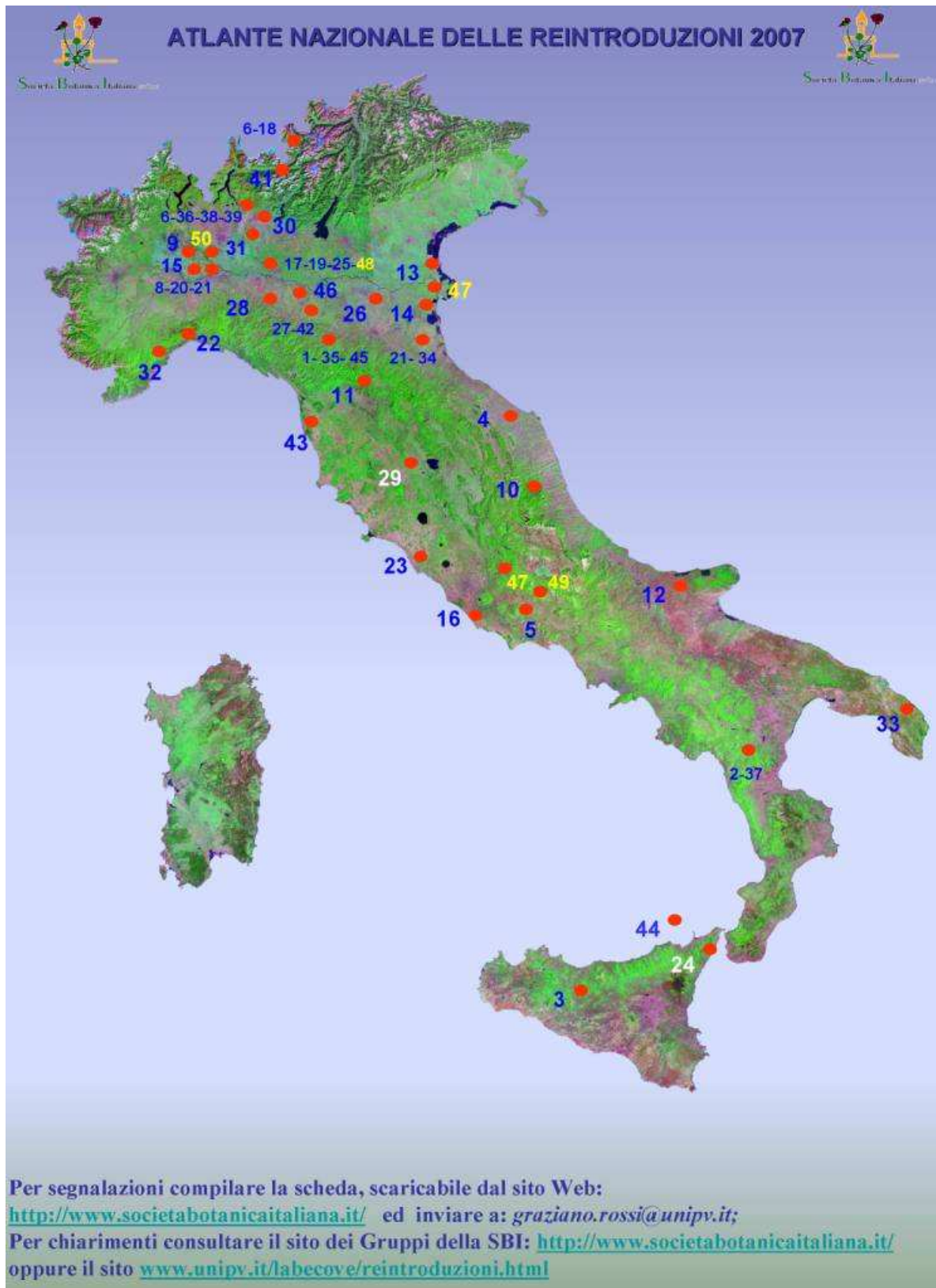


Fig. 2 - National Reintroduction Atlas for Italy



Società Botanica Italiana

Gruppo di interesse scientifico per la Conservazione della Natura

In collaborazione con

Gruppo di interesse scientifico degli Orti Botanici e Giardini Storici

CENSIMENTO NAZIONALE DEI CASI DI REINTRODUZIONE DI SPECIE RARE E MINACCIATE 2006/2007

N.	SPECIE	ENTE	REGIONE	finanz./prog./anno	SCHEDA
1	<i>Abies alba</i> Mill.	Parco Reg. dei Cento Laghi	Em.-Rom. (PR)	Life Natura '95	-
2	<i>Abies alba</i> Miller	Parco Nazionale del Pollino	Calabria (CS)	P.O.R. R. Calabria 2000-06	X
3	<i>Abies nebrodensis</i> (Lojac.) Mattei	Parco delle Madonie	Sicilia (PA)	LIFE00NAT/IT/7228	-
4	<i>Arthyllis barba-jovis</i> L.	Univ. Polit. delle Marche	Marche	-	-
5	<i>Bidens cernua</i> L.	Orto Bot. Dip. Biol. Veg. Uni. Roma	Lazio (FR)	Non finanziato	X
6	<i>Caltha palustris</i> L.	Cons. Parco Naz. dello Stelvio	Lombardia (SO)	Fondi Ente	X
7	<i>Campanula raineri</i> Perpentini	Parco del Monte Barro	Lombardia (LC)	LIFE00NAT/IT/7258 (2000)	-
8	<i>Carex otrubae</i> Podp.	Università di Pavia, DET	Lombardia (PV)	Progetto Reg. Lomb. (2006)	X
9	<i>Centaurea cyamus</i> L. e <i>Agrostemma githago</i> L.	ProNatura P. agr. Sud MI	Lombardia (MI)	LR 8/2005 (x detenuti)	X
10	<i>Centaurea scannensis</i> Anzal., Soldano & F. Conti	Giard. Bot. "Gole del Sagittario"	Abruzzo (AQ)	L.R. 35/1997, Com. WF '07	X
11	<i>Cheilanthes persica</i> (Bory) Mett. ex Kuhn		Em. Rom. ()	-	-
12	<i>Cistus chusii</i> Dunal.	Orto Bot. Univ. di Bari	Puglia (BA)	Fondi EU - Reg. P.O.P. 94/99	-
13	<i>Cistus creticus</i> L. ssp. <i>eryosephalus</i> (Viv.) Greuter & Burdet.	Veneto Agricoltura	Veneto (Ve)	LIFE Natura '04-'06	X
14	<i>Cistus incanus</i> L.	Univ. FE Parco Reg. Delta Po	Em.-Rom. (FE)	Fondi Ente	X
15	<i>Corynephorus canescens</i> (L.) P. Beauv.	Uni. PV DET	Lombardia (PV)	Fondi Ente Provincia	X
16	<i>Cyperus polystachyus</i> Rottb.	Orto Bot. Uni. Ro APAT	Lazio (Roma)	Fondi Enti	X
17	<i>Daphne mezereum</i> L.	Provincia di Cremona	Lombardia (CR)	Fondi Ente	-
18	<i>Dianthus glacialis</i> Hankl.	Cons. Parco Nazionale Stelvio	Lombardia (SO)	Fondi Ente	X
19	<i>Erythronium dens-canis</i> L.	Provincia di Cremona	Lombardia (CR)	Fondi Ente	-
20	<i>Iris sibirica</i> L.	Università di Pavia, DET	Lombardia (PV)	Reg. Lomb. (2006)	X
21	<i>Leucogon austriacum</i> L.	Uni. Pv. Ris. Nat. Alfonsine	L. (PV) E.R-RA	Fondi Ente	X
22	<i>Leucogon nicaense</i> Ardoino	DIP. TE. RIS Uni. Ge. - Ist. Floric.	Liguria (GE)	-	-
23	<i>Limonium etruscum</i> Arrigoni et Rizzotto	Univ. FI Parco Reg. Maremma	Toscana (GR)	Life Natura	X
24	<i>Limonium sibthorptianum</i> (Guss.) Kuntze.	Dip. Sc. Bot. Univ. di Messina	Sicilia (Messina)	REALIZZANDA	-
25	<i>Listera ovata</i> (L.) R. Brown	Provincia di Cremona	Lombardia (CR)	Fondi Ente	-
26	<i>Ludwigia palustris</i> (L.) Elliot	Orto Botanico Uni. Ferrara	Em.-Rom. (FE)	-	-
27	<i>Marsilea quadrifolia</i> L.	Orto Bot.-Univ. Mo. e Reg. Em.	Em.-Rom. (MO)	-	-
28	<i>Myricaria germanica</i> L. (Desv.)	Parco Regionale del fiume Taro	Em.-Rom. (Parma)	-	-
29	<i>Nymphaea alba</i> L.	Prov. Siena - Uff. Ris. Nat.	Toscana (Siena)	Fondi Ente-REALIZZANDA	X
30	<i>Osmunda regalis</i> L.	Orto Botanico di Bergamo	Lombardia (BG)	-	-
31	<i>Palmaris spina christi</i> Miller	ProNatura P. Adda Nord	Lombardia (MI)	LR 8/2005 (x detenuti)	X
32	<i>Pancreatum maritimum</i> L.	Provincia di Savona	Liguria (SV)	-	-
33	<i>Periploca graeca</i> L.	Orto Bot., Univ. di Lecce	Puglia (Lecce)	Fondi Ente	X
34	<i>Phyllitis scolopendrium</i> (L.) Newman	Uni. Pv. Ris. Nat. di Alfonsine	Em.-Rom. (RA)	Fondi Ente	X
35	<i>Picua ewebia</i> L.	Parco Reg. dei Cento Laghi	Em.-Rom. (PR)	Progetto Life Natura '95	-
36	<i>Pinguicula vulgaris</i> L.	Parco del Monte Barro	Lombardia (MI)	LIFE00NAT/IT/7258	X
37	<i>Pinus leucodermis</i> Antoine	Parco Naz. del Pollino- C.R.A.	Calabria (CS)	Fondi P.T.A.P. 94/96 Ente	X
38	<i>Polemonium coeruleum</i> L.	Cons. Parco Naz. dello Stelvio	Lombardia (SO)	Fondi Ente	X
39	<i>Primula glaucescens</i> Moretti s.l.	Parco del Monte Barro	Lombardia (Lecco)	LIFE00NAT/IT/7258	-
40	<i>Pteris cretica</i> L.	Parco del Monte Barro	Lombardia (Lecco)	LIFE00NAT/IT/7258	X
41	<i>Sanguisorba dodecandra</i> Moretti	Privato - Val di Tegno (SO)	Lombardia (So)	-	-
42	<i>Senecio paludosus</i> subsp. <i>angustifolius</i> Holub	Orto Bot.-Univ. Mo. e Reg. Em.	Em.-Rom. ()	-	-
43	<i>Serapias vomeracea</i> ssp. <i>taxiflora</i> (Soò) Götz & H.R. Reinhard	Orto Bot.-niv. Mo. e Reg. Em.	Toscana (PI)	-	-
44	<i>Silene hircanica</i> Brullo & Signorello	Ris. Nat. Orientata Is. Eolie	Sicilia (Messina)	LIFE99 NAT/IT/006217	X
45	<i>Taxus baccata</i> L.	Parco Reg. dei Cento Laghi	Em.-Rom. (PR)	Progetto Life Natura '95	-
46	<i>Viola pumila</i> Chaix	Orto Bot.-Univ. Mo. e Reg. Em.	Em.-Rom. (RE)	Fondi Ente	X
47	Varie	CONS. BONIF. DELTAPOADIGE	Veneto (VE)	LEADER II	X
48	Varie	Un bosco a Ca. delle Mosche	Lombardia (CR)	Regolamento UE N.2070	X
49	Varie (orchidee)	Università La Sapienza, Roma	P. Mont. Simbruini.	-	?
50	Varie	MI BOSCO IN CITTA'	Lombardia	-	-

Fig. 3 - national Reintroduction database for Italy