Preamble to the new edition of the Position paper on Transplanting and seeding as a means of preservation.

In 2010, the Joint Conservation Committee and Ecology Section decided to reopen the discussion regarding the role that transplantation may play in the conservation sphere of species at risk and possible threatened ecosystems. This decision came from the fact that over the past two decades new knowledge was acquired related to this mode of preservation. Since the 1980s, researchers, NGOs and governmental agencies have continued to examine the strategy of transplantation as a possible way to avoid species extinction or extirpation from an area.

The need was felt for the CBA/ABC to update its position paper, which was originally approved in 1987, entitled "Position paper on Transplantation as a means of preservation". In 2012, a joint CBA/ABC and BSA symposium entitled "Transplantations and relocation of species at risk: learning from the past to plan for the future" was organised to further discuss the lessons learned from Canada and the United States. This led to a special issue in Botany (May 2013) which included several of the papers presented at the symposium as well as others to ensure a vast coverage of the various issues related to transplantation (Vasseur 2013).

When the CBA position paper was written in the 1980's, the field of restoration ecology was very young. In addition, very few studies had been conducted to determine how and whether transplantation as a means of preservation would be beneficial. Since, data have shown that there are positive and negatives aspects of this preservation technique and a precautionary approach must be taken (Guerrant 2013).

Indeed, the science of restoration ecology has grown tremendously over the last two decades. E.O Wilson predicted that "The next century will, I believe, be the era of restoration in ecology" (Wilson 1992). The discipline now has at least three respected and peer-reviewed scientific journals and a growing number of ecological restoration projects in a variety of ecosystem types. Ecosystem restoration practices have the potential to improve ecosystem conditions from a degraded state, and also have the potential to advance ecology by using experimental approaches. However a closer examination of restoration ecology reveals a mix of successes and failures (Suding 2011), and a tendency to create false hope (Hilderbrand et al. 2005). This is further complicated by the lack of consensus on rigorous evaluation criteria (Suding 2011). One key focus of restoration ecology is the characterization of reference areas that can serve as restoration targets. This is not a trivial task and for certain ecosystems such as dry forests of western North America, very different perspectives on historical conditions have been proposed (Odion et al. 2014). Although ecosystem restoration has its place in natural resource management, it is critical to use it with a certain dose of humility and not overstate what it can deliver, particularly when dealing with rare species and fragile ecosystems. We argue (as suggested by Guerrant (2013) that in these cases the precautionary principle should take precedence. For example, although there have been suggestions that it is possible to re-create sensitive alvars and grasslands to mitigate development projects, ecologists who are experts in the ecology of these places argue that we do not currently

have the capability to do this successfully (Fahselt 2007, Catling 2013). Transplanting species is a common tool used in ecosystem restoration projects. Given that people from a variety of sectors are transplanting (recovery teams, industry, municipalities, etc.), it may be most efficient at this time to simply advocate that experts should be contacted and engaged in transplanting projects and that three key conditions be in place - management, monitoring, and enforcement. On this basis, the new version of this position paper was prepared prepared by the Ecology and Conservation Section, then approved by the general membership on _____ 2014.

Position Paper on Transplanting and seeding as a Means of Preservation (edition 4, Canadian Botanical Association AGM accepted in 2014 by vote)

Background

Natural vegetation is being increasingly threatened by land development; such development is often opposed by conservationists and biologists because of the potential for destruction of native species, habitat and/or ecosystems. Suggestions have been made that transplanting and seeding key species or rare species from proposed development sites to other locations, or creating equivalent habitats elsewhere, would eliminate conflict and thus satisfy everyone.

Statement

The Canadian Botanical Association believes that neither transplanting nor seeding is a sufficiently reliable or guaranteed method of conserving rare species, communities and/or ecosystems. They should not automatically be the method of choice for mitigation of proposed development when other viable options for management and protection *in situ* are available.

Notes

(1) Transplanting may be advantageously used to help restore damaged plant communities or to create associations that are very similar to naturally occurring associations, but the expectation should not be greater than warranted by the actual capability.

(2) The extent to which a population, community and/or ecosystem is self-sustaining is an important consideration. A distinction should be made between wild plants in a natural habitat and gardening such as in a botanical garden. “It is stressed that translocation experiments must be regarded as horticultural operations with a full and flexible aftercare program to provide a reasonable chance of successful plant establishment” (Lusby 1996).

(3) In most cases, protection will be far more successful by protecting a natural habitat with minimum management than to attempt to recreate it or salvage it by transplanting and seeding after substantial damage.

(4) Not only may transplantation sometimes fail to perpetuate species, but degradation of natural areas may be accelerated in the process. This can occur through damage to plants in the transplant or seeding location or accidental introduction of invasive species to the new location with the seeds or transplants.

(5) A rare native species cannot be considered in isolation from its habitat. It is not simply the presence of rare plants that makes a site significant. Rather, rare species indicate that the habitat and, thus, the entire ecosystem are significant.

(6) Rare species may signify sites of phytogeographical importance, or unusual soil, microclimatic or other ecological conditions. In some cases, their presence may indicate a lack of disturbance. In all instances, the habitat is as important to scientific knowledge and our cultural heritage as the rare species itself. Thus, the transfer of rare species to a garden or a habitat where they did not occur naturally does not constitute a reasonable conservation alternative because the native habitat has been lost.

(7) Since any species taken from its native habitat no longer interacts with its natural suite of biological and physical environmental factors, the answers to many important questions dealing with its biology are lost along with the native habitat. For example, if plants are introduced to a non-native site, it may be difficult if not impossible to discover how natural factors determined the native range of species or even what the original native range was. It will be impossible to probe physiological adaptations which have fitted plants to grow under specific natural conditions.

(8) In parts of the world where the entire landscape has already been altered by man, and no other conservation alternatives exist, transplantation has been used to permit some genotypes to persist at least for some period of time. However, the success of a transplant cannot be predicted and the permanence of the protection available in cultivation is similarly uncertain – further reasons why transplantation is generally not a desirable alternative to *in situ* protection.

(9) The propagation of rare plants in gardens may be aesthetically pleasing and indeed can be an important tool for scientific research. However, many desirable natural ecosystems could be destroyed if impoverished by collecting rare and uncommon plants for purposes of cultivation, and certainly, neither the plant community nor a reasonable range of genetic variability of a species will be preserved in most gardens.

(10) Perhaps the most serious problem of all is the possibility that extensive transplanting and /or seeding might become viewed as a standard way of resolving the preservation *versus* development conflict. If transplanting and/or seeding is/are condoned as a standard solution(s), then uninformed decision-makers will feel no compunction about approving developments in any natural area.

(11) The use of natural ecosystems as analogues or models for greening of wasteland has potential conservation value, but the idea that we can create a particular self-sustaining natural ecosystem with its full complement of species is not appropriate. In addition, the

use of commercial seeds that are mainly introduced to a region may further reduce the benefits that restoration may have. For this purpose, the use of native and local seeds should be used to ensure that this system is closely related to other local systems.

(12) With the threat of climate change and the possibility that some species may not be able to survive in their current native ecosystem, some managers have argued that assisted migration (or translocation) may be a solution to ensure their survival in other regions. While this is a legitimate concern, research in this field remains limited and such a solution should not be implemented unless the species is officially at risk due to climate factors. In these circumstances, the precautionary principles must be followed and a prior research should be completed to ensure a greater success.

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Some quotes of interest:

Transplantation to new locations is used widely to propagate horticultural and agricultural species but is also promoted as a means of relocating whole communities that stand in the way of development. It may be used as well to move vegetation from the field for experimentation under controlled conditions. Transplantation has not in the past been considered a reliable means of conserving threatened species or reproducing functional characteristics of natural communities, and has been regarded by many as highly ineffective. However, its potential must now be re-examined because of the many recent transplant attempts as well as advances in related fields. Recent trials illustrate that individual endangered species are still particularly difficult to transplant and displaced multi-species sods are almost always changed in the process. Exact reconstruction of communities from individual components is next to impossible because the full complement of species, including critical microbial components, is almost never known.

Owing to a limited understanding of phenology, reproduction, functional roles, and interrelationships among constituent microbes, cryptogams, vascular plants, and fauna, transplants may be placed into sites with both biological and physical insufficiencies. Genetic diversity may be lost or, if genotypes from diverse sources are mixed, utbreeding depression may result. Recent advances in soil science, microbial ecology, and opulation genetics have in some cases improved the effectiveness of transplantation, but new insights mainly permit a fuller appreciation of the causes of failure. Home-site advantage has been demonstrated, and habitat protection appears to be the best and perhaps only reliable way of preserving intact natural communities and rare species. Furthermore, experimentation with vegetational mats under controlled conditions may have little relevance to natural ecosystems. … *Fahselt 2007*

A brief survey of the literature indicates that there is no scientific basis for the assumption that a self-sustaining and fully diverse alvar ecosystem can be created or fully repaired following serious damage. Consequently it is much better to protect an existing alvar than to use creation elsewhere, or full repair, as an excuse to allow damage. Although conservation may be well served by establishing some alvar species *ex situ* and in partially restored areas, at present the best way of protecting alvar diversity is through a well-planned system of protected natural sites of high quality. … *Catling 2013*

… it is extremely difficult to demonstrate scientifically that transplanting will succeed. Without the appropriate data, predictions of success are really nothing more than guesses and therefore transplanting cannot be considered a straightforward solution to preserving rare plants. … *Keddy 1983*