Endangered Plants at the Garden in the Woods: Problems and Possibilities

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The special difficulties of raising endangered nonwoody species in a botanic garden evoke information on how to preserve the same species in their natural habitats.

As members of the recently formed Center for Plant Conservation (CPC), the Arnold Arboretum and the Garden in the Woods (the botanic garden of the New England Wild Flower Society) face similar challenges in their attempts to propagate and raise endangered plant species. It should be made clear from the beginning, however, that raising endangered plants in a botanic garden ("ex situ conservation") is not a substitute for protecting them in their natural habitats ("in situ preservation"). Botanic gardens must not find themselves in the predicament zoos are in—holding collections of creatures that can no longer exist in the wild because their habitats are gone. Rather, botanic gardens should emphasize to their visitors that preserving its habitat is the single most important way to preserve a species, and that the role of a botanic garden is to complement, not to substitute for, preserving plants in the wild.

Yet both gardens can play significant roles by conducting research on the reproductive biology and potential of endangered plants, as well as by creating valuable reserve collections that could be used for reintroduction should wildlife biologists ever deem it necessary to do so. However, I feel that our most important role is educating the public to the fact that plants are endangered (overwhelmingly because of disturbance by man), gardens will be serving the cause of conservation.

The Problems and the Challenges

But what are the problems both gardens will face in holding collections of endangered plants? The biggest problem will be to select and maintain in perpetuity the widest possible degree of genetic variability of each species. We will be attempting to preserve their genetic integrity for an indefinite period of time, so that the plants growing in our collections twenty, fifty, or a hundred years hence will be essentially the same genetically as the plants in the wild.

In practice, this may not be totally possible to do. In the first place, any sample of seeds collected from the wild, even with the most judicious sampling, will not contain all of the genetic variability inherent in a species throughout its entire range. However, we should be able to capture a very high proportion of the variability since it has been shown (Primack, 1980) that even small populations of rare plants contain a great deal of genetic variability.

It is after the seeds have been collected that the real problems arise. We must then germinate 100 percent of the seeds so that none of the genetic variability is lost; otherwise, we will select for those seedlings that can survive under our cultural conditions, which may be quite different from those in the wild.
Realizing that some loss is likely to occur, CPC has wisely arranged to have a large portion of the collected seeds stored in a seed bank under cold, dry conditions, which will maintain the viability of most seeds for long periods of time.

Siting the New Species

Once the plants are grown to proper size, they will be placed in the collections. Exactly where they are placed will be a matter for some consideration. They should, of course, be planted where they will have the best chance of surviving and, if possible, where they will be available to visitors. However, there are other factors to consider. To reduce the chance of hybridization, endangered plants ideally should be located far from other species that might hybridize with them. Because there may be similar (or, in fact, identical) species already present in the garden’s collection, hybridization may occur, meaning that seedlings growing near the endangered species could be very different from the parent plants.

With woody species, the focus of the Arnold Arboretum’s collections, it should be possible to collect any seedlings that persist so as to maintain the genetic integrity of the collection. With the herbaceous species that make up the bulk of the collection at the Garden in the Woods, the process of collecting seedlings will be similar, but much greater vigilance will be required of us because the seedlings will become mature plants quickly and may then be indistinguishable in morphology from their parents.

One way around this problem would be to remove the flowers before seeds are set, but the seeds are a valuable source of research material, and we would like to avoid the laborious maintenance task of removing flowers. Another possibility would be to maintain only material of a species from a single wild source. This might mean having to remove plants if the same species, already present in the Garden in the Woods, were not as well documented as the new CPC material.

The Tennessee Coneflower

Surprisingly, some endangered species are proving easy to cultivate. Echinacea tennesseensis, the Tennessee coneflower, has proven very successful under cultivation. In the wild, it grows over limestone, in openings in the cedar glades of Tennessee, where the soil is too thin to support trees. In the wild, it is a low plant, but in rich soil at the Garden in the Woods it becomes much more robust.

Other species may not be so easy to cultivate, particularly the native terrestrial orchids and plants that are semiparasitic or sapro-
phytic. Furthermore, because they would have to be maintained and continually repropagated for the Garden's collection, annual and biennial species probably can be conserved best in seed banks.

Information Applicable to In Situ Preservation

One aspect of the cultivation of endangered species in botanic gardens that is valuable to wildlife managers is the information generated by the successful propagation and cultivation of a species. If we are able to raise an endangered plant in the controlled environment of a botanic garden, questions arise for the botanist monitoring the same species in decline in the wild. Is the decline of the species due solely to destruction of its habitat, or has the habitat been changed, allowing stronger competitors to get a foothold? Perhaps the pollination and dispersal mechanisms are not successful, or the conditions necessary for the establishment of seedlings are no longer present. It is very possible that we may raise more questions for biologists than we answer.

But we can also provide valuable information on species biology. For instance, Helonias bullata, the swamp pink, is an attractive member of the lily family that grows in open, wet places, primarily in the eastern United States. In May, it sends up a flower spike that resembles a pink drumstick on a two-foot stalk. Plants grow slowly into large clumps. Plants of Helonias bullata at the Garden in the Woods set copious amounts of seeds. Research has taught us that germination drops off sharply if the seeds are allowed to dry out after they have been collected, although some of them may germinate as many as nine months after collection. It has also taught us that the seeds should not be covered with the germination medium after sowing and that the best germination was achieved by placing each flat of freshly sown seeds in a tray of water. Seedlings appear approximately three weeks after sowing and resent any disturbance until they have attained a reasonable size. The plants need three to five growing seasons to mature, and some may not bloom for several years more.

This information could give valuable clues to a wildlife biologist who is following Helonias bullata. If a wild population declines, perhaps it is because water levels have been changed so that seedlings receive too little or too much moisture. Perhaps other disturbances make it difficult for seedlings to develop. Furthermore, because we know that plants need a relatively long period of time to mature, this information may hold implications for a population of only one or two blooming plants and a few seedlings.

Thus, by working with an endangered plant in a botanic garden we can help biologists manage wild populations. Furthermore, we have developed the techniques to propagate a particular genotype for return to the wild should that be deemed advisable, and have built up a reserve collection in case of catastrophe.

This year we will be collecting seeds for the CPC collection from various species throughout New England. We hope that the resulting new plants will become permanent additions to the Garden in the Woods and that we will be able to admire them and to learn more about endangered species in general.

Reference


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