



Global Re-introduction Perspectives: 2010

Additional case-studies from around the globe
Edited by Pritpal S. Soorae



IUCN/SSC Re-introduction Specialist Group (RSG)





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Conservation introduction of a locally extinct fern species in Estonia during 1998-2008

Ruth Agurauja

Senior researcher, Tallinn Botanic Garden, Kloostrimetsa Rd. 52,
Estonia (ruth.agurauja@tba.ee)

Introduction

Woodsia ilvensis (L.) R. Br. has a disjunct circumpolar distribution (Hultén & Fries, 1986). The species has not been evaluated for IUCN yet, its condition and conservation status within the whole range varies from locally common to locally extinct (Torleif *et al.*, 1993). In Estonia, *Woodsia ilvensis* was historically rare. It was found growing in northern and north-western Estonia representing the south-eastern border of its Scandinavian disjunction, where few areas offer suitable habitat. First found in 1887, it was documented only in four locations in different times and has not been found since 1977. Initially it was assessed as critically endangered (Lilleleht, 1998) and until 2004 it belonged to I category of protected plant species (RT, 2004). Since 2005, it has been considered as naturally extinct species in Estonia (Kukk & Kull, 2005).

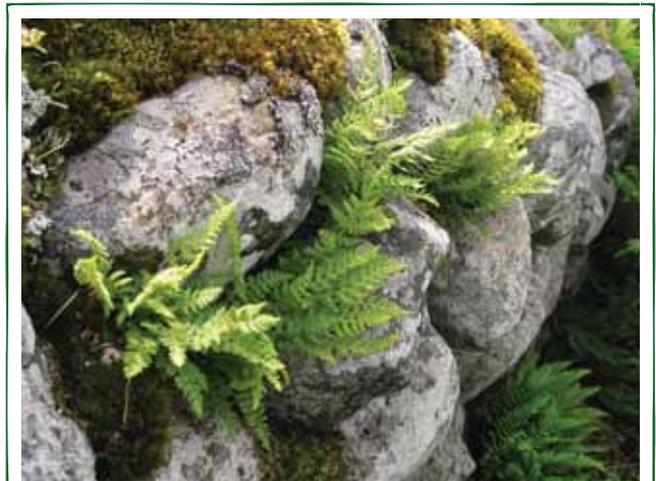
Considering that habitat conditions may have changed on previous locations, an experimental project was started to test if it would be possible to successfully introduce *W. ilvensis* into new localities where suitable habitat conditions exist.

Goals

- Goal 1: Testing the habitat suitability for population establishment.
- Goal 2: Establishment of a viable experimental population.
- Goal 3: Creating a local spore source for further natural dispersal of the species.

Success Indicators

- Indicator 1: Long-term survival of out planted individuals.
- Indicator 2: Establishment of new natural generations, population recruitment.
- Indicator 3: Colonization and establishment in new empty patches of suitable habitat, extended distribution.



Re-introduced individuals in 2009

Project Summary

Woodsia ilvensis is known as a fern of dry sunny or half shaded rocky habitats, on thin acidic soils on many different types of metamorphic and eruptive rocks. The older findings from Estonia were from the north-eastern coastal cliff. The most recent findings were from old stone fences piled from the stones collected from surrounding fields. While checking previous locations in Estonia during the period of 1994-2006, not a single individual was found. The two older locations were dominated by calcareous substrate. In two most recent locations the habitat was degraded - the stone fences were destroyed or removed. Considering that substratum reaction may be limiting factor and that changed habitat conditions may not support the species survival in previous locations any longer, the search for new apparently suitable habitats for experimentation of conservation introduction was started. There are only few areas of almost 'calcium free' environment in northern and north-western part of Estonia where vendian layer is denuded. These areas, some northern islands, stone fences and siliceous erratic boulders were checked for possibly suitable habitat.

In many regional floras, *Woodsia ilvensis* is mentioned sharing the habitat with *Asplenium septentrionale* (L.) Hoffmann. Both species are represented in Finland and on easternmost islands of Finnish Gulch (Glazkova, 1996). On its most recent location in Estonia, *W. ilvensis* was also found growing together with *A. septentrionale* (Hein & Puusepp, 1962), both currently extinct on this site. There is a single natural population of *A. septentrionale* growing on the south facing stone wall of the old churchyard on small island of Prangli. It was decided to consider *A. septentrionale* as the indicator for suitable habitat conditions and choose the north-facing side of the same stone wall for re-introduction experiment of *W. ilvensis*. As there was no natural source of local spores, all plants were grown from the spores received via the seed and spore exchange of botanical gardens. Only spores of wild provenance were used for introduction experiment (Joensuu HB, North-Karelia, spont.; Helsinki HB, Uusimaa, spont.). The sowings were made in laboratory conditions and timed for late autumn. Next spring young plants were planted into the mix of leaf mold, drained peatland forest soil and coarse sand, and thereafter taken into the shaded sphagnum beds, where they were kept and handled with minimal maintenance until planted into natural conditions.

In 1998, two years old individuals were planted onto the old north facing stone fence on the island Prangli. In 2001, a group of five years old individuals were added to that site. In both cases, the planting was timed to late summer and early autumn according to more moist weather conditions, thus giving plants enough time to get rooted before winter. The plants were watered only after the planting and then left into natural conditions without any maintenance or site management. The introduction on stone fence was successful. Some plants died during two first years, the rest survived and continue growing. The ferns are well adapted to the conditions of dry and open habitat conditions. They are tolerant to long droughts, drying and curling up the fronds during the dry months and turning back green and growing on after the late summer or autumn rains. The spores are produced yearly. The germination tests show that they produce viable spores. No sign of regeneration, natural recruitment or spread has been discovered yet. The number

of fronds and rhizome tips is bigger for these ferns which were out planted when younger and smaller (two years old plants). The monitoring is conducted yearly. The growth, condition and vitality of single individuals are assessed. During each visit the whole habitat patch is searched for regeneration.

The results confirm that if the spores of *Woodsia ilvensis* would land on suitable substrate within suitable habitat in northern or northeastern part of the Estonia, they could germinate, the individual plants could get established and persist at least for a certain period of time. The ferns have been out in the habitat for eleven years without any maintenance. For now, the age of experimental individuals is 13 years and they have been growing in natural habitat for 11 years. As the ferns of this experimental population still increase in size and produce spores yearly, one may conclude that the habitat conditions of the site may be suitable for the species. Since, the population recruitment has not been observed.

Major difficulties faced

- More research on microhabitat requirements and conditions is needed, for selecting the exact locations for planting the individual ferns into natural habitat. Not only substrate reaction, but the moisture content and régime in the soil of the microhabitat could be vital for long-term survival, particularly in case of ferns of dry and mesic habitats. The ferns do not have a deep root system as most of flowering plants do. Rather thin additional roots grow out of the rhizome, and get their water and nutrition from relatively smaller soil area.
- Many fern species are sensitive to repeated planting. They may get disturbed and need a longer period for the recovery and after-care. For this reason it is important to consider which developmental stages could be best for the successful establishment in the habitat. Theoretically, it would be good to plant out the fern individuals in as early developmental stages as possible, enabling the longer period for adaptation with natural conditions and the rhythm of natural changes in the habitat. The 'right' developmental stages for out planting may be specific depending of autecological characteristics of the species and habitat conditions.

Major lessons learned

- The growing process is the continuous adaptation to environmental conditions. The ex situ propagation should be toughening the plants for future planting into natural habitat, decreasing thus the after planting environmental stress and increasing the potential survival of the individuals in the site.
- The single out planting into the habitat equals to single occasional natural distribution event. It may take very long time until structured self-sustaining population evolves naturally, and probability for this event to happen is as big as that of extinction. It was learned that the out planting should be gradual during several consecutive years or by the cycles, imitating thus the natural colonization, population growth and establishment of structured self-sustaining population.
- The optimal number of individuals planted per year and the numbers of years, necessary to promote establishment of a viable population, may be specific to

the species or the group with similar life strategy. Analyzing monitoring data of natural and experimental populations helps to specify these numbers.

- As the number of individuals and amount of spores/seeds is limiting in case of endangered species, it would be more sustainable and more effective to start with smaller experimental populations, gradually increasing the size and number of patches in accordance to the intermediate survival analyze.
- If appropriate habitat with characteristic community and habitat conditions could still be found, then any after-management of the site will not be needed.
- The best indicators for selecting the possibly suitable habitat were characteristic species of the typical to the species natural community.

Success of project

Highly Successful	Successful	Partially Successful	Failure
	√		

Reason(s) for success/failure:

- Though limited and patchy, the suitable habitat conditions for *Woodsia ilvensis* still exist in Estonia. The thorough preliminary analysis of historical and current natural distribution, the distance from closest natural spore source, availability of suitable habitat and microhabitat conditions, life history characteristics of the species and the structure of natural community, are essential for the successful re-introduction/restoration/recovery efforts.

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