

Conserving Our Native Orchid Heritage – The What, How and When Behind the North American Orchid Conservation Center

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Introduction

ORCHIDS are one of — if not the most — diverse plant families on earth with an estimated 25,000+ species and orchids are in trouble all over the world (Dixon *et al.*, 2003). Most orchid diversity occurs in the tropics and subtropics where the majority of species are epiphytic. If, however, you need to be convinced about the diversity and beauty of orchids in temperate climates, take a visual trip to southwestern Australia (*link to this and other web sites provided after Acknowledgments*) or the Bruce Peninsula in Ontario Canada. If you are more interested in temperate zone terrestrial orchids in a garden setting, check out the fantastic display of orchids at the Gerendal reserve in Limburg, The Netherlands. Of course, a personal visit to any of these sites and many others is far more fulfilling than the images that you will find on the links to the web sites! Numerically, the U.S. and Canada have a relatively small number of native orchid species, about 210 (Krupnick *et al.*, in press), but they include a relatively large number of genera that have only 1-3 species. Not unexpectedly, Florida has the highest orchid diversity because parts of the state have a subtropical climate that enables epiphytic and hemi-epiphytic orchids to survive and prosper in addition to terrestrial orchids.

Other than the rich diversity that occurs across a wide range of habitats from Florida to Alaska, what is most important about orchids native to the U.S. and Canada from a conservation perspective is that more than half of the species are listed by one organization or another as being endangered, watch listed, threatened, etc. Figure 1, page 31, demonstrates that every state has at least one threatened orchid species; indicating that the factors responsible for their decline are widespread across a range of habitats. Clearly not everything has been going well for our native orchids. There are a variety of reasons why orchids are prone to becoming threatened. Many species have small and scattered populations and the loss of many individuals or populations through habitat loss poses a threat. Many orchids have specialized pollinators that are themselves often threatened or endangered and when they are not available to polli-

nate orchids, orchid population cycles are disrupted. Most important, all orchids have essential relationships with mycorrhizal fungi and when the fungi are not present, orchids cannot survive (Rasmussen 1995). These and other interrelated factors demonstrate that there is a real need for a focused and large-scale effort to conserve our native orchid heritage (Swarts and Dixon 2009).

Orchid Conservation

Orchid conservation in the U.S. and Canada has and continues to be a focus of individuals and organizations and some of the efforts are beginning to produce exciting results. For example, Larry Zettler and his colleagues and students at Illinois College have established the Orchid Recovery Program and are involved in efforts to conserve and restore native orchids from the mid-west to Hawaii and Florida. Their efforts have reached the stage where they have planted orchids that were grown in the laboratory and greenhouse into their native habitats (e.g., Zettler *et al.*, 2011a, Zettler and Perlman, 2012). Michael Kane has established a facility at the University of Florida (Plant Restoration, Conservation, and Propagation Biotechnology Program) that includes orchid research and conservation. In addition to individual and university efforts to restore native orchids (e.g., Kauth *et al.*, 2010), several botanic gardens (e.g., Chicago Botanic Garden, Atlanta Botanical Garden – Richards and Cruse-Sanders, 2010) have started programs designed to grow and restore native orchids. A variety of public and federal programs have focused on understanding the ecology and the restoration of threatened and endangered native orchids species such as *Platanthera praeclara*, *P. leucophaea* and *Isotria medeoloides* (Alexander *et al.*, 2010a, 2010b; Zettler *et al.*, 2005; Zettler and Piskin, 2011; Brumback *et al.*, 2011).

While these and other efforts (e.g., Stewart and Hicks, 2010) to conserve orchids are important and will undoubtedly continue, the individuals and organizations that are involved in orchid conservation also are engaged in other non-orchid conservation, educational, research and conservation activities. No organization is entirely focused on the conservation of native orchids in the U.S. and Canada; even though there is clearly a need to focus on a plant family in which more than half of the species are in trouble. Without a focused and large-scale effort, our native orchid heritage will be in greater and greater peril and the list of species for which there have been or are conservation efforts (Stewart and Hicks, 2010; Krupnick *et al.*, in press) will continue to be only a small percentage of the total number of species in the U.S. and Canada.

The North American Orchid Conservation Center

In an effort to provide a national focus on the conservation of native orchids, the Smithsonian Institution (SI) and the U.S. Botanic Garden (USBG) have

collaborated to establish the North American Orchid Conservation Center (NAOCC). Krupnick *et al.* (in press) have summarized the status of orchid conservation in North America, in the context of how well we are doing as per international guidelines for conservation established by the International Union for Conservation of Nature, and they have given an overview of NAOCC. In this contribution, I expand on the information about NAOCC presented in Krupnick *et al.* to provide an update on NAOCC activities and future directions. The goals of the contribution are to spread-the-word about NAOCC and, most importantly, encourage you to join NAOCC efforts individually or through one of the current NAOCC partner organizations.

WHAT IS NAOCC?

NAOCC is a private-public partnership that was established by the Smithsonian Institution and the U.S. Botanic Garden with a mission to **conserve orchids native to North America**. NAOCC has established an initial set of long-term goals:

- Develop a national seed bank that will be representative of the genetic diversity of all native orchids in the U.S. and Canada,
- Develop a national collection of fungi that will be representative of the genetic diversity of mycorrhizal fungi required by native orchids,
- Use seed and mycorrhizal fungus banks to develop techniques for conserving, cultivating, and restoring orchids in native habitats,
- Develop techniques to conserve the genetic diversity of all native orchids by cultivating them in a national network of botanic gardens and arboreta,
- Support efforts to conserve orchid populations through habitat conservation and restoration,
- Develop web-based material that will provide up-to-date information on the ecology, conservation status, and techniques for the cultivation of native orchids.

Fulfilling the mission of NAOCC and reaching the goals will not be easy. It will take resources, both human and financial, persistence, education, and lots and lots of collaboration among and between individuals and organizations. While reaching the NAOCC goals will be difficult, success is essential if we are to conserve our native orchid heritage. Anything less than a focused and

large scale national effort will assure that endangered orchids will continue to decline and disappear at a faster rate than the number of species that will be saved through the current pace of orchid conservation.

HOW WILL NAOCC DEVELOP?

Initial funding for NAOCC came out of a new effort (Smithsonian Grand Challenges Consortia; <http://www.si.edu/consortia>) at the Smithsonian. I joined with SI colleagues Barbara Faust (Smithsonian Gardens), Gary Krupnick and John Kress (National Museum of Natural History), Melissa McCormick (Smithsonian Environmental Research Center) and Frank Clements (National Zoological Park) and Holly Shimizu, Director of the United States Botanic Garden (USBG), to obtain two successful grants to design and begin the initial stages of NAOCC development. Smithsonian support has been matched by the USBG and NAOCC has received the first donations from orchid groups that have learned about our intentions and efforts (Native Orchid Conference, Inc; New Hampshire Orchid Society). These initial sources of funding have allowed NAOCC to take the first small steps toward reaching our goals while also actively identifying potential sources of funding to assure success in the long-term.

I envision that NAOCC success will be assured through a combination of gifts to support specific purposes and development of an endowment that will provide basic long-term funding of essential program elements. NAOCC staff and partners will also actively seek grants to conduct research on important issues related to orchid life cycles and orchid habitats – including fungal ecology. NAOCC resources will be used to provide opportunities for collaboration and participation by individuals and organizations, and we will actively train students and educate the public. NAOCC financial resources will also support efforts to cultivate, propagate, conserve and, when appropriate, restore native orchids.

The current structure of NAOCC consists of a small volunteer group that has been guided by an internal (*i.e.*, SI and USBG) committee and by input from NAOCC partners and leading individuals in the areas of orchid ecology, propagation, and conservation. Initially NAOCC developed partnerships with a small group of botanical gardens and conservation organizations in order to proceed slowly, carefully and successfully. Initial botanical garden partners are the New England Wild Flower Society, Mt. Cuba, Duke Farms, Smithsonian Gardens, U.S. Botanic Garden, Atlanta Botanical Garden, Chicago Botanic Garden, Alaska Botanical Garden, and the Desert Botanical Garden. Over the next two years NAOCC will expand the network of partner organizations to include botanical gardens in all regions of the U.S. and Canada. In addition to botanical gardens, NAOCC has also started to develop partnerships with con-

ervation-focused groups (e.g., Center for Plant Conservation, The Nature Conservancy, NatureServe). The Nature Conservancy is also representative of organizations that own or manage large areas that serve as home to most of the native orchids. Over the next few years, NAOCC will establish working relationships with all of the large federal agencies that are obligated to manage native orchids on property that they manage (e.g., Bureau of Land Management, Department of Defense, U.S. Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service). Active NAOCC partnerships will also be established with the state heritage programs and equivalent organizations in Canada.

We are using initial NAOCC funding resources to develop a public NAOCC web site that will provide background information on our goals and objectives while providing up-to-date information on our activities and those of our partners. We hope that by the time this article appears, the NAOCC web site will be up and running and will become a place that you visit regularly to follow and participate in NAOCC. A second major web-based activity, to be developed over the next 2-3 years, will be an interactive web site that will be accessible through computers, tablets, and smart phones. The web site will enable anyone to identify native orchids – in the field - and be linked to all information available for each native orchid species; including what is known about their ecology, whether or not they are being cultivated, etc. If you want a preview of the types of things you will be able to do on the interactive web site, go to the orchid portion of the *Go Botany* web site. *Go Botany* was recently launched by the New England Wild Flower Society (NEWFS). The interactive NAOCC web site will be developed in collaboration with NEWFS and, when it is launched, it will initially consist of orchids of New England and the Mid-Atlantic region with orchids of Alaska and the southeastern U.S. to quickly follow.

In June (2012), NAOCC held its first workshop at the Smithsonian Environmental Research Center. The partner organizations listed above and individuals (Larry Zettler, Illinois College), organizations focused on orchids or orchid mycorrhizae (e.g., Lynn Sigler, Curator of the University of Alberta Microfungal Collection and Herbarium), and organizations focused on conservation through seed and fungal banking and storage activities (e.g., Megan Haidet, Bureau of Land Management, Seeds for Success; Aaron Kennedy, USDA APHIS program that maintains a national fungal collection) discussed NAOCC development and goals. One outcome of the workshop is the establishment of working groups that will set goals and procedures for the first four major activities to be initiated: seed bank, fungal bank, growing orchids, interactive web site. There is not enough space in this contribution to provide details of each of the activities but planning for the establishment and work of each committee are underway and will be the major focus of NAOCC in the remainder of 2012 and into 2013.

There are many other themes that could be included in this article as there are many compelling reasons why we need to have a national focus on native orchids. Orchids are, for example, the equivalent of the canary-in-the-coalmine of the plant world. Most orchid species consist of small populations that are in delicate balance with other elements of the ecosystem. Especially important are the interactions that occur between orchids and fungi. Fungi are critical elements of several life history stages of orchids and orchids will not survive in nature if the appropriate fungi are not present (Rasmussen, 1995; McCormick *et al.*, 2006). Orchids and their fungi are thus indicators of ecosystem health. If we are able to sustain healthy ecosystems and restore ecosystems to orchid-health we as a species will also be better sustained by the goods and services that are provided for free by those ecosystems.

HOW YOU CAN HELP?

We seek your help and support in making the goals and objectives of NAOCC a reality. Once NAOCC is fully operational, for example, individuals and groups can assist by helping collect plant material for genetic analysis, collecting seeds for the seed bank and collecting roots for isolation and growing orchid mycorrhizal fungi for the fungal bank – as well as providing the fungal material for fungal identification. Equally important, NAOCC will provide opportunities for individuals and groups to assist in monitoring native orchids to provide important information that is rarely available. Wouldn't it be great to say in a couple of decades that we have successfully assured the survival of our part of the most diverse group of plants on earth? You can view a video that explains much of what is written here at the following YouTube site: <http://www.youtube.com/watch?v=BB0NIYvOOJM>.

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Links to web sites listed in the text

Orchids of southwest Australia: http://images.search.yahoo.com/search/images:_ylt=A0PDoX9cEkJQQzYAmy6JzbfF?p=western+australia+orchis&fr=yfp-t-701&ei=utf-8&n=30&x=wrt&vm=r

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