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Establishment of a new genebank for herbaceous ornamental plants

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Summary

Establishment of a new genebank for herbaceous ornamental plants

This paper summarizes the establishment and development of the new Ornamental Plant Germplasm Center (OPGC) of the US National Plant Germplasm System (NPGS), its initial accomplishments, and future plans. We recount its genesis from a concept to the signing of a Special Cooperative Agreement (SCA) in 1999 between the United States Department of Agriculture (USDA) and The Ohio State University (OSU). The roles of the NPGS Herbaceous Ornamental Crop Germplasm Committee (HOCCG), the creation of an OPGC Ad-hoc Advisory Committee in shaping the foundation of the OPGC leading to the appointment of an interim centre programme director, and the employment of the centre director and curator are described. The Center was officially inaugurated in July 2001. At this initial stage of the Center's development, a decision was made to concentrate initial efforts mainly on four economically important genera (*Begonia*, *Impatiens*, *Petunia* and *Pelargonium*). To date, 966 accessions of herbaceous ornamental species conserved at other NPGS repositories have been transferred to the OPGC and more than 700 new accessions have been acquired. The accomplishments of the past two years of operation are highlighted, and the first year annual report is posted on the OPGC Web site: <http://opgc.osu.edu>.

Key words: *ex situ* conservation, germplasm management, National Plant Germplasm System, ornamental plants

Résumé

L'établissement d'une nouvelle banque de genes pour les plantes ornamentales herbacées

Cet article décrit l'établissement et le développement du nouveau Centre du Matériel Génétique Végétal Ornamental (OPGC, en anglais) du Système National du Matériel Génétique Végétal des États-Unis (NPGS, en anglais), ses accomplissements initiaux, et ses desseins futurs. Nous racontons sa genèse depuis un concept jusqu'à l'achèvement d'un accord coopératif spécial (SCA, en anglais) entre le Département d'Agriculture des États-Unis et l'Université de l'État du Ohio. Les rôles du Comité pour Matériel Génétique des Récoltes Ornamentales Herbacées du NPGS (HOCCG, en anglais) et l'établissement d'un Comité Consultatif ad-hoc pour le Centre en formant le fondement du OPGC, menant à la nomination d'un Directeur d'intérim et l'emploi du Directeur permanent et le Conservateur, sont élucidés. Le Centre a été inauguré en juillet 2001. À cette première étape du développement du Centre, une décision a été prise pour concentrer des efforts initiaux principalement sur le supérieur peu de genres (*Begonia*, *Impatiens*, *Petunia*, and *Pelargonium*). Jusqu'ici, 966 accessions des espèces ornamentales herbacées, conservées à d'autres depots du NPGS ont été transférées au Centre et, plus de 700 nouvelles accessions ont été acquises. Les accomplissements des deux dernières années de l'opération sont accentués, et le rapport annuel de première année est signalé sur le web site du Centre : <http://opgc.osu.edu>.

Resumen

Establecimiento de un nuevo banco de germoplasma para plantas ornamentales herbáceas

Este documento resume el establecimiento y desarrollo de el nuevo Centro de Germoplasma de Plantas Ornamentales (OPGC siglas en Inglés) de el Sistema Nacional de Germoplasma Vegetal (NPGS, siglas en Inglés) de los Estados Unidos, así como sus logros iniciales y sus futuros planes. Nosotros describimos su generación bajo el concepto de un Acuerdo Cooperativo Especial (SCA, siglas en Inglés) en 1999 entre el Departamento de Agricultura de los Estados Unidos (USDA) y Ohio State University (OSU). Se señala el papel de el Comité de Germoplasma de Cultivos Ornamentales Herbáceos (HOCCG, siglas en Inglés) de el NPGS, también se aborda la creación de un Comité de Consejo propio para el OPGC para mostrar la naturaleza de la fundación de el OPGC, la designación de un director interino de programa en el centro y el empleo de el director y encargado del centro. El centro fue inaugurado oficialmente en julio del 2001. En la etapa inicial de desarrollo del centro se tomó la decisión de concentrar los esfuerzos iniciales en pocos géneros (*Begonia*, *Impatiens*, *Petunia* y *Pelargonium*). A la fecha 966 accesiones de especies herbáceas ornamentales conservadas en otras instalaciones de NPGS han sido transferidas a el OPGC y además, más de 700 accesiones nuevas han sido adquiridas. Los logros de los pasados dos años de operación son resaltados y el reporte anual de el primer año está disponible en la página electrónica del OPGC : <http://opgc.osu.edu>.

Introduction

The National Plant Germplasm System (NPGS) of the United States comprises a network of sites that cooperatively manage extensive collections of plant genetic resources of agronomic and horticultural crops and their wild and weedy relatives (White et al. 1989; Shands 1995). For much of its history, the NPGS lacked comprehensive collections of herbaceous ornamental plants. In 1999 an agreement between the

United States Department of Agriculture—Agricultural Research Service (ARS) and The Ohio State University (OSU) established and funded a new management site, the Ornamental Plant Germplasm Center (OPGC), as an integral part of the NPGS.

This paper presents a historical overview of the development of the OPGC, its initial accomplishments and

future plans. Beyond serving as historical documentation, we hope this information provides useful advice for researchers or institutions considering the establishment of new genebanks.

Genesis

The concept of a national collection of herbaceous ornamental plants within the United States came about indirectly, as a result of a 1977 decision by the OSU Board of Trustees to establish the D.C. Kiplinger Chair in Floriculture shortly after the death of Dr Kiplinger, a distinguished scientist who had served on OSU's floriculture faculty since 1937. The Chair was created as a temporary, rotating position to be filled by individuals with a record of significant achievements in the field of floricultural education and research.

The first appointee to the Kiplinger Chair, Dr H. Marc Cathey (1980–81), recommended the establishment of a national germplasm collection and conservation programme for herbaceous ornamentals as an important tool for meeting future floricultural needs (Cathey 1981), but his recommendation was not acted on. In 1992, representatives of two trade associations, the Society of American Florists (SAF) and the American Nursery and Landscape Association (ANLA), began a coordinated effort to assemble information on the need for federal funding for ornamental crop research and presented that information to the US Congress. This was supported by a report by Cathey (1993) that again identified the need for an ornamental plant germplasm centre.

In 1995, two faculty members at OSU proposed that OSU act upon Cathey's (1981) recommendations by establishing a new centre within the University structure, and that such an effort be built upon a partnership among OSU, the NPGS and the floricultural industry (Anonymous 1996). A team of OSU faculty members with research interests in floriculture and seed biology was assembled. During 1996, plans for the centre were communicated to the Ohio Florists' Association (OFA), which brought them to the attention of the leadership of the ARS, SAF and ANLA. At the end of 1996, OSU's plans were included as a key part of a larger funding proposal for federal research support that SAF and ANLA presented to Congress.

These diverse efforts by trade associations and academia, and strong support from within USDA, led to the creation of the Floriculture and Nursery Research Initiative, which was included in the Federal budget being debated by Congress during the winter of 1997–98 for the fiscal year beginning 1 October 1998. One of the stipulations of the Initiative was that a centre for ornamental plant germplasm conservation be established in Ohio and that funding for the new centre be directed through the ARS.

State of herbaceous ornamental germplasm conservation within NPGS prior to establishment of OPGC

Prior to the establishment of the OPGC, the NPGS maintained only relatively small collections of herbaceous ornamental plants dispersed across various locations (Table 1). These

genebanks typically did not include curatorial personnel with floricultural expertise. Limited professional relationships between these personnel and the floricultural research community provided no effective stimulus for collection development and usage.

During the 1980s, the NPGS established 40 crop-specific committees made up of experts from academia, private industry, public gardens and governmental agencies to help improve communications between germplasm managers and users and to involve external expertise in germplasm evaluation and utilization. These Crop Germplasm Committees (CGCs) have been instrumental in developing descriptor lists for evaluation (Roath 1989), identifying acquisition and regeneration needs and improving dissemination of information about germplasm collections and their value (Shands 1995).

As part of that effort, in 1988 the NPGS established a CGC specifically for herbaceous ornamental plants. The Herbaceous Ornamental CGC (HOCGC) initiated an ambitious project to develop germplasm status reports for 24 of the most important genera of herbaceous ornamental plants. Those status reports (Herbaceous Ornamental Crop Germplasm Committee 1995) helped document germplasm collections held outside of the NPGS, identify experts and set crop-specific priorities.

During the 1980s and 1990s, HOCGC members met annually with NPGS curators and administrators to discuss management of existing collections and to evaluate pertinent exploration and evaluation proposals. Once federal funding was appropriated for the OPGC in 1998, the HOCGC turned much of its attention to technical issues and reports related to the creation of this new site. A subcommittee specifically for OPGC activities was established to integrate many of the activities of the Ad-hoc Advisory Committee described in the next section.

Development of the Ad-hoc Advisory Committee

In 1999 an Ad-hoc Advisory Committee for the OPGC was established with members from the floricultural industry, academia, government and pertinent trade associations. By mid-July 1999, a mission statement for the OPGC was developed. The Committee defined the Center's main functions as the acquisition, maintenance, characterization, and distribution of herbaceous ornamental plant germplasm and appropriate research, outreach and publicity efforts. To help focus initial efforts, given the great diversity of herbaceous ornamental plants, the Committee created a list of 25 genera with current or potential significant economic importance as targets for the Center's first efforts.

A strong partnership among federal government agencies, the OSU, the floricultural industry and research community was deemed essential to ongoing support for the OPGC and its long-term success. To inform stakeholders of progress, articles were published in trade journals and newspapers. In coordination with the Ad-hoc Advisory Committee's

Table 1. NPGS collections of herbaceous ornamentals and their maintenance sites in the mid-1990s prior to the establishment of the OPGC

Genus	No. accessions	NPGS maintenance site
<i>Adonis</i>	4	Ames, Iowa
<i>Alcea</i>	9	Ames, Iowa
<i>Alchemilla</i>	3	Ames, Iowa
<i>Althaea</i>	2	Ames, Iowa
<i>Anemone</i>	2	Ames, Iowa
<i>Baileya</i>	1	Ames, Iowa
<i>Baptisia</i>	2	Ames, Iowa
<i>Begonia</i>	14	Griffin, Georgia
<i>Begonia</i>	2	Ames, Iowa
<i>Calendula</i>	14	Ames, Iowa
<i>Caltha</i>	1	Ames, Iowa
<i>Campanula</i>	5	Ames, Iowa
<i>Catananche</i>	1	Ames, Iowa
<i>Cheiranthus</i>	2	Ames, Iowa
<i>Chrysanthemum s.l.</i>	85	Ames, Iowa
<i>Coleus</i>	10	Ames, Iowa
<i>Consolida</i>	4	Ames, Iowa
<i>Delphinium</i>	10	Ames, Iowa
<i>Dianthus</i>	65	Ames, Iowa
<i>Duchesnea</i>	3	Ames, Iowa
<i>Echinacea</i>	1	Ames, Iowa
<i>Geranium</i>	2	Ames, Iowa
<i>Gypsophila</i>	7	Ames, Iowa
<i>Helianthella</i>	1	Ames, Iowa
<i>Helichrysum</i>	1	Ames, Iowa
<i>Hemerocallis</i>	1	Ames, Iowa
<i>Hesperis</i>	1	Ames, Iowa
<i>Iliamna</i>	2	Ames, Iowa
<i>Impatiens</i>	2	Ames, Iowa
<i>Iris</i>	1	Ames, Iowa
<i>Kitabelia</i>	1	Ames, Iowa
<i>Knautia</i>	1	Ames, Iowa
<i>Lapeirousia</i>	1	Ames, Iowa
<i>Lavatera</i>	8	Ames, Iowa
<i>Liatris</i>	2	Miami, Florida
<i>Liatris</i>	5	Pullman, Washington
<i>Lilium</i>	11	Ames, Iowa
<i>Lythrum</i>	1	Ames, Iowa
<i>Malope</i>	1	Ames, Iowa
<i>Malva</i>	9	Ames, Iowa
<i>Malvastrum</i>	1	Ames, Iowa
<i>Mimulus</i>	2	Ames, Iowa
<i>Paeonia</i>	1	Ames, Iowa
<i>Penstemon</i>	41	Ames, Iowa
<i>Petunia</i>	101	Fort Collins, Colorado
<i>Peperomia</i>	1	Ames, Iowa
<i>Phlox</i>	1	Ames, Iowa
<i>Potentilla</i>	13	Ames, Iowa
<i>Sanvitalia</i>	12	Ames, Iowa
<i>Scilla</i>	1	Ames, Iowa
<i>Simsia</i>	1	Ames, Iowa
<i>Sphaeralcea</i>	2	Ames, Iowa
<i>Tithonia</i>	4	Ames, Iowa
<i>Tulipa</i>	3	Ames, Iowa
<i>Verbena</i>	4	Ames, Iowa
<i>Verbena</i>	19	Fort Collins, Colorado
<i>Viola</i>	2	Ames, Iowa
<i>Zinnia</i>	56	Ames, Iowa
<i>Zinnia</i>	26	Fort Collins, Colorado

Source: Herbaceous Ornamental Crop Germplasm Committee (1995), and a list of ornamental genera in Roath et al. (1990)

activities, meetings were conducted in Ohio which included a diverse group of university academics, administrators and ARS staff to develop interest in the OPGC and expand the possibilities for cooperation. Informational sessions about the new centre were also held at the Ohio Florists' Association Short Course, one of the largest educational and trade-show programs for floriculturists in the US. Finally, the Ad-hoc Advisory Committee recommended the appointment of an interim programme director for the OPGC to provide leadership and bridge the transition from concept to reality. The actions and recommendations of the Ad-hoc Advisory Committee allowed the OSU to take quick action upon its receipt of federal funding earmarked for the OPGC.

Negotiation of a Specific Cooperative Agreement between ARS and OSU

During 1999, ARS and OSU developed a Specific Cooperative Agreement (SCA) that defined overall project objectives, described the areas of mutual interest, the general approaches to be taken and the responsibilities of the parties for specific aspects of the work and provided a detailed budget including in-kind contributions by both parties. In the SCA, the parties agreed to create the OPGC as a new active management site within the NPGS specifically for herbaceous ornamental plants, with pre-existing NPGS collections to be identified and transferred to the new site. The OPGC would include medium-term, seed storage facilities along with those required to maintain clonally propagated accessions. OSU agreed to provide rent-free space and facilities. Under the SCA, all OPGC employees would be employed by OSU, including positions supported internally by OSU, those funded through the transfer of federal funds via the SCA, and those supported by external sources. ARS agreed to make specialized equipment available to the OPGC, provide consulting services from other NPGS sites, transfer herbaceous ornamental collections from other sites, and provide appropriate training to OPGC personnel to facilitate integration.

A strong emphasis was placed in the SCA on the establishment of a close working relationship between the OPGC and NPGS. This has been key in acquainting OPGC staff with the standards and practices of the NPGS, such as operational protocols developed at other NPGS sites, participation in system-wide coordinating activities, use of the Germplasm Resources Information Network (GRIN) database (Bird 1994), and collaboration with the National Center for Genetic Resource Preservation (NCGRP) in Fort Collins, Colorado, which manages the base collection for the entire NPGS (Shands 1995).

Description of initial resources for OPGC

An interim director for OPGC (James L. Corfield) was appointed in November 1999. OSU gave the OPGC the use of an existing campus building known as the Biocontainment Building and made improvements to the electrical, plumbing,

communications, water and air-quality systems of both the building and its attached greenhouse complex needed for it to function as a genebank.

The interim director met with faculty, staff, and administrators on the OSU campuses at Columbus and Wooster, Ohio, and with ARS liaisons to begin building effective working relationships and gain information about equipment, including type, specifications and preferred sources or manufacturers. Lists of necessary start-up equipment were prepared, sources contacted, inquiries made and purchase orders issued.

Position descriptions for a director and a curator were drafted and salaries within the OSU personnel system were negotiated. Agreements were reached in approximately six months, and hiring searches initiated. Interviews were held in November 2000 and the selected candidates (Dr David C.S. Tay as OPGC Director and Ms Susan M. Stieve as OPGC Curator) took up their posts in May and March of 2001, respectively.

In order to communicate the nature of the OPGC and progress to stakeholders in the university community, ARS, government and the floriculture industry, the broad-based publicity programme begun by the Ad-hoc Advisory Committee was expanded by the interim director with written and oral presentations, the issue of press releases leading to articles and interviews with newspapers and trade publications, and brochures prepared for distribution. These activities, combined with extensive personal interactions, were essential to creating an image and presence for the new OPGC.

Major accomplishments

Objectives

The most important tasks of the director on assuming duty in May 2001 were to further develop the OPGC mission statement, establish goals and objectives, and develop an implementation plan. The plan was approved by the HOCGC at its annual meeting in July 2001 during the OPGC's official inauguration. The revised mission statement is "to conserve and nurture the world wealth of herbaceous ornamental plant diversity by systematically saving, assessing and using it to bring happiness and health to humankind, and to promote awareness in herbaceous ornamental crop germplasm conservation." The stated goal is to develop the OPGC into the world's leading herbaceous ornamental plant genebank and a 'centre of excellence' in floricultural germplasm conservation and research. The OPGC's main objectives are:

- to establish a world-class herbaceous ornamental plant genebank as an integral component of NPGS;
- to build a network of cooperators from the horticultural industry, universities, USDA, botanic gardens and arboreta, crop specific societies and individuals both in the United States and the world;
- to establish a system that promotes industry-oriented collaborative research to enhance germplasm utilization;
- to institute academic programmes and industrial short courses in floricultural germplasm conservation.

The three main functions of the OPGC are to serve as: (1) a service provider to collect, conserve, characterize, evaluate, document and distribute herbaceous ornamental germplasm; (2) a research hub in floricultural germplasm and conservation research to develop more efficient and effective germplasm management systems, new techniques to conserve seed and clonally propagated germplasm, and germplasm enhancement; and (3) an educational focal point to provide training and public awareness in the *ex situ* conservation of herbaceous ornamental plants. Expected benefits of the OPGC to the floricultural industry and consumers include access to unique genetic materials essential for the improvement of our present and future floricultural crops. These materials serve as sources of genes for pest and disease resistance, may enable reduction of production inputs, and provide better consumer product-appeal.

At this stage, a three-phase development plan (Table 2) was formulated based on the needs of floricultural producers, technical considerations, and available resources. This plan has served as a useful framework for activities in the two years since its formulation in 2001. A strategic planning session conducted in July 2002 established implementation-plan priorities for 2003 and 2004 (see 'Future plans and directions' in this report).

Staff development and networking

Staff development and networking with other institutions and individuals are high priorities. The OPGC is organized based on seed and clonal curation with a curator and a research assistant that work together as a team. A second team for the conservation of clonally propagated crops is currently being developed. Genebanking protocols are divided into two main categories: first, the physical activities which include acquisition, post-entry quarantine, multiplication, characterization, evaluation, identification of duplicates, accessioning, seed processing, viability testing, packaging, storage and distribution, and second, the data-

documentation activities necessary for managing the flow of accessions and associated information into and out of the OPGC, and documenting the status of utilization and distribution. GRIN is used to store and manage germplasm passport, characterization, evaluation, taxonomic, inventory and distribution data. The USDA policy of free distribution and exchange of germplasm to both public and private, bona fide researchers, both domestic and international, is applied.

An annual report was published on the progress made in the first year of operation (OPGC 2002). Presentations were made at numerous international and domestic meetings, including the 2002 ISHS International Horticultural Congress (Tay 2003a), the 2003 International Master Gardeners Conference, the 2003 National Floriculture Forum, the 2002 American Association of Botanic Gardens and Arboreta Annual Conference, the Chicago Botanic Garden New Ornamental Crop Symposium, the OFA Short Course, and the American Seed Trade Association Vegetable and Flower Seed Conference. An informational brochure and bookmarks were created and distributed at both local and national meetings and conferences. A Web site (<http://opgc.osu.edu>) was designed to highlight the OPGC's activities.

Facilities development

The former Biocontainment Building has been remodeled to include a 25 000-accession capacity, seed-storage cooler operating at 2–5°C and ca. 30% relative humidity and a seed-research laboratory with a seed-conditioning room. The seed-research laboratory is equipped with a thermogradient germinator, two accelerated-aging, water-jacketed incubators, four germinators, two microscopes and a complete set of modern seed-testing equipment. The seed-conditioning room is equipped with a laboratory springload, belt thresher, a laboratory air-screen cleaner, a custom-built, single-seed, weight-sorting machine, a single-column blower, a four-channel aspirator, a laboratory gravity separator, a laboratory brush machine, a single-deck, vibratory seed separator, a

Table 2. Chronological development plan for the OPGC

Establishment Phase (2001–2002)

- Building infrastructure
- Building team—staff and networking
- Establishing priority genera—consultation, survey and literature review
- Launching germplasm introduction and accessioning

Development Phase (2002–2004)

- Evaluating progress and analysing needs
- Perfecting genebanking techniques
- Expanding curation team, staff development and graduate assistantships
- Seeking R&D funds
- Formulating a manageable OPGC programme

Operational Phase (2004 onward)

- Running a predictable yearly programme, including services and training activities with flexibility to introduce new activities
- Continuing to seek R&D funds and maintaining cooperator and clientele base

seed scarifier, a cabinet-system dryer and a temperature- and time-controlled, precision dryer. The low relative-humidity seed cooler is also used as a slow dryer where seed of less than 10% seed moisture content (wet-weight basis) can be equilibrated to a low seed moisture content for medium or long-term storage. The seed-processing facilities were designed to provide a free-flowing production line system to transfer seed into the seed cooler. An 8.3 m² vernalization cooler operating at 8°C is available for plant vernalization, seed stratification, and vegetative-propagule storage. A 1060 m² computerized, environment-controlled greenhouse adjoining the building has been upgraded and equipped for year round seed regeneration and research. A tissue-culture laboratory is being established to maintain meristem cultures of clonally propagated germplasm. In addition to *in vitro* storage, clonal accessions will be maintained in the OPGC greenhouse and in a field genebank to be established at the OSU experimental farms. Duplicate collections will also be backed up by cooperating institutions.

Current status of OPGC and of herbaceous ornamental germplasm conservation within NPGS

The OPGC Annual Report (OPGC 2002) outlines yearly activities at the Center. Seed production, processing and testing techniques, and data entry and management protocols are being established and documented for the preparation of comprehensive Operations Manuals. The building and greenhouse renovations and equipment procurement activities are nearing completion and a greenhouse maintenance programme is in place.

In the first seed regeneration cycle during 2002, about 40 accessions were successfully multiplied in greenhouse compartments and field pollination cages by using both honeybees and bumblebees as pollinators (Stieve and Tay 2003). In the 2003 season, the number of accessions in the regeneration programme doubled. Winter seed production in the greenhouse was successfully tested in the 2002–03 season, and additional regenerations are planned in 2003–04.

In 1995, 1999 and 2001, the HOCGC produced three lists of high-priority genera, which collectively comprise 64 distinct genera. The OPGC is presently using the 2001 list (Table 3) of 30 genera in its work plan. These 30 genera encompass about 6700 distinct taxa, based on Hortus Third (Bailey and Bailey 1976), which exceeds current OPGC resources. The ability to prioritize species within these genera for conservation and to be selective about the genetic materials to acquire and maintain is critical. In 2001, the Director asked the HOCGC to rank the priority genera in order to focus near-term activities on the most important genera. A survey was carried out among floricultural scientists in academia and industry, and the top 15 genera in descending order were *Begonia*, *Impatiens*, *Geranium* (more probably referring to *Pelargonium* as it is known as geranium in the trade), *Petunia*, *Salvia*, *Pelargonium*, *Viola*, *Dianthus*, *Campanula*, *Hemerocallis*, *Alstroemeria*, *Lilium*, *Verbena*, *Rudbeckia* and *Phlox* (Tay 2003b). Germplasm acquisition is now focusing on four

of the genera with the highest rankings: *Begonia*, *Impatiens*, *Petunia* and *Pelargonium*. In contrast, unique germplasm of the other priority genera and threatened germplasm irrespective of genera will also be added to the genebank and put into long-term storage. Germplasm characterization and evaluation will concentrate on the high-ranking priority genera.

Most of the transferable herbaceous ornamental plant accessions at other NPGS repositories have been transferred to the OPGC resulting in the acquisition of 966 accessions representing 62 genera (Table 4).

Salvia continues to be maintained at the USDA Western Regional Plant Introduction Station, Pullman, Washington; the five tropical foliage genera will be mainly preserved at the USDA National Germplasm Repository, Miami, FL. Numerous transferred accessions have low seed inventory or viability, necessitating prompt regeneration to provide for base and active collections and distribution needs.

Through strong working relationships with both public and private sector researchers and plant breeders, some 700 new accessions were acquired in 2003–04 and given temporary OPGC numbers. These include the 205 accessions of *Pelargonium* breeding materials from Pennsylvania State University, 121 accessions of *Pelargonium* species from Shady Hill Gardens

Table 3. High-priority herbaceous ornamental genera identified by the HOCGC in 2001

<i>Aglaonema</i>
<i>Alstroemeria</i>
<i>Anthurium</i>
<i>Aquilegia</i>
<i>Aster s.l.</i>
<i>Baptisia</i>
<i>Begonia</i>
<i>Campanula</i>
<i>Chrysanthemum (Dendranthema)</i>
<i>Dianthus</i>
<i>Dieffenbachia</i>
<i>Euphorbia (poinsettia)</i>
<i>Geranium</i>
<i>Hemerocallis</i>
<i>Impatiens</i>
<i>Iris</i>
<i>Lilium</i>
<i>Narcissus</i>
<i>Pelargonium</i>
<i>Petunia</i>
<i>Phalaenopsis</i>
<i>Philodendron</i>
<i>Phlox</i>
<i>Rudbeckia</i>
<i>Salvia</i>
<i>Spathiphyllum</i>
<i>Tagetes</i>
<i>Verbena</i>
<i>Veronica s.l.</i>
<i>Viola</i>

Table 4. Current (2003) OPGC herbaceous ornamental plant accessions in the GRIN database

Genus	No. accessions	Genus	No. accessions
<i>Adiantum</i>	1	<i>Impatiens</i>	1
<i>Alstroemeria</i>	1	<i>Iris</i>	36
<i>Antirrhinum</i>	88	<i>Junellia</i>	1
<i>Aquilegia</i>	4	<i>Leonotis</i>	1
<i>Argyranthemum</i>	3	<i>Leucanthemum</i>	90
<i>Arum</i>	1	<i>Liatris</i>	7
<i>Aruncus</i>	3	<i>Ligularia</i>	6
<i>Asclepias</i>	20	<i>Lilium</i>	35
<i>Astilbe</i>	6	<i>Osteospermum</i>	43
<i>Astilboides</i>	1	<i>Pavonia</i>	2
<i>Begonia</i>	3	<i>Penstemon</i>	56
<i>Bredia</i>	1	<i>Petrorhagia</i>	1
<i>Campanula</i>	34	<i>Phlox</i>	2
<i>Canna</i>	1	<i>Portulaca</i>	4
<i>Cardiocrinum</i>	6	<i>Portulacaria</i>	2
<i>Caulophyllum</i>	1	<i>Primula</i>	1
<i>Chelidonium</i>	1	<i>Pseudolysimachion</i>	4
<i>Chrysanthemum</i>	9	<i>Rudbeckia</i>	2
<i>Clematis</i>	4	<i>Sanguisorba</i>	1
<i>Cleome</i>	38	<i>Stokesia</i>	38
<i>Clintonia</i>	1	<i>Tagetes</i>	114
<i>Consolida</i>	6	<i>Trollius</i>	1
<i>Convallaria</i>	1	<i>Turnera</i>	1
<i>Coreopsis</i>	1	<i>Veratrum</i>	1
<i>Delphinium</i>	31	<i>Verbena</i>	17
<i>Dianthus</i>	102	<i>Veronica</i>	1
<i>Echinops</i>	1	<i>Veronicastrum</i>	1
<i>Engelmannia</i>	1	<i>Viola</i>	15
<i>Filipendula</i>	1	<i>Xylanthemum</i>	2
<i>Geranium</i>	4	<i>Zinnia</i>	74
<i>Glandularia</i>	2	Total	966
<i>Gypsophila</i>	29		

(<http://www.shadyhill.com/>), 26 accessions of *Begonia* species from the American Begonia Society (<http://www.begonias.org/>) and 18 accessions of *Impatiens* species from the International Impatiens Society (http://www.geocities.com/impatiens_society/). There are another 147 accessions of newly collected germplasm from Armenia, China, Russia and Ukraine from recent USDA plant exploration missions, the North American China Plant Exploration Consortium (NACPEC) and the Midwest Plant Collecting Collaborative (MWPCC). In addition, a number of botanical gardens, arboreta, and plant nurseries, such as the USDA National Arboretum, Chicago Botanic Garden, Cornell Plantation of Cornell University and Toledo Botanic Garden, and Plant Delights Nursery, have committed to donate germplasm.

Future plans and directions

In July 2002, the OPGC conducted a strategic-planning session to develop an implementation plan for the remaining years of the SCA (through July 2004), in order to meet project objectives and establish the basis for a successful project review and potential renewal. The one-day session was facilitated by Garry E. Gibbons, Leader of the OSU Strategic Planning and Marketing programme, and involved nine members of the HOCGC's OPGC Subcommittee and four observers. The following specific recommendations resulted from that session:

1. to reconstitute the HOCGC committee to consist only of active members with equal representation of different groups of customers, i.e. government, industry, academia and botanic gardens;

2. to develop and publish a resource database;
3. to encourage the OPGC staff to join and actively participate in professional organizations;
4. to rank priority genera and choose exemplar genera for germplasm management projects and based on biological features, then to select a preliminary set of benchmarks and apply them to performance assessments;
5. to determine what is the most efficient balance between professional staff and hourly labour based on current resources;
6. to develop and adjust priorities, levels and types of activity that can be accomplished by OPGC personnel versus external collaboration.

Significant progress is now being made in all these areas. The HOCGC is under going reorganization. Crop-specific Technical Working Groups (TWG) are being established to provide OPGC advice germplasm diversity, natural distribution and existing collections, gaps in collections, taxonomic and evolutionary relationships, genetics, seed and vegetative regeneration and storage, formulation of crop descriptors, germplasm characterization and evaluation (Tay in press). The TWGs will consist of five to seven specialists for each crop, representing a range of scientific disciplines, e.g. systematics, genetics, horticulture, plant breeding, pathology and entomology. TWG business will be conducted through e-mail, teleconferences, HOCGC meetings, industry conferences and professional meetings. The existing TWGs are listed on the OPGC Web site.

The OPGC is actively participating in both domestic and international horticultural science societies, trade associations, crop-specific societies and gardener groups. It organized and hosted the 2003 National Floriculture Forum of the American Society for Horticultural Science and, in 2005, will organize and host a special symposium on herbaceous plant genetic resources conservation and utilization under the auspices of the International Society for Horticultural Science.

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